Status of Irish Aquaculture 2007

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A compilation report of information on Irish Aquaculture.

Marine Institute, Bord Iascaigh Mhara and Údarás na Gaeltachta.

Report compiled and prepared by:
MERC Consultants Ltd.

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Editors
Ronan Browne, Bryan Deegan, Lucy Watson, Donáll Mac Giolla Bhríde, Mark Norman, Micheal Ó'Cinnéide, David Jackson and Terence O'Carroll.

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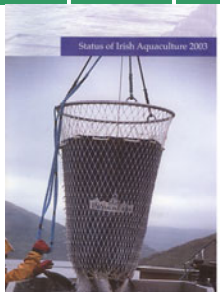
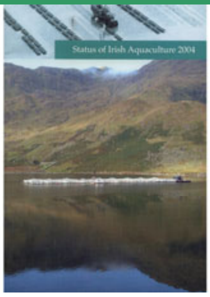
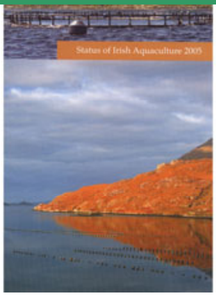
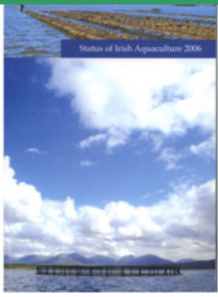








This is the fifth annual report to review the status of Irish aquaculture (see Parsons *et al*., 2004, Parsons *et al*., 2005, Browne *et al*., 2006, and Browne *et al*., 2007). As with previous editions it has been produced in collaboration with the three main State agencies that provide support services in the areas of research and development to the industry – Bord Iascaigh Mhara (BIM), the Marine Institute (MI) and Údarás na Gaeltachta.

The objectives of this and previous reports are:

- To provide an objective and comprehensive source of information on the status of Irish aquaculture in 2007.
- To show trends in the production, employment, export and market statistics for the Irish industry in 2007.
- To summarise the current licensing activity, this was the responsibility of the Department of Communications, Marine and Natural Resources, now the Department of Agriculture, Fisheries and Food (DAFF).
- To present the results of the wide range of monitoring programmes for farmed shellfish and finfish, which are carried out primarily by the Marine Institute, in accordance with Irish and EU food safety and environmental requirements.
- To highlight the various aquaculture research and development initiatives which were underway in 2007.
- To collate information about Irish aquaculture training.
- To report on issues/events/initiatives that occurred during the year 2007.
- To present summaries of pertinent aquaculture reports published during 2007.

The overall aim of the report is to provide useful reference material for the industry, trade customers, investors, researchers and interested parties.

Executive Summary

The Irish aquaculture industry is market led with most of the produce being exported to meet the growing worldwide demand for marine and freshwater food. The modern Irish aquaculture industry began in the 1970's and it has experienced significant challenges in the last few years. It is an industry that provides employment and generates income in rural Ireland.

In 2007, the total production volume of the shellfish and finfish aquaculture sectors was 48,350 tonnes, which was a 15.8% volume decrease from the year 2006. As a result the total harvest value decreased by 15% to give a total aquaculture production value of €105.7 million in 2007. Although the overall production volume was down on 2006 figures, there were a number of species that showed growth. These species were: gigas oyster (+8%), scallop (+56%), native oysters (+6%) and other finfish (+33%).

In 2007, there were a total of 1,981 people employed in the aquaculture industry, of which 686 were in full time employment, 478 were in part time employment and 817 were employed on a casual basis. There was a slight fall of 3.5% in overall aquaculture employment in 2007.

BIM's database shows that in the year 2007 there were 573 active aquaculture licences around Ireland. Of these, there were 494 active shellfish licences (86% of total), 75 finfish licences and 4 licences for the cultivation of algae. The greatest number of licences was for oyster farming (268 licences) and there were 167 mussel licences. Data from the Department of Agriculture Fisheries and Food (DAFF) demonstrate that the number of applications (new and renewals) was 57 in the year 2007. The Aquaculture Licences Appeals Board (ALAB) made five determinations on licences in 2007. These decisions resulted in the granting of three aquaculture licences and the refusal to grant one licence (the number of determinations is not necessarily the sum of the decisions as several appeals may have been received against one Ministerial decision). There were no Ministerial aquaculture decisions appealed in the year 2007 and there were no appeals carried over into 2008.

Ireland has an established and a comprehensive system of environmental and food safety monitoring for the aquaculture industry which meets EU and market demands. For example, Shellfish production areas are classified by the Sea Fisheries Protection Authority (SFPA) based on the monitoring results of shellfish for bacterial contamination and in accordance with the terms of EU regulations. The Marine Institute as the National Reference Laboratory operates a virus testing facility and can undertake virus testing either for surveillance purposes, or in response to outbreak investigations at the request of the SFPA or the Food Safety Authority of Ireland. The SFPA with support from the Marine Institute (MI) is responsible for residue controls on farmed finfish for the national residue-monitoring plan and there were no non-compliant (i.e. positive) results detected for farmed finfish in 2007 (as per the year 2006). In 2007 the Quality and Environment Section of BIM's Aquaculture Development Division continued to provide the industry with a variety of quality assurance schemes for farmed products that are independently verified.

From a marketing perspective, there was a decline in the volume and total value of salmon exports from Ireland in 2007. This can be explained by increased demand from the domestic Irish market and a decline in the overall level of production. For Irish exporters France remained the key market. During 2007 the overall price of Irish fresh salmon exports declined by 5%. The Irish retail market for trout in 2007 was valued at €4 million; this was a slight increase on the 2006 value of €3.7million. In terms of total volume this equated to a live weight equivalent of 500 tonnes. Bulk gigas oyster prices during 2007 were similar to those of 2006 with average prices for Irish oysters delivered into France typically obtaining €2.20 to €2.30 per kg. Bulk Irish rope mussels delivered into France achieved €1.30 to €1.40 per kg and bottom mussels (80-100 pc/kg) obtained approximately €1.00 per kg to France and €1.30 to €1.50 per kg delivered into the Netherlands.

The Co-ordinated Local Aquaculture Management Systems (CLAMS) continued in the year 2007. It is a nationwide initiative and is also in operation in Northern Ireland to manage the development of aquaculture in bays and inshore waters at a local level. By the year 2007 there were a total of 18 CLAMS groups established around the coast of Ireland. The CLAMS process allows for the integration of aquaculture into the coastal zone, whilst recognising the need to improve environmental compliance, product quality and consumer confidence.

During the year 2007, the total investment in aquaculture projects supported by BIM under the National Development Plan (NDP) EU co-funded Measures and BIM's non EU co-funded Pilot and Resource Development Grant Schemes was €13.06 million compared with €13.35 million in 2006. Commercial and R&D Grants are also available to operators in the Gaeltacht from Údarás na Gaeltachta. In 2007, these projects received approval for grant aid under NDP funding totalling €2.69 million compared with €2.40 million in 2006.

There were a number of significant technical developments within the Irish Aquaculture sector in the year 2007. These included:

- 2007 was a good year for the bottom mussel sector and 29,600 tonnes of mussel seed was reported as transplanted during the year by 34 vessels.
- The first Irish farmed cod were harvested in February 2007 from the Trosc Teoranta site in Beirteraghbui Bay, Connemara in County Galway. Cod had been identified as a worthwhile candidate for further investigation in the "New Species Development" report published in 1999.

The technical report 'Offshore Aquaculture Development in Ireland – Next Steps' was jointly commissioned by BIM and the Marine Institute and launched in 2007. The document represents a joint initiative by technical staff in BIM and the MI, setting out a detailed Irish vision for the development of a significant offshore aquaculture capability for Ireland.

Aidhm agus Scóip na Tuarascála

Is í seo an cúigiú tuarascáil bhliantúil a dhéanann athbhreithniú ar stádas an uisceshaothraithe in Éirinn (féach Parsons *et al*. 2004, Parsons *et al*. 2005, Browne *et al*. 2006, agus Browne *et al*. 2007). Mar atá le tuarascálacha roimhe seo, tá sí curtha i láthair i gcomhar leis na trí Phríomhghníomhaireachtaí Stáit a chuireann seirbhísí tacaíochta ar fáil i réimsí taighde agus forbartha sa tionscal – Bord Iascaigh Mhara (BIM), Foras na Mara (MI) agus Údarás na Gaeltachta.

Is iad seo a leanas cuspóirí na tuarascála:

- Foinse oibiachtúil agus chuimsitheach eolais a chur ar fáil faoi stádas an uisceshaothraithe in Éirinn i 2007.
- Treochtaí a léiriú i dtáirgeadh, fostaíocht, onnmhairiú agus staitisticí margaidh do thionscal na hÉireann i 2007.
- Achoimre a thabhairt ar ghníomhaíocht reatha cheadúnais, a bhí roimhe seo mar fhreagracht ar an Roinn Cumarsáide, Fuinnimh agus Acmhainní Nádúrtha agus atá anois faoi chúram na Roinne Talmhaíochta, Iascaigh agus Bia.
- Na torthaí a bhaineann le raon fairsing clár monatóireachta ar shliogiasc agus ar iasc eite, a dhéanann Foras na Mara go príomha, de réir riachtanais chomhshaoil agus sábháilteachta bia na hÉireann agus an AE.
- Chun béim a leagan ar thionscnaimh éagsúla taighde agus forbartha i réimse an uisceshaothraithe a bhí ar siúl i 2007.
- Eolas faoi oiliúint uisceshaothraithe na hÉireann a chomhordú.
- Tuairisc a dhéanamh faoi cheisteanna/imeachtaí/tionscnaimh a tharla le linn na bliana 2007.
- Achoimrí ar thuarascálacha ábhartha uisceshaothraithe a foilsíodh le linn 2007 a chur i láthair.

Is é aidhm fhoriomlán na tuarascála ábhar úsáideach tagartha a chur ar fáil don tionscal, do chustaiméirí trádála, d’infheisteoirí, do thaighdeoirí agus do pháirtithe leasmhara.

Achoimre Fheidhmiúcháin

Is é an margadh a threoraíonn tionscal uisceshaothraithe na hÉireann agus onnmhairítear mórchuid den táirge chun freastal ar an bhfás domhanda san éileamh do bhia mara agus fíoruisce. Thosaigh tionscal uisceshaothraithe na hÉireann sna 1970daí agus tá dúshláin shuntasacha aige le blianta beaga anuas. Tionscal é a sholáthraíonn deiseanna fostaíochta agus a chothaíonn ioncam i gceantair thuaithe na hÉireann

I 2007, bhí táirgiúlacht iomlán, idir iasc sliogáin agus iasc eiteach, 48,350 tonna, laghdú 15.8% ar 2006. Dá thoradh laghdaigh luach an fhómhair 15% chuig luach iomlán €105.7 milliún in iomlán ó uisceshaothrú i 2007. Cé go raibh an mór-iomlán laghdaithe ó leibhéal 2006 bhí méadú ar thonnáiste roinnt speiceas. Ba iad sin oisrí gigas (+8%), muiríní (+56%), oisrí dúchasacha (+6%) and iasc eiteach eile (+33%).

I 2007, bhí 1,981duine in iomlán fostaithe sa tionscal dobharshaothraithe, 686 díobh i bhfostaíocht lán-aimseartha, 478 i bhfostaíocht pháirtaimseartha agus 817 fostaithe ar i gcorrfhostaíocht. Bhí laghdú beag 3.5% in fhostaíocht uile uisceshaothraithe i 2007.

Léiríonn bunachar sonraí BIM go raibh 573 ceadúnas dobharshaothraithe gníomhach i Éirinn in 2007. Díobh siúd bhí 494 ceadúnas iasc sliogáin (86% den iomlán), 75 d’iasc eiteach agus 4 cheadúnas d’fhás feamainne Bhí formhór na gceadúnas d’fhás oisrí (268 ceadúnas) agus bhí 167 ceadúnas d’fhás diúilicíní. Léiríonn sonraí ón Roinn Talmhaíochta, Iascaigh agus Bia gur 57 iarratas (idir nua agus athnuachan) a rinneadh i 2007. Rinne an Bord Achomhairc ALAB cúig chinneadh i 2007. Cheadaigh siad trí cheadúnas agus dhiúltaigh siad ceann (ní gá gur ionann an uimhir chinnidh agus an uimhir achomhairc mar gur féidir go mbeadh níos mó ná achomharc amháin in aghaidh cinneadh Aire). Ní raibh aon achomharc ar chinneadh Aire i dtaca le ceadúnas uisceshaothraithe i 2007 agus ní raibh aon achomharc tugtha ar aghaidh go 2008.

Tá córas forleathan monatóireachta ar shábháilteacht timpeallachta agus bia a shásaíonn riachtanais an AE agus an mhargaidh forbartha ag Éirinn don tionscal uisceshaothraithe. Tá, mar shampla, ceantair tháirgeachta iasc shliogáin rangaithe ag an Údarás Chosaint Iascaigh Mhara (SFPA) bunaithe ar thorthaí monatóireachta iasc shliogáin do thruailliú baictéarach agus i gcomhréireacht le téarmaí rialacháin an AE. Feidhmíonn Foras na Mara, ina rol mar Shaotharlann Tagartha Náisiúnta, áis tástála víreas agus is féidir leis tabhairt faoi thástáil víreas do chuspóirí monatóireachta nó mar fhrithghníomh i gcás fiosrúchán ráige ar iarratas ón SFPA nó an tÚdarás Sábháilteachta Bia na hÉireann Tá an SFPA, le tacaíocht ó Fhoras na Mara, freagrach as smachtú iarmhair ar iasc eiteach feirme don phlean náisiúnta monatóireachta iarmhair agus níor fuarthas aon toradh i 2007 (mar a bhain le 2006) nár shásaigh na riachtanais. I 2007, lean Rannóg Chaighdeán agus Thimpeallachta den Roinn Forbartha Uisceshaothraithe BIM de sholáthar scéimeanna éagsúla dearbhaithe caighdeán do tháirgí feirme agus iad seo dearbhaithe go neamhspleách.

Ó thaobh na margaíochta de bhí laghdú sa tonnáiste agus luach iomlán na mbradán onnmhairithe as Éirinn i 2007. Tá seo de thoradh méadú san éileamh baile agus laghdú ar an táirge iomlán. Is í an Fhrainc an eochair-mhargadh d'onnmhairithe iasc Éireannacha. Bhí titim 5% ar luach na n-easpórtálacha bradán as Éirinn i rith 2007. Bhí luach €4 mhilliún ar an mhargadh miondíola do bhric i 2006, méadú beag ar an luach €3.7 milliún i 2006. B'ionann sin agus 500 tonna de mheáchan beo. Bhí luach na n-oisrí Gigas i rith 2007 mar a chéile le 2006 agus meánluach €2.20 go €2.30 an Kg á mbaint amach ar bhulc dhíolacháin chuig an Fhrainc. Bhí luach €1.30 go €1.40 á bhaint amach ar bhulc dhiúilicíní rópa soláthraithe sa Fhrainc agus diúilicíní ón ngrinneall (80 – 100 píosa/Kg) ag baint amach timpeall €1.00 an Kg sa Fhrainc agus €1.30 go €1.50 san Ollainn

Lean an Córas Comhordaithe Bainistíochta d'Uisceshaothrú Áitiúil (CLAMS) ar aghaidh i 2007. Tionscnamh náisiúnta é seo atá ag feidhmiú freisin i dTuaisceart Éireann chun bainistiú a dhéanamh ag leibhéal áitiúil ar fhorbairt an uisceshaothraithe i gcuanta agus uiscí le cladach. Faoi dheireadh 2007 bhí 18 grúpa CLAMS in iomlán bunaithe timpeall chósta na hÉireann. Tugann an próiseas atá i gceist le CLAMS deis comhtháthú a dhéanamh ar an uisceshaothrú sna ceantair chósta agus aitheantas ag an am chéanna don ghá atá ann cloí le feabhsú timpeallachta, caighdeán an táirge agus muinín an tomhaltóra.

I rith 2007 infheistíodh €13.06 milliún, i gcomparáid le €13.35 milliún i 2006, i dtograí uisceshaothraithe a fuair tacaíocht ó BIM faoin bPlean Forbartha Náisiúnta (NDP) i scéimeanna deontais a bhí comh-mhaoinithe ag an AE agus thograí gan comh-mhaoiniú an AE faoi Scéimeanna Forbartha Píolóta agus Acmhainne BIM féin. Bhí deontais thráchtála agus thaighde agus fhorbartha ar fáil do thograí sa Ghaeltacht freisin ó Údarás na Gaeltachta. I 2007 ceadaíodh cúnamh deontais €2.69 milliún do na tograí seo faoin NDP i gcomparáid le €2.40 milliún i 2006.

Bhí roinnt forbairtí teicniúla suntasacha san earnáil uisceshaothraithe Éireannach i 2007. Ina measc siúd bhí:

- Bliain mhaith a bhí i 2007 don earnáil diúilicíní a tógadh ón ngrinneall agus tuairiscí ó 34 soitheach gur aistrigh siad 29,600 tonna de shíol diúilicíní i rith na bliana
- Tuairiscíodh an chéad fhómhar trosc Éireannach i bhFeabhra 2007 ó shuíomh Trosc Teo i gCuan na Beirtrí Buí i gConamara i gContae na Gaillimhe. Bhí an trosc aitheanta mar speiceas le féidearthachtaí fiúntacha do thaighde breise sa tuarascáil "New Species Development" a foilsíodh i 1999.
- Foilsíodh an tuarascáil theicniúil 'Offshore Aquaculture Development in Ireland – Next Steps' a bhí coimisiúnaithe ag BIM agus Foras na Mara le chéile. Fiontar comhpháirteach idir fhoireann theicniúil BIM agus Fhoras na Mara é seo a léiríonn fís shonrach Éireannach d'fhorbairt shuntasach uisceshaothraithe amach ó chósta na hÉireann.

The geographic locations of aquaculture licences for salmon, oyster, mussel and scallop culture are shown in Figure 1:1. The distribution of licences for new or novel species is shown in Figure 1:2.

Figure 1:1. Location of Aquaculture Licences for Shellfish and Finfish Species 2007 (BIM). Hatched areas in the oyster figure are areas subject to native oyster orders (e.g. Tralee and Clew Bay).

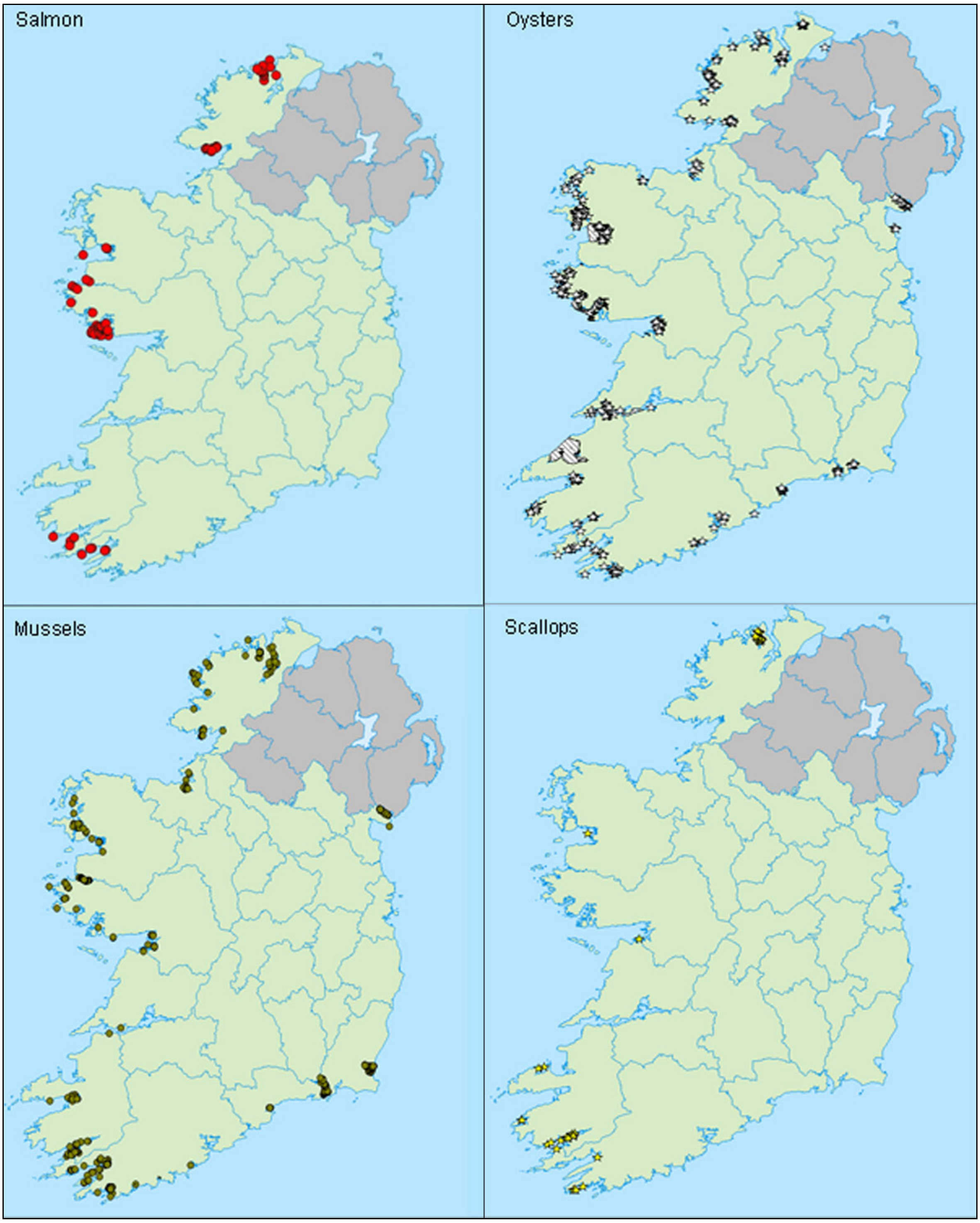
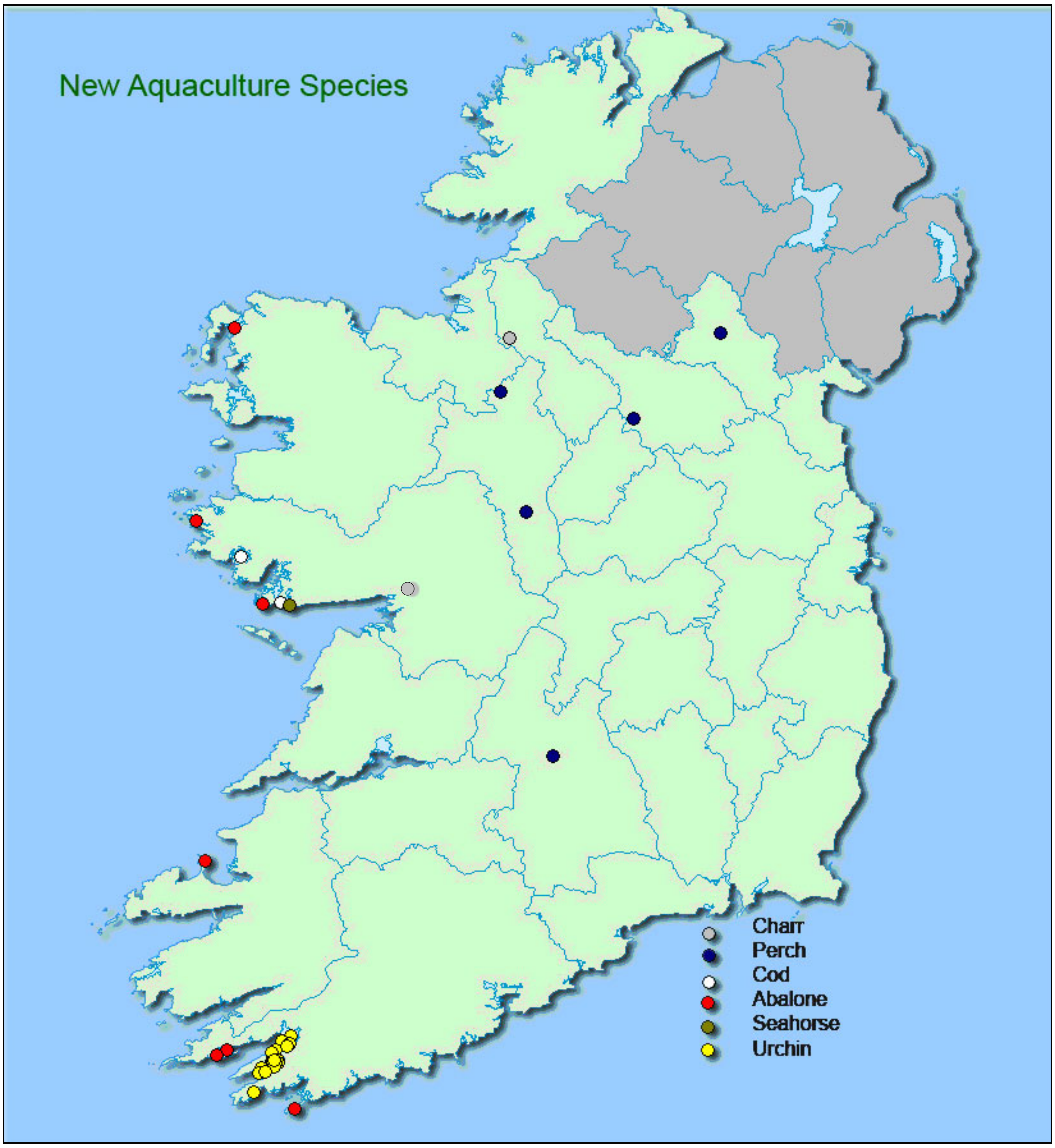


Figure 1:2. New Aquaculture Species Sites in Ireland (BIM).



2. PRODUCTION AND EMPLOYMENT

2007 Overview

The method of gathering information for this section of the "Status of Irish Aquaculture 2007" involved a species-specific questionnaire being mailed out to each farmer on BIM's licence database at the start of 2008. These forms requested information on production and employment for the previous year (2007). The resultant data gathered provides a summary of company status for the year, total aquaculture production and employment. Any farmers who had not returned their forms by the 31st March 2008 were contacted directly by BIM. If a farmer was unreachable, their employment and production data was estimated based on data from previous reports. Of the 376 questionnaires distributed requesting information about the year 2007 BIM received 335 returns, which was a return rate of 89.1%.

The method by which BIM's data was managed changed in 2007 with the development of the new Aquaculture License Production System (ALPS). This project was undertaken to solve the problem associated with having two independent databases (production and a separate licence database).

In 2007, the total production volume of the shellfish and finfish sectors was 48,350 tonnes (Table 2:1), which was a 15.8% volume decrease from the year 2006. The total harvest value also decreased by 15%, giving a total aquaculture production value of €105.7 million in 2007. Although the overall production volume was down on 2006 figures, there were a number of species that showed growth in production volume. These species were: gigas oyster (+8%), scallop (+56.12%), native oysters (+6%) and other finfish (+33%).

Table 2:1. Total Aquaculture Production (volume and value) 2006 and 2007 (BIM).

	Volume (tonnes)		Value (€'000)	
	2006	2007	2006	2007
Species				
Rope Mussel	9,660	11,200	7,177	7,784
Relaid Rope Mussel Seed	4,300	0	1,935	0
Bottom Mussel	23,583	18,270	35,789	20,906
Gigas Oyster	6,511	7,032	14,623	15,390
Native Oyster	360	382	1,941	1,630
Clam	245	170	1,382	1,038
Scallop	37	58	200	339
Shellfish Other*			201	204
Total Shellfish	**44,696**	**37,112**	**63,248**	**47,291**
Salmon ova/smolt*			3,378	2,869
Salmon	11,174	9,923	52,711	51,294
Sea reared Trout	546	507	2,444	1,932
Freshwater Trout	970	760	2,658	2,027
Other Finfish	36	48	221	317
Total Finfish	**12,726**	**11,238**	**61,412**	**58,439**
Total Aquaculture	**57,422**	**48,350**	**124,660**	**105,730**

*This category is expressed as individuals so is not included as a tonnage. This includes additional value from sales of juveniles etc.

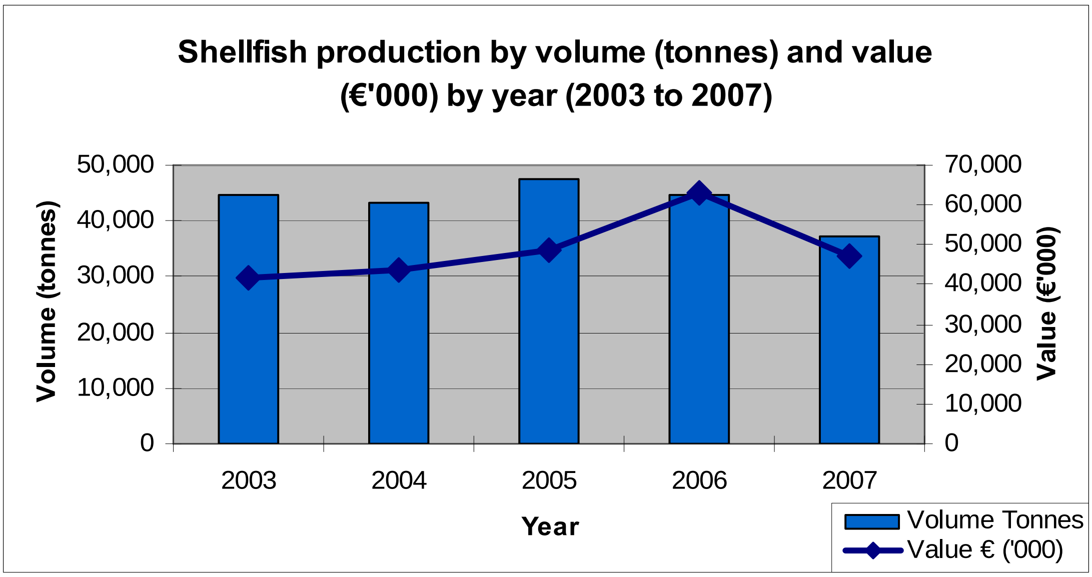
In 2007 there were a total of 1,981 people employed in the aquaculture industry, of which 686 were in full time employment, 478 were in part time employment and 817 were employed on a casual basis. There was a slight fall of 3.5% in overall aquaculture employment in 2007.

Shellfish Production 2007

Shellfish Production Overview in 2007

Although both gigas and native oysters recorded an increase in volume during 2007, bottom mussel production volume reduced by 22.5% compared with the year 2006, resulting in an overall shellfish production volume decrease of 17% to 37,112 tonnes in 2007. The decline in bottom mussel production also had a knock-on effect on the total shellfish value which declined by €15.9 million (-25.2%) from the 2006 value (Figure 2:1 and Table 2:1).

Figure 2:1. Total Shellfish Production by Year (2003 to 2007) (BIM).



Figures 2:2a and 2:2b display a breakdown the volume of shellfish produced in Ireland and their value respectively. As in 2006 bottom mussel remained the species with the highest harvest volume and the highest total value making up 50% of the volume and 45% of the value of shellfish produced in 2007. The average price per tonne of bottom mussel in 2006 was €1,517, while in 2007 the average value of a tonne of bottom mussel stabilised at €1,144 per tonne This decrease had a significant bearing on the overall decrease in shellfish value.

In 2007, gigas oysters comprised 19% of the volume (Figure 2:2a) of shellfish produced and 33% of the overall shellfish value (Figure 2:2b), which was a slight increase on their market share recorded in 2006. The total volume of rope mussel produced accounted for 30% of the total volume of shellfish produced and 16% of the total shellfish value. The remaining volume and value was made up of native oyster, clam, scallop and novel shellfish.

Figure 2:2a. Percentage Breakdown of the Total Shellfish Production in 2007 by Species (volume) (BIM).

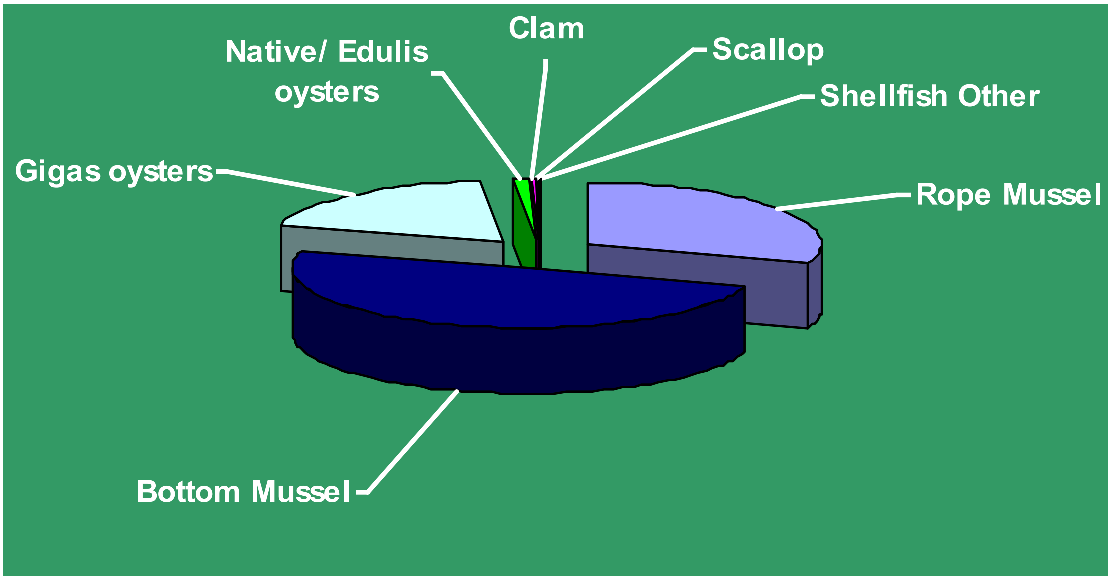
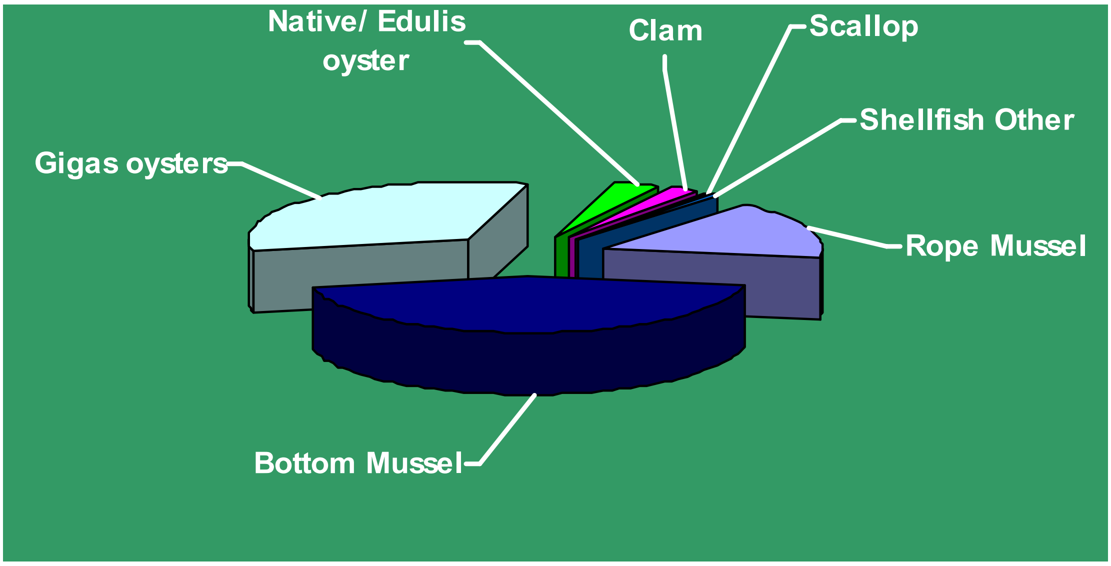


Figure 2:2b. Percentage Breakdown of the Total Shellfish Production in 2007 by Species (value) (BIM).



Mussels

Bottom Mussels

The bottom mussel harvest (Figure 2:3) decreased for the second consecutive year due to a reduction in mussel seed relaid in 2005. Production fell from 23,583 tonnes in 2006 to 18,270 tonnes in 2007, which was a decrease of 22.5%. The market value of bottom mussels also declined from €35.78 million in 2006 to €20.9 million in 2007. This was caused by both the drop in production and the average price decreasing by 24.6% from the 2006 value to €1,144 per tonne (Figure 2:4).

Figure 2:3. Bottom Mussel Production by Volume (tonnes) and Value (€'000) 2003 to 2007 (BIM).

Figure 2:4. Bottom Mussel Average Value (€) per Tonne 2003 to 2007 (BIM).

<u>Rope Mussel</u>
Reduced biotoxin closures of production areas in 2007, compared with 2005 and 2006 meant that no rope mussels were sold to the bottom mussel sector for relaying in 2007. This allowed increased sales of rope mussels in 2007 for consumption (Figure 2:5). There was a total of 11,200 tonnes of rope mussel harvested to market in 2007 which was an increase of 15.9% on the previous year (Figure 2:5). The total market value increased from €7.1 million in 2006 to €7.78 million in 2007 (+8.4%) with an average price of €693 being achieved per tonne (-6.6% on the previous year) (Figure 2:6).

Figure 2:5. Rope Mussel Production by Volume (tonnes) and Value (€'000) 2003 to 2007 (BIM). (N.B. This figure does not include mussels sold for relaying to the bottom mussel sector in 2005 and 2006).

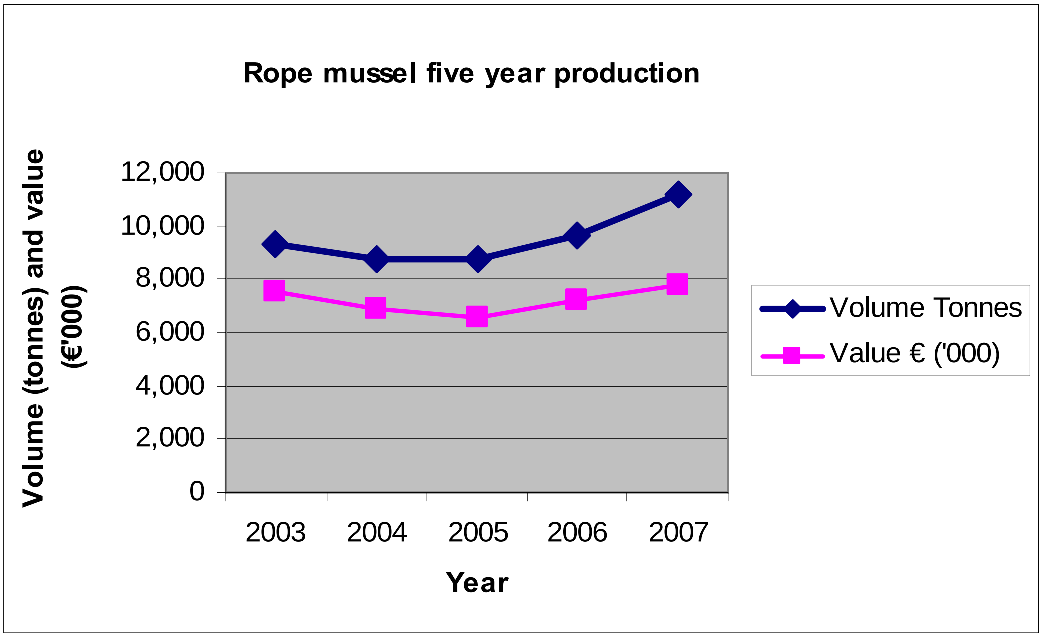
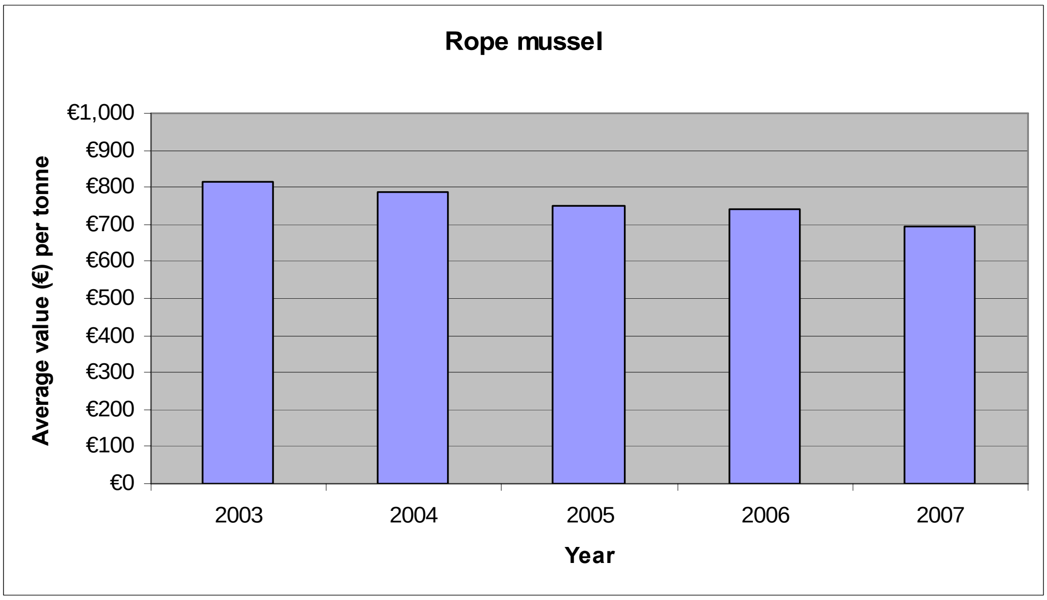


Figure 2:6. Rope Mussel Average Value (€) per Tonne 2003 to 2007 (BIM).



Oysters

Crassostrea gigas (gigas oyster)
In 2007, gigas oyster production increased for the second consecutive year (Figure 2:7). Production rose from 6,511 tonnes in 2006 to 7,032 in 2007 (+8%). The total market value of gigas oysters increased by €0.76 million, which was a 5.24% increase on the reported 2006 value. In 2007, the average value per tonne decreased from the 2006 value of €2,245 to €2,188 per tonne (-2.5%) (Figure 2:8).

Figure 2:7. Gigas Oyster Production by Total Volume (tonnes) and Value (€'000) 2003 to 2007 (BIM).

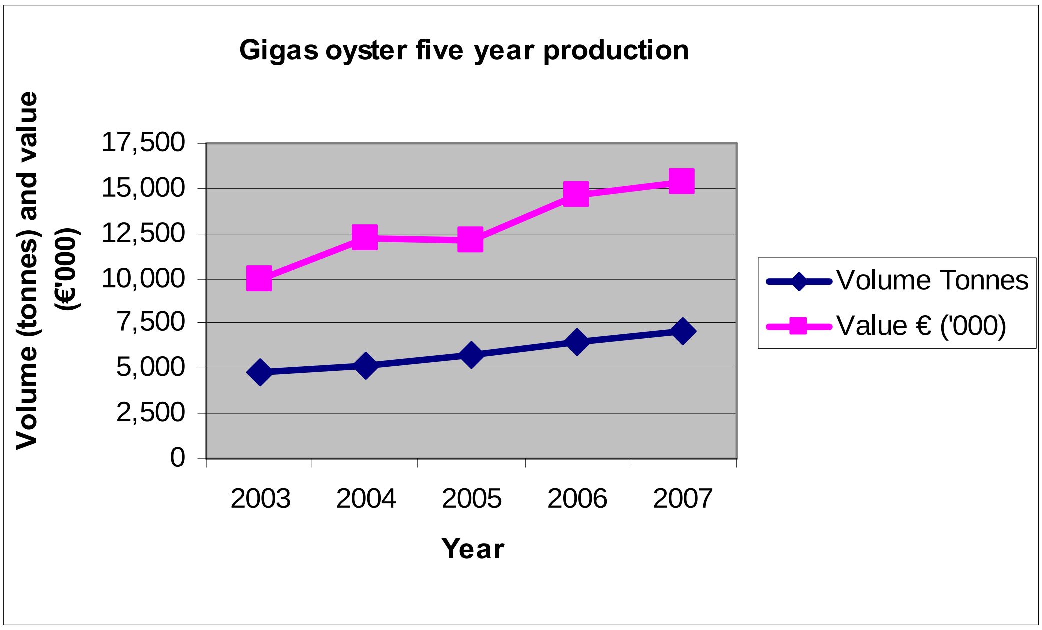
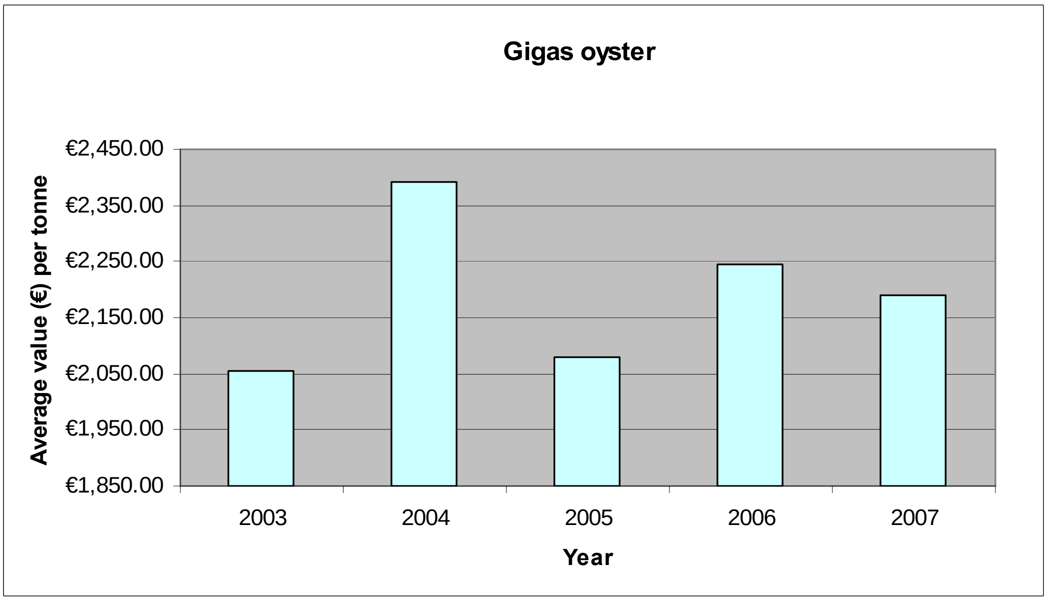


Figure 2:8. Gigas Oyster Average Value (€) per Tonne 2003 to 2007 (BIM).



<u>*Ostrea edulis* (Native or flat oyster)</u>
The national harvested volume of native oyster increased from 360 tonnes in 2006 to 382 tonnes in 2007 (+6%) (Figure 2:9). However, the total market value decreased by €0.3 million in 2007 (-16%) because the average value per tonne decreased to €4,267 in 2007 (-20%) (Figure 2:10).

Figure 2:9. Native Oyster Production by Total Volume (tonnes) and Value (€'000) 2003 to 2007 (BIM).

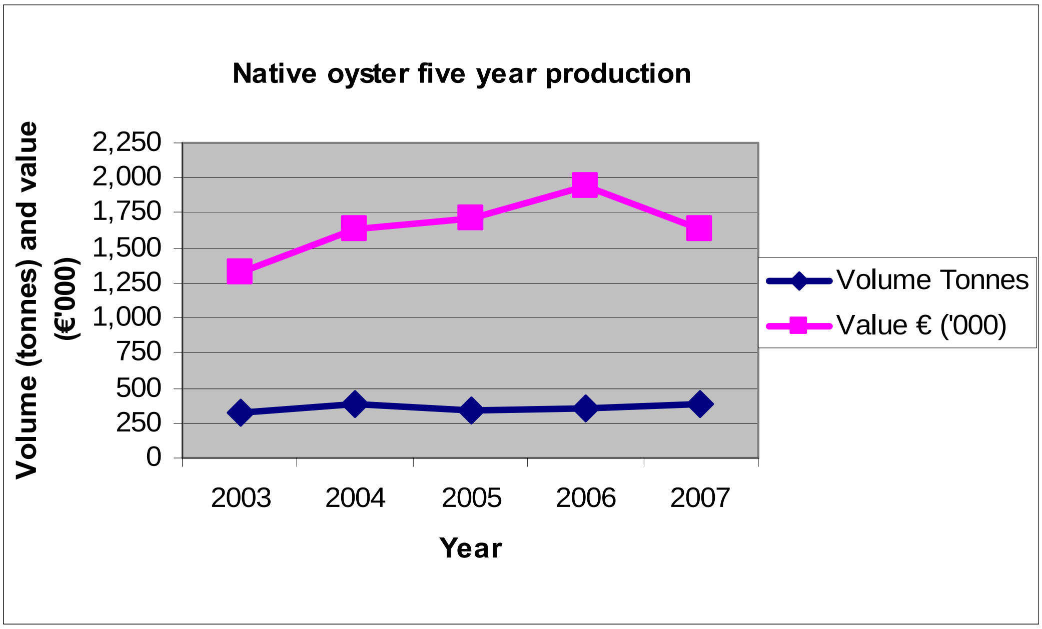
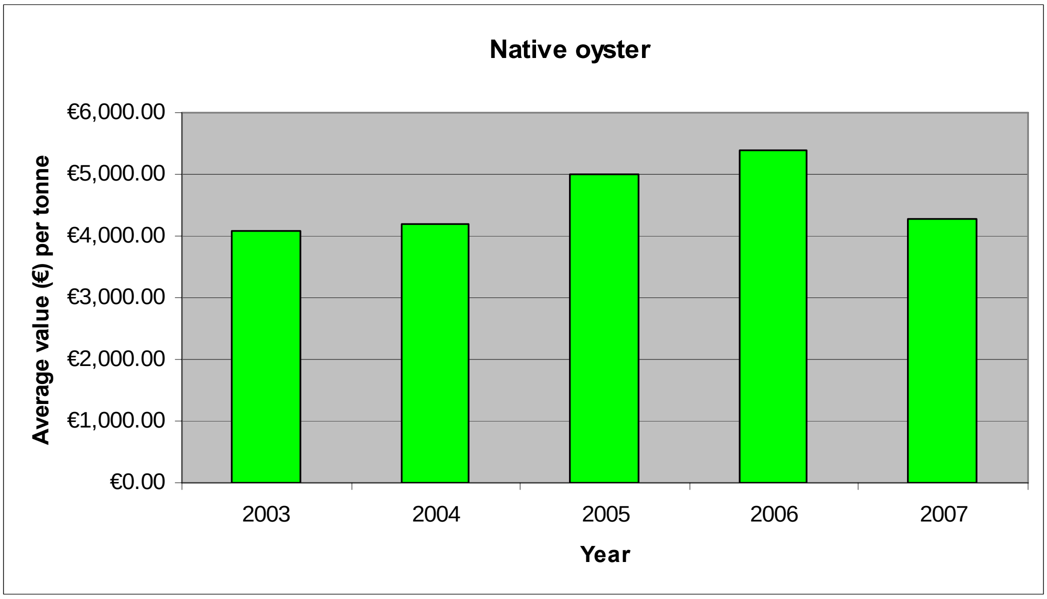


Figure 2:10. Native Oyster Average Value (€) per tonne 2003 to 2007 (BIM).



Clam

Clam production decreased from 245 tonnes in 2006 to 170 tonnes in 2007, which was a decrease of 30.6% (Figure 2:11). The value of the clam harvest also decreased from €1.38 million in 2006 to €1.038 million in 2007 (-24.8%). The average value per tonne of clams increased from €5,640 in 2006 to €6,105 per tonne in 2007 (Figure 2:12).

Figure 2:11. Clam Production by Total Volume (tonnes) and Value (€'000) 2003 to 2007 (BIM).

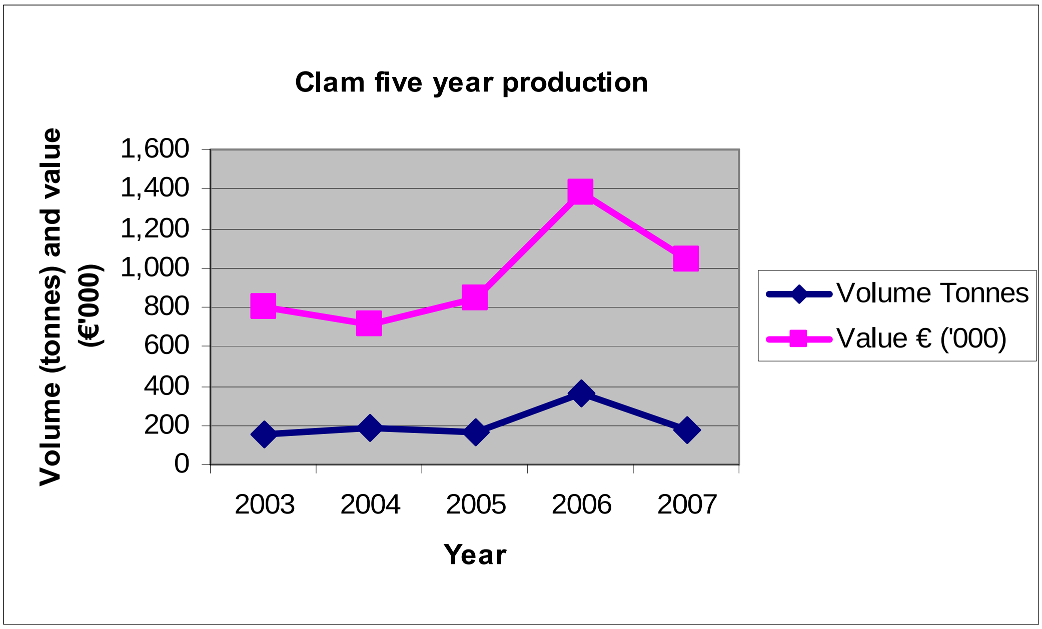
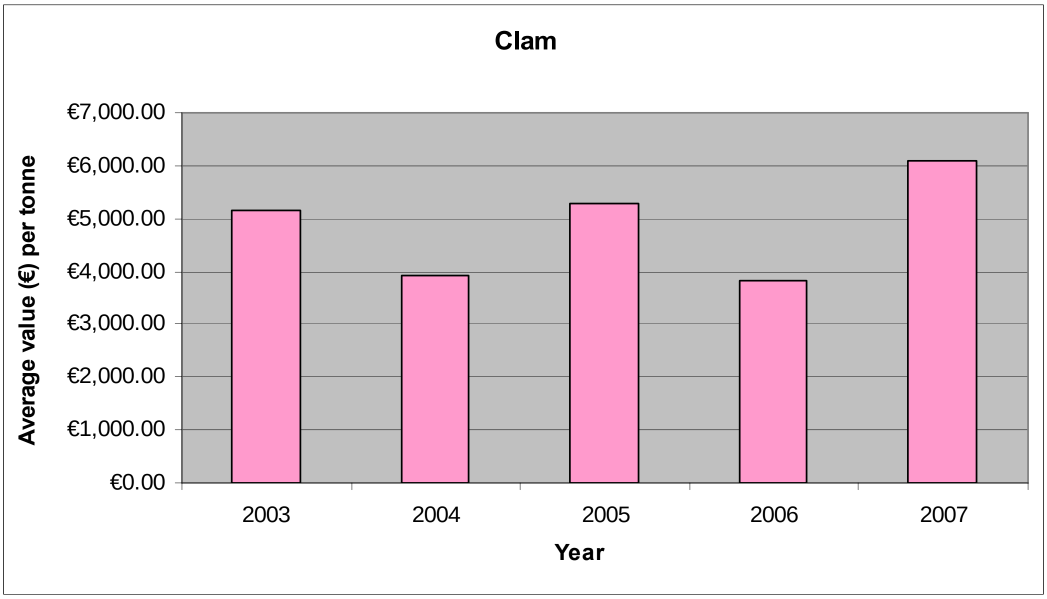


Figure 2:12. Clam Average Value (€) per tonne 2003 to 2007 (BIM).



Scallop
The total volume of scallops harvested in 2007 was 58 tonnes, which was an increase on the 37 tonnes reported harvested in 2006 (+56%) (Figure 2:13). The total market value of the scallop harvested also increased from its 2006 value of €0.2 million to €0.34 million in 2007 (+69%). The average price of scallops increased for the fourth consecutive year to €5,844 per tonne (+8.5%) (Figure 2:14).

Figure 2:13. Scallop Production by Total Volume (tonnes) and Value (€'000) 2003 to 2007 (BIM).

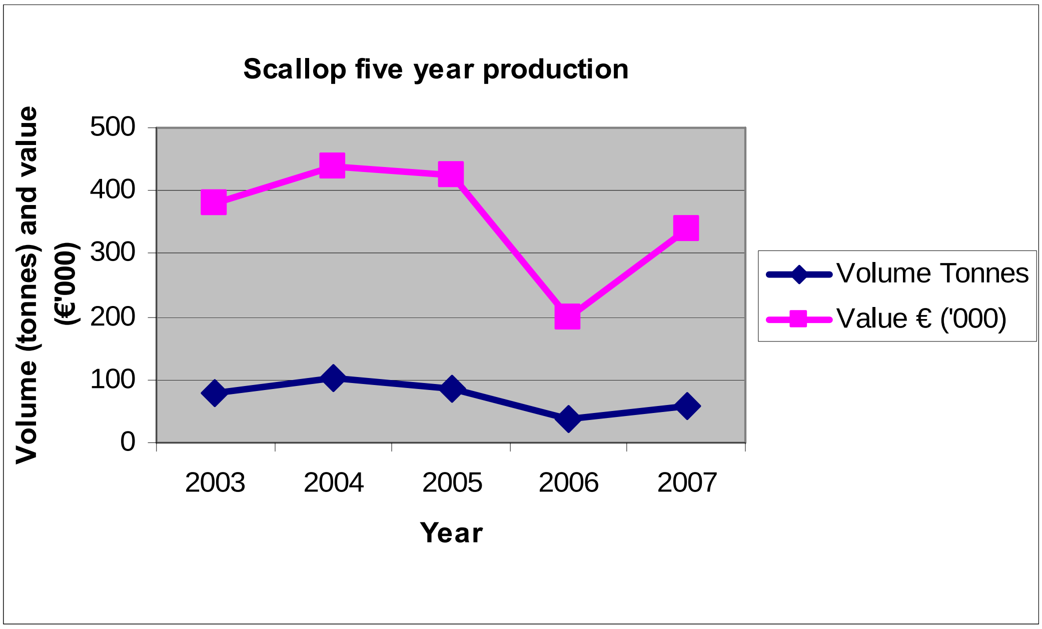
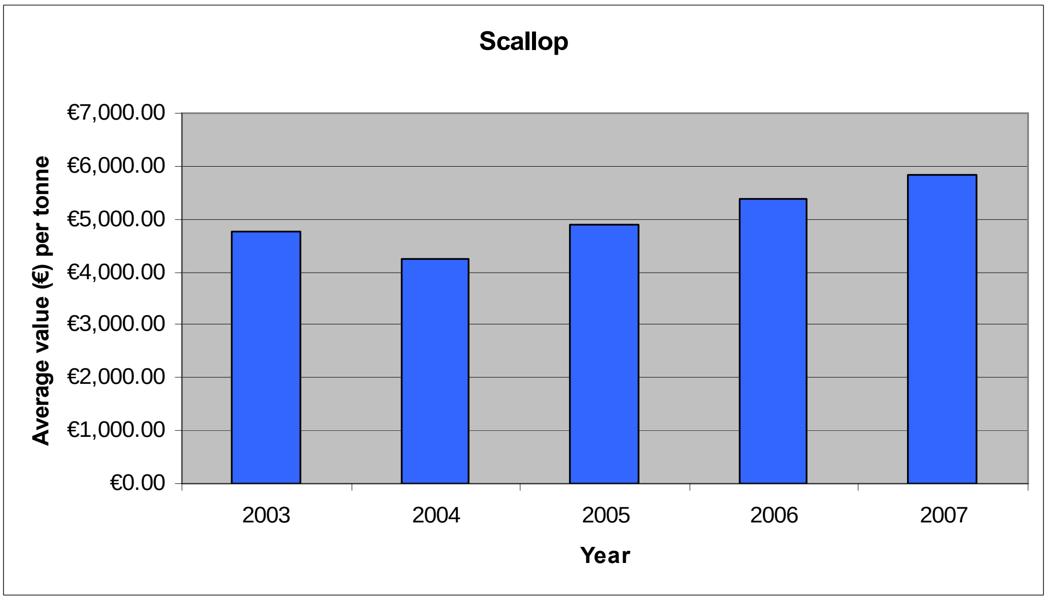
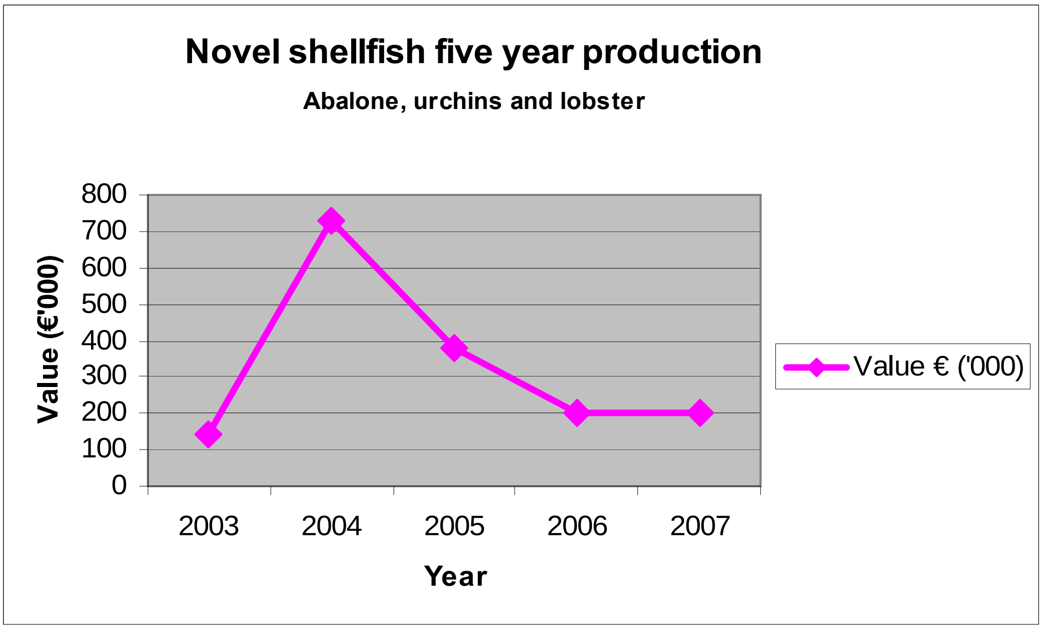


Figure 2:14. Scallop Average Value (€) per tonne 2003 to 2007 (BIM).



Novel Shellfish
The category referred to as "novel shellfish" consists of abalone, urchin and lobster. In 2006 the total combined value for these species was €204,000 (Figure 2:15).

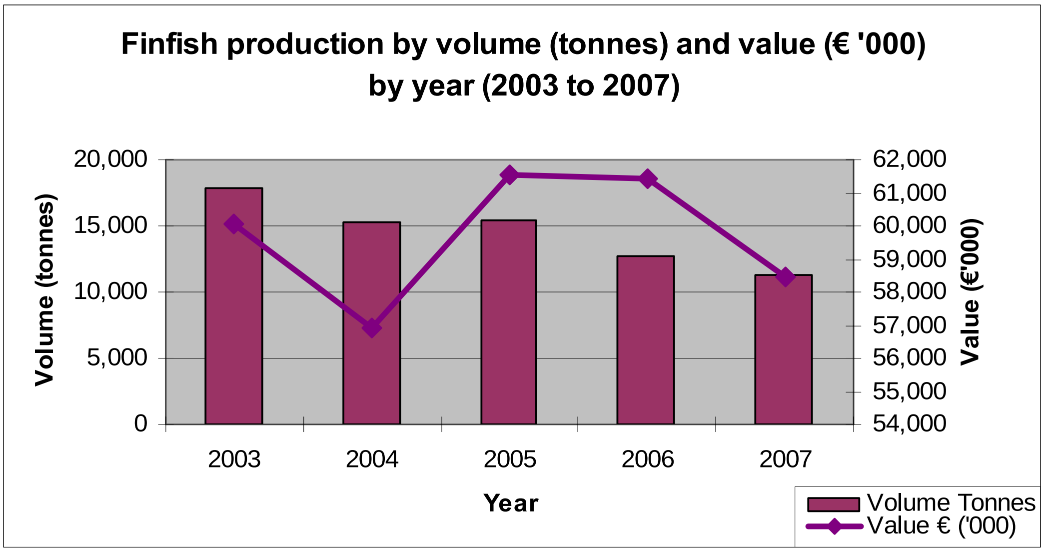
Figure 2:15. Novel Shellfish Production by Value (€'000) 2003 to 2007 (BIM).



Finfish production overview in 2007

The national finfish harvest volume decreased from the 12,726 tonnes recorded for 2006 to 11,238 tonnes in 2007 which was a decline of 11.6%. The total value of the harvest decreased by 4.8%, giving a total finfish production value of €58.4 million in 2007 (Table 2.1 and Figure 2:16).

Figure 2:16. Total Finfish Production (volume) and Value (€'000) by Year (2003 to 2007) (BIM).



Figures 2:17a and 2:17b show the percentage breakdowns of the volumes and value of the total finfish harvested in 2007. Salmon dominates both the volume produced and the value of the total harvest comprising 88% of the total volume and 88% of the harvest value. How the salmon harvest performs generally dictates how the total finfish sector is performing. Freshwater trout make up 7% of the total volume and 3% of the total value, sea reared trout make up 5% of the total volume and 3% of the total value, smolts makes up 5% of the value and novel finfish make up the remainder.

Figure 2:17a. A Breakdown of the Total Finfish Production in 2007 by Species (volume) (BIM).

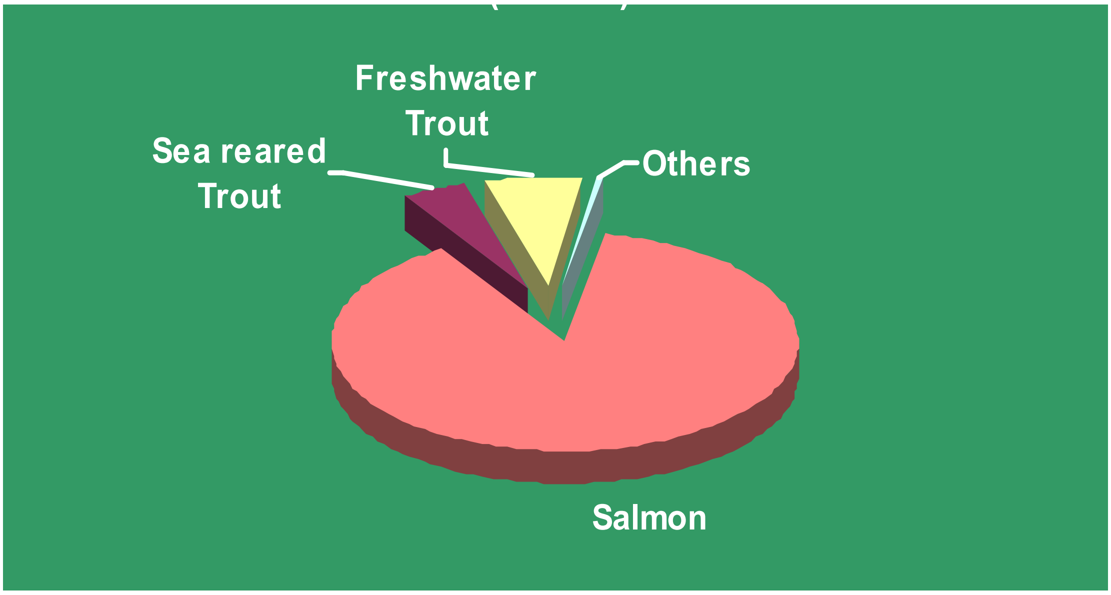
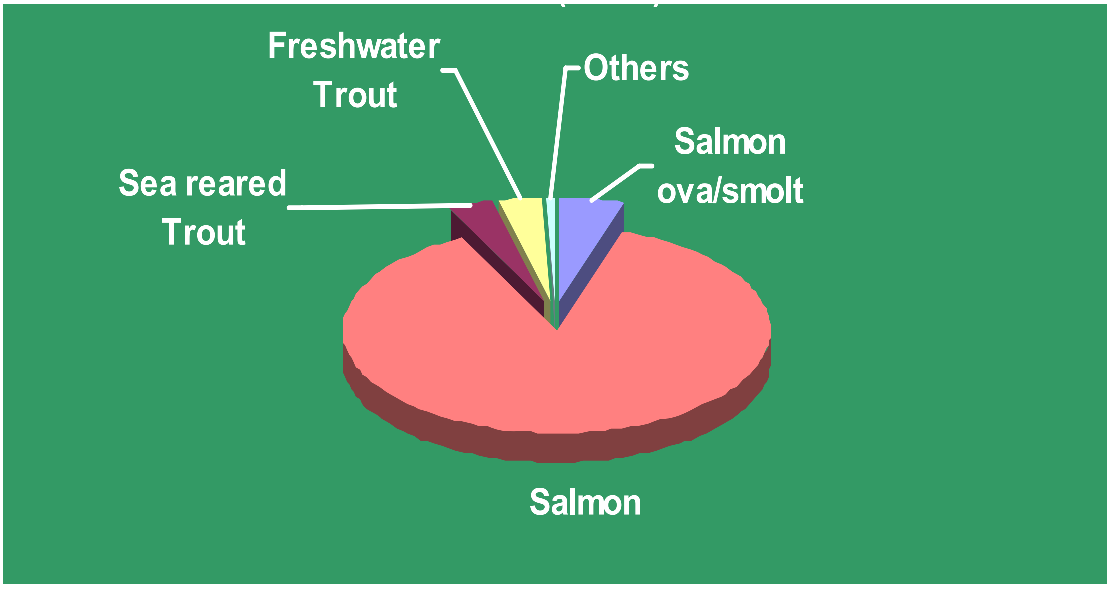


Figure 2:17b. A Breakdown of the Total Finfish Production in 2007 by Species (value) (BIM).



Atlantic salmon

Total salmon production fell from 11,174 tonnes in 2006 to 9,923 tonnes in 2007, which was a decrease in production of 11.2% (Figure 2:19). The total market value of salmon also reduced from €52.7 million in 2006 to 51.2 million in 2007 (-2.69%) (Figure 2:18). The average price per tonne of Atlantic salmon increased for the fifth consecutive year with an average value of €5,169 in 2007, up 9.5% on the 2006 value (Figure 2:19).

Figure 2:18. Irish Atlantic Salmon Production by Total Volume (tonnes) and Value (€'000) 2003 to 2007 (BIM).

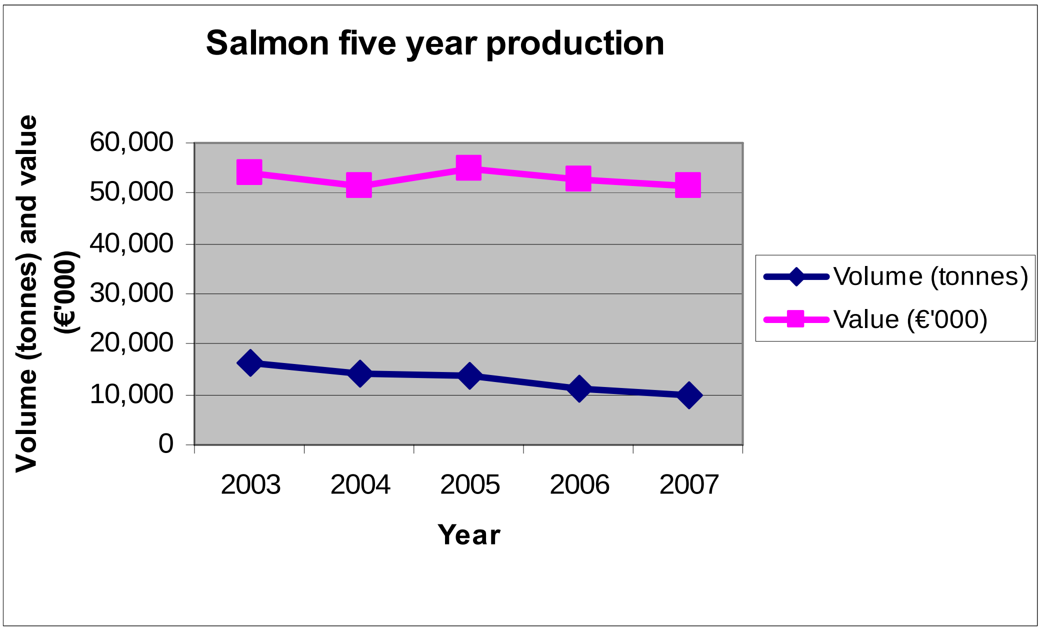
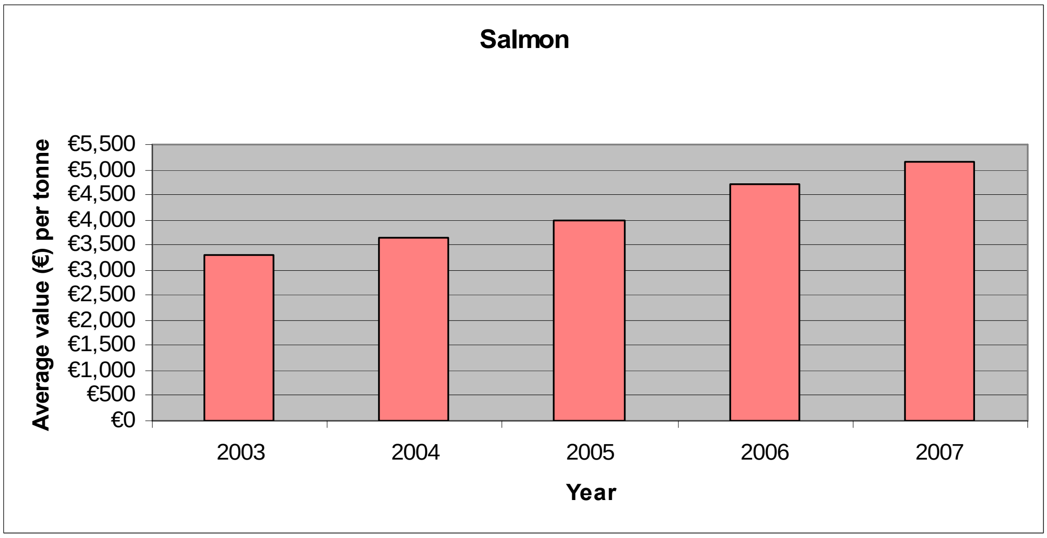


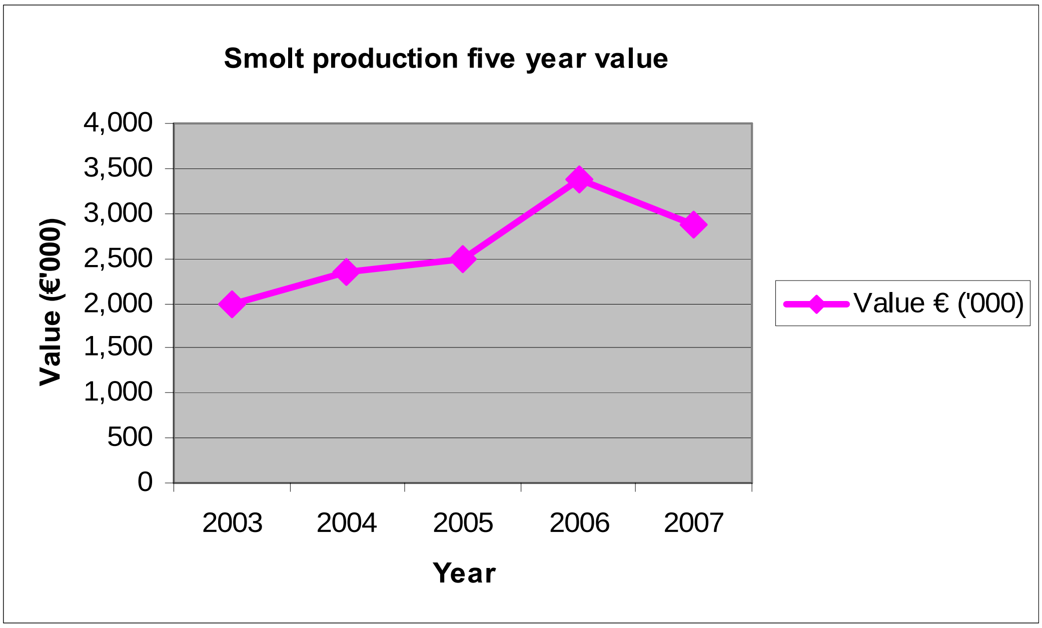
Figure 2:19. Atlantic Salmon Average Value (€) per Tonne 2003 to 2007 (BIM).



Smolt

The national value of salmon ova and smolt production declined from €3.37 million in 2006 to €2.8 million in 2007, which was a drop of 15% (Figure 2:20).

Figure 2:20. Salmon Ova/Smolt, Total Production Value (€'000) by year (2003 to 2007) (BIM).



Irish Salmon Production Trends Between the Years 2000 to 2007 (BIM).

In 2001, Irish salmon farmers produced 23,312 tonnes of salmon which was the highest annual harvest tonnage since production began in Ireland. However, since 2001 the total annual salmon harvest volumes have suffered a series of setbacks which have resulted in a reduction in production to a low of 9,923 tonnes recorded in 2007 (Figure 2:19). Arising from this decline in output it was decided to undertake an examination of the sector for this year's 'Status of Irish Aquaculture' report. The aim of this special section is to analyse Irish salmon production trends at both marine and freshwater sites from the year 2000 to 2007.

Historically it would appear that the biggest factor influencing the decline in Irish production was poor EU market prices in the period 2000 to 2004 which were due to below cost sales of large volumes of salmon produced in Norway. This resulted in the EU establishing a market intervention measure known as the Minimum Import Price or MIP. The low prices achieved in the 2002 to 2004 market impacted on Irish producers making it difficult for them to generate cash flow and as a consequence caused contraction of their businesses. The same contraction, albeit at a lower level was also seen in the independently owned salmon farms in Scotland over the same period. In contrast, Norwegian producers continued to expand output despite suffering heavy financial losses (BIM pers. comm.). In addition, over this period the Irish sector was also grappling with production issues, such as the impact of diseases and lack of critical mass within the industry to achieve efficiencies of scale. The poor market prices further exacerbated these underlying issues and the Irish growers were forced to progressively reduce their inputs in line with financial constraints. Although suffering from similar problems the Norwegian growers were able to access capital and maintained and even increased their output. When prices rose within the EU, after the introduction of the MIP, producers with high stock levels did well, whereas the Irish growers have had to trade their way back to increasing levels of output from a low base, which is a slow process.

Notwithstanding the declines in output, the Irish salmon farming industry delivers a product which is seen as distinct and desirable in the marketplace by virtue of its origin. Ireland's high-energy, exposed sites and low stocking densities result in good quality salmon that have achieved a price premium in the market place. Over the last five years a significant proportion of the Irish industry has focused on organic-status production which has proven to be a good strategy for Ireland's low-volume niche output, in terms of achieving a favourable price differential. Aside from marketing considerations, production success is also dependent on a whole variety of interrelated factors including natural ones, such as biology and environment, as well as man made factors like the commercially sensitive administration of licences, the production techniques applied and the financial factors governing the companies involved.

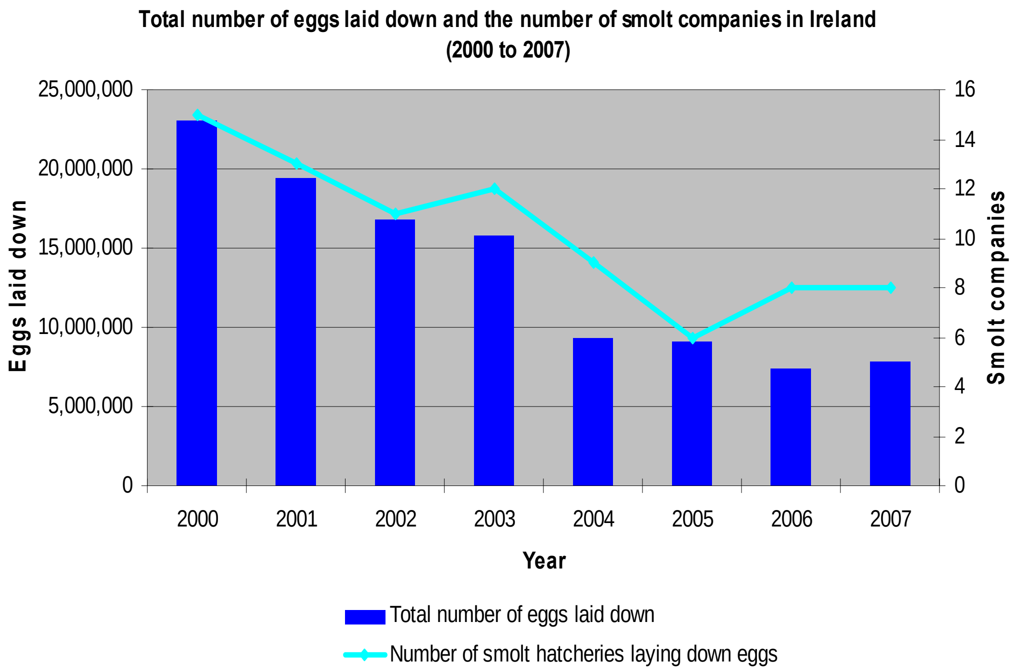
It should be noted that the decrease in salmon production in Ireland since 2001 cannot be explained by disease-related mortalities alone. However, in this short analysis only the biological factors influencing the salmon industry will be concentrated on as the market and finance issues have been the subject of much comment and analysis elsewhere. Fish health and disease have negatively impacted on the salmon sector over the last seven years, contributing to the reduction in the tonnage of salmon produced. Pancreas disease (PD), infectious pancreatic necrosis (IPN) and gill disorders are reported as being the most significant cause of mortalities in Irish salmon aquaculture.

Materials and methods used in examining Irish salmon production trends.
Data used for this section of the 'Status of Irish Aquaculture 2007' report on Irish salmon production were collated from salmon-specific questionnaires that BIM distributed to farmers and processors on an annual basis. A total of 98 questionnaires from freshwater companies and 92 from companies owning marine sites were studied covering the period 2000 to 2007.

Information on the Irish stock was collected including number of eggs, parr and smolt number, strain of fish, smolt type, harvest volume, value per kilo, value per fish, and the final destination of fish. This review is written on the basis of the 'best available data' to BIM. To ensure that the data retrieved and used, was as accurate as possible, farmers were also contacted directly by BIM. However, some farmers were not contactable due to cessation of their business. In such cases, the information retrieved is treated as uncertain. Despite the efforts made to collect data, it is possible that not all companies forwarded their production questionnaires to BIM.

Findings on Ireland's salmon industry production trends (2000 to 2007).
Number of eggs laid down by hatcheries (2000 to 2007).
The total number of salmon eggs laid down decreased from a high of 23,100,000 in 2000 to 7,385,000 in 2006 (Figure 2:22). The number of freshwater sites which laid down these eggs also decreased from 15 in 2000 to 6 in 2005. In 2007, the total amount of salmon eggs laid down showed a slight increase on the 2006 figures to 7,833,000 with 8 hatcheries laying down these eggs (Figure 2:21).

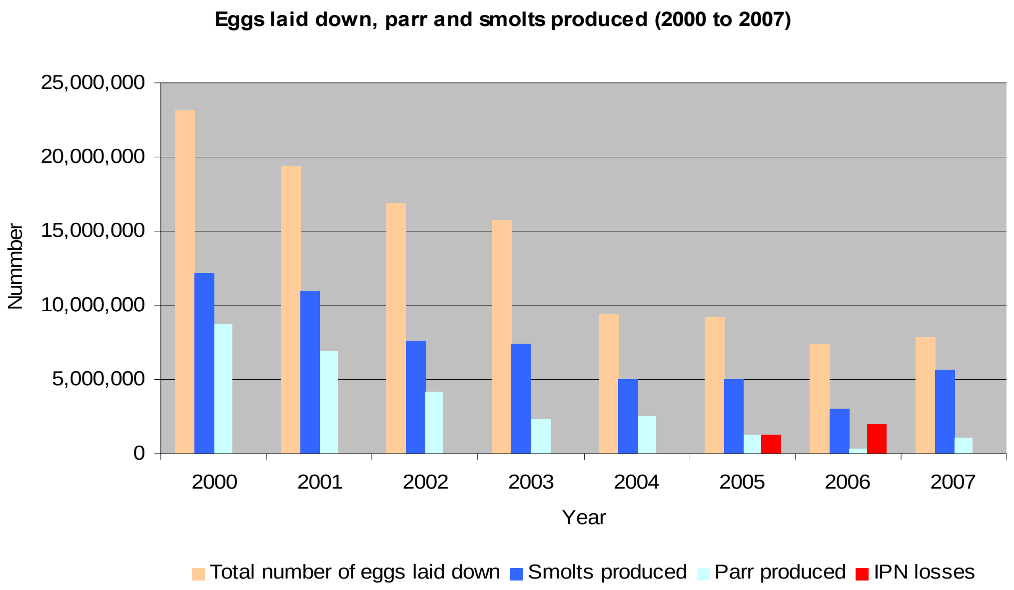
Figure 2:21. Total Number of Eggs Laid Down and the Number of Smolt Hatcheries which Laid Down Eggs (2000 to 2007) (BIM).



The number of parr and smolts produced (2000 to 2007).

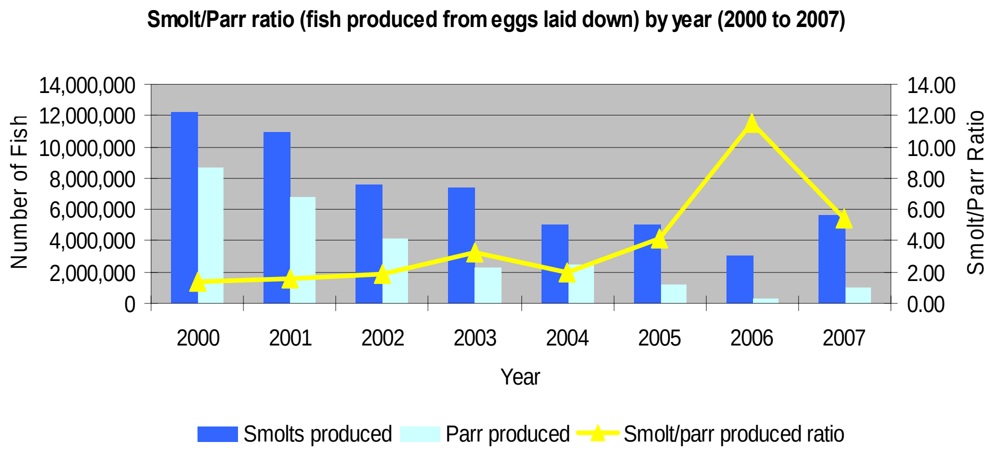
Figure 2:22 shows the number of smolts and parr produced from the eggs laid down during the years 2000 to 2007. Both smolt and parr production decreased from 2000 to 2006 following the same pattern as the number of eggs laid down in that period. In contrast, 2007 represents a slight increase in number of smolts and parr produced when compared with 2006. The affect of the IPN virus in Ireland is evident in 2005 and 2006 with several salmon hatcheries reporting fish losses due to IPN outbreaks. The reported losses due to IPN increased from 1,300,000 fish in 2005 to 1,945,000 in 2006. No IPN outbreaks were reported by farmers during the remaining years of the period examined. It should be noted that most of the parr are ongrown to smolts in Ireland and a small percentage are exported.

Figure 2:22. The Total Number of Eggs Laid down in Irish Hatcheries, the Numbers of Parr and Smolts Produced from Eggs Laid Down and IPN losses (BIM).



The annual smolt/parr ratio for 2000 to 2007 is depicted in Figure 2:23. The ratio shows an increasing trend over this period with 2004 being the only year presenting a decrease. This pattern may be explained by the fact that during the period 2000 to 2007 salmon hatcheries became more specialised in the production and sales of smolts as opposed to parr. In 2006, the smolt/parr ratio shows a peak and this is probably related to IPN losses. A considerable number of fry and parr died or were culled in 2006 due to IPN outbreaks.

Figure 2:23. Parr and Smolts Produced from Eggs Laid Down and Smolt/Parr Ratio (BIM).



Strain of fish used by the salmon production industry.
Tables 2:2 and Table 2:3, show the origins, strains and percentage supply by strain of fish farmed in the Irish freshwater sites from 2000 to 2007. Data included in Table 2:2 and 2:3 are eggs, parr and smolts laid down in all the freshwater facilities reporting production figures. None of these strains are indigenous to Ireland although the main company providing the Mowi/Fanad strain to the Irish industry has selectively bred this strain in Ireland for many years. Both Landcatch and Fanad strains comprised the majority of the salmon farmed in Ireland during the period 2000 to 2006, while the other strains represent a small proportion of farmed fish. In 2006, IPN outbreaks were reported by hatcheries importing eggs from outside Ireland. As a result of this, over 70% of the egg requirement of the Irish market was sourced internally in 2007.

Table 2:2. Origin of Salmon Strains Farmed in Ireland (BIM).

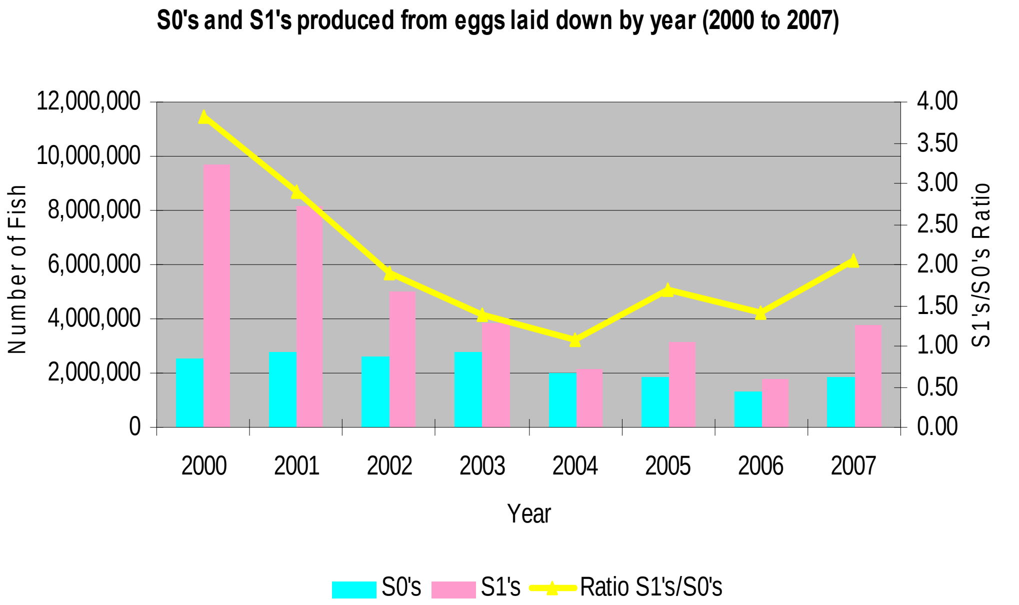
Strain	Origin
Mowi/Fanad Group	Norway
Landcatch	Scotland
Bolax	Iceland
Icelandic	Iceland
Saga	Iceland
Aquagen	Norway
Cook Hatcheries	Canada
Hiland Farm	Scotland

Table 2:3. Main Salmon Strains Farmed in Ireland from 2000 to 2007 and their Percentage of Supply by Strain (BIM).

2000	2001	2002	2003	2004	2005	2006	2007
Mowi/Fanad Group (27.8%)	Mowi/Fanad Group (50%)	Mowi/Fanad Group (53.8%)	Mowi/Fanad Group (42.9%)	Mowi/Fanad Group (31.3%)	Mowi/Fanad Group (55.5%)	Mowi/Fanad Group (57.1%)	Mowi/Fanad Group (72.7%)
Landcatch (38.9%)	Landcatch (38.9%)	Landcatch (30.8%)	Landcatch (50%)	Landcatch (50%)	Landcatch (44.4%)	Landcatch (35.7%)	
Icelandic (11.1%)	Icelandic (5.5%)	Icelandic (7.7%)	Saga (7.1%)	Saga (18.7%)			Saga (9.1%)
Hiland Farm (5.5%)	Hiland Farm (5.5%)	Hiland Farm (7.7%)				Aquagen (7.1%)	Aquagen (9.1%)
Bolax (16.7%)							Cook Hatcheries (9.1%)

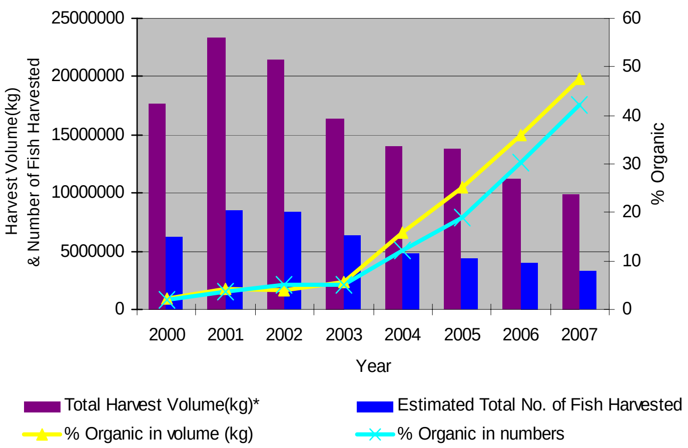
Smolt Production (2000 to 2007).
Figure 2:24 represents the number of S0's and S1's produced from the total number of eggs laid down by the Irish salmon freshwater companies and the S1's/S0's ratio during 2000 to 2007. In general, the ratio decreases from 3.81 in 2000 to 1.08 in 2004. The graph shows that the production of S1's decreased considerably from 2000 to 2004 while the production of S0's was relatively constant during this period and thereafter. Therefore the decline of the S1's/S0's ratio from 2000 to 2004 is more related to the lower production of S1's in that period and not with an increase in S0's production. From 2004 the ratio increased mainly due to a higher production of S1's.

Figure 2:24. S0's and S1's Produced in Irish Hatcheries from Eggs Laid Down and the S1's/S0's ratio (BIM).



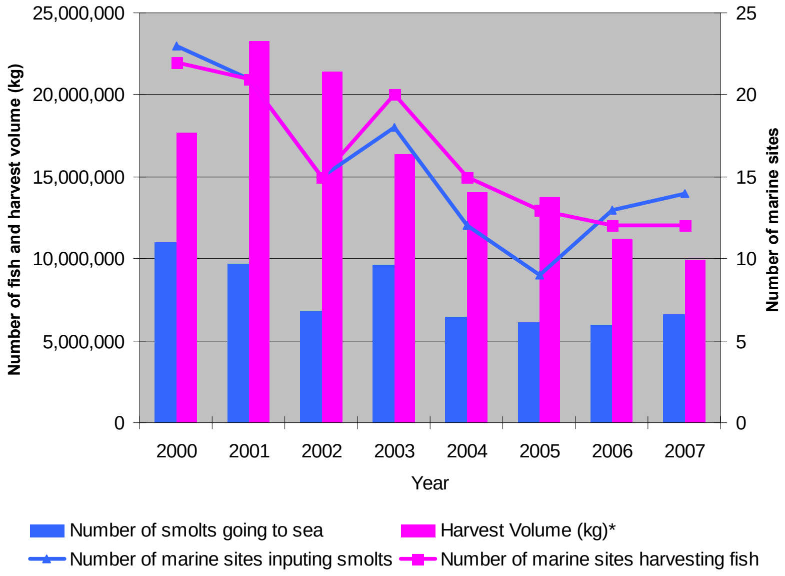
Salmon harvest volumes.
Figure 2:25 illustrates the total harvest volume (kg) of salmon, the number of fish harvested and the percentage of organic salmon production between the years 2000 and 2007. Despite a decrease in salmon production between 2003 and 2007, the percentage of organic production increased considerably. The value per kg of organic salmon is higher than other Atlantic salmon somewhat lessening the economic impact of the production decline since 2003. The number of smolts going to sea decreased from 11,058,305 in 2000 to 6,870,260 in 2005.

Figure 2:25. Irish Atlantic Salmon Harvest Volume (kg) and the Percentage of Organic Production (2000 to 2007) (BIM). (*Volumes are Whole Fish Equivalent, WFE).



The number of marine sites harvesting salmon has also decreased between 2000 and 2007 (Figure 2:26).

Figure 2:26. Smolts Going to Sea, Harvest Volumes (kg), Number of Marine Sites Laying down Smolts and Harvesting fish (2000 to 2007) (BIM).



*Volumes are Whole Fish Equivalent (WFE).

Table 2:4 summarises the total number of salmon harvested and the mean harvest weight (kg) between the years 2000 and 2007. The mean harvest weight represents the total whole fish weight before any processing takes place.

Table 2:4. Estimated Number of Fish Harvested and Mean Harvest Weight (kg) (BIM).

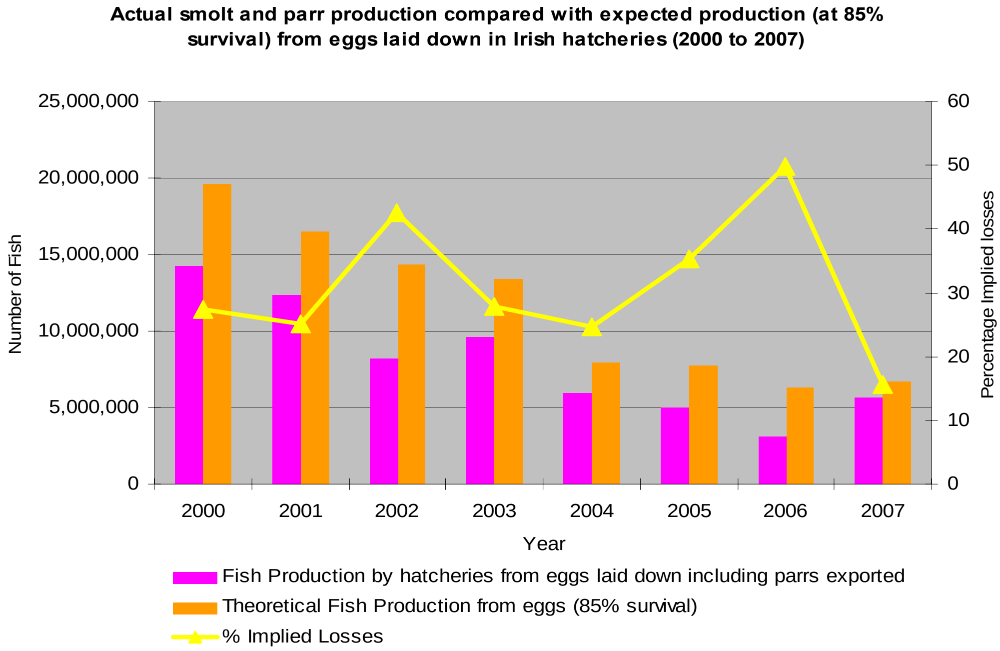
Year	2000	2001	2002	2003	2004	2005	2006	2007
Estimated total Number of fish harvested	6,209,012	8,435,592	8,368,076	6,338,730	4,848,379	4,401,077	4,016,494	3,337,313
Estimated total Mean harvest weight (kg/fish)	2.68	2.9	2.87	2.58	2.72	3.13	2.62	2.70

Economic Impact.

Hatcheries.

Figure 2:27 presents the total smolt and parr production from eggs laid down in Irish hatcheries for the years 2000 to 2007. An optimal survival rate of 85% would result in a projected production of smolts for this period and this is also shown in Figure 2:27.

Figure 2:27. Smolt and Parr Production from Total Eggs Laid Down in Irish Hatcheries from 2000 to 2007 (BIM).

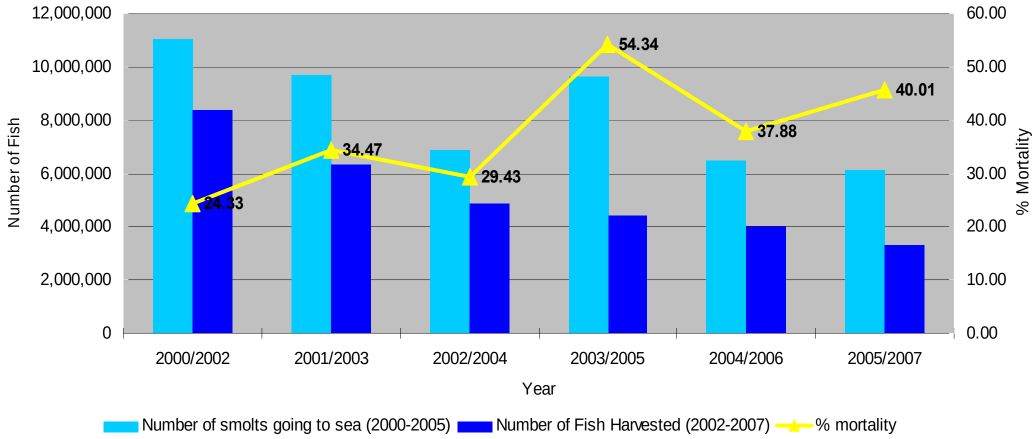


The difference between the projected and actual production of smolts and parr from 2000 to 2007 (a seven year period) is an average loss of 3,524,238 fish per year. Had these fish survived and been sold as smolts at 85 cent each, this would have represented an extra income of over €20 million to the smolt farmers for the seven year period and a potential production at sea of over 60,000 tonnes.

Marine Sites.
Data compiled for the years 2000 to 2007 on the number of fish transferred to sea and the numbers of fish harvested were analysed for this report. Theoretically S0's and S1's going to sea in any given year are harvested two years later. Figure 2:28 shows the trend of smolts (numbers) going to sea from the year 2000 to 2005 (a five year period) and the number of fish harvested two years later between the years 2002 to 2007. Therefore the difference between these two figures will show the total smolt mortality for the year class input (which is spread over the grow-out period of up to two years). However, it should be noted that data from the questionnaires analysed was not always totally accurate and every year there was a small percentage of fish from mixed generations (resulting from grading of fish) that were also harvested together with the S0 and S1 smolts which went to sea two years earlier. When that data was examined it was found that the highest total fish mortality occurred in the input class of 2003.

The average number of fish going to sea per year between 2000 and 2005 was approximately 8,300,000 and the average number of fish harvested per year in the period 2002 to 2007 was around 5,200,000 giving an average fish loss of 3,100,000 per year (an annual loss of 37%) and a cumulative total loss of over 18,000,000 salmon over the six year period. Had 95% of these fish survived and subsequently been sold at an average price of €4.10 per kg at an average size of 2.77 kg, they would have generated sales of an additional €194 million to the farmers. These projected figures represent a gross value and they do not include feed costs, staff wages, treatments, production costs, etc. In reality the actual losses to the farmer in terms of smolts, feed, labour costs etc. was over €40 million.

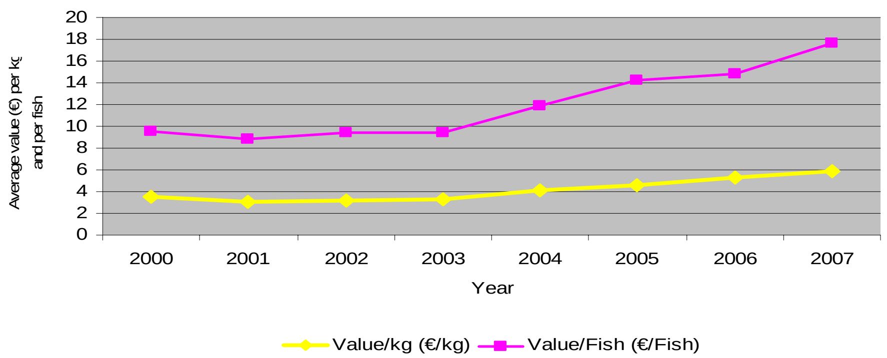
Figure 2:28. Number of Smolts Going to Sea, the Number of Fish Harvested and the Percentage of Mortality for the Period 2000 to 2007 (BIM).



Salmon value per kg and value per fish.

Figure 2:29 shows the average value per kg and per fish over the period 2000 to 2007. There was an increase in the value of salmon from €3.55 per kg in 2000 to €5.93 per kg in 2007, while the value per fish increased from €10.51 to €17.61

Figure 2:29. Average Value (€) of Salmon per Kilo and per Fish (BIM).



Destination of salmon

When gathering information from the salmon-specific questionnaires for freshwater sites, the destination of eggs, parr and smolts was not always specified for every site (a small proportion of these were also exported). The main destination for smolts was Ireland with a small percentage of the smolts produced being exported to Scotland, the Shetlands and France. From the information analysed it was found that five companies supplied the total exports of parr and smolts between the years 2000 and 2007. Four of these companies included Ireland as a destination for their production, one of the companies was mainly focused on exporting to Scotland and France. The numbers of parr imported from Scotland in 2000, 2002 and 2007 were 356,000, 1,350,000 and 620,000 respectively. In general, all hatcheries were very consistent with their source of eggs, parr and smolts laid down in their facilities from the year 2000 to 2006.

Salmon egg production in Ireland was carried out by one company which provides eggs to several hatcheries in Ireland and also to other freshwater salmon sites in Scotland and Chile.

Discussion on salmon production trends (2000 to 2007).

During the period 2000 to 2007 there was a significant downward shift in all aspects of the salmon production sector in Ireland. This trend included a fall in the number of eggs laid down from 23.1 million in 2000 to 7.8 million in 2007 and a reduction in the number of freshwater sites from 15 to 8 in the same period. The decline was year on year (with a small upward shift in 2007) representing a steady contraction of the sector. The drop in production was most significant in 2005 and 2006 when IPN was isolated at a number of hatcheries. In 2007 there was a slight production recovery. The number of smolts put to sea during this period (2000 to 2007) fell from 11 million in 2000 to 5.9 million in 2006. There was also a contraction of the marine grow out sector during this period. The number of specialised marine sites harvesting fish fell by nearly half, from 23 to 12. Salmon harvest volumes declined from a record production high in 2001 of 23,312 tonnes to a low of 9,923 tonnes in 2007. The contraction of the sector can be traced from start to finish i.e. through the farmed salmon life cycle. Numbers of eggs laid down can be correlated with the numbers of smolts sent to sea and finally numbers of harvested fish.

The factors influencing this contraction are complex and poor production efficiencies and disease incidences are just two of the causes. In the time period 2000 to 2007 the sector has experienced challenging market forces arising from over-production and below-cost selling on the part of third countries, rationalisation of the sector itself and a change in physical operating conditions. In addition, the non-availability of extra licence capacity, required to enable the adoption of accepted best-practice production techniques to optimise disease control and pests has also proved a significant impediment to progression in the sector. On a more positive note, an increasing proportion of Irish salmon is now achieving either organic or eco-friendly status and with these assurance standards an associated price premium. The better capitalised companies have been taking over the uncompetitive farms which could not sustain production during the period 2000 to 2007 and the sector, broadly speaking, is profitable.

Trout

Freshwater trout

Freshwater trout production decreased from 970 tonnes in 2006 to 760 tonnes in the year 2007 (-21.65%) (Figure 2:30). The total value of production also decreased from €2.6 million in 2006 to €2 million in 2007 (-23%) (Figure 2:30). The average price of freshwater trout rose slightly from €2,648 per tonne in 2006 to €2,667 in 2007 (+0.7%) (Figure 2:31).

Figure 2:30. Total Freshwater Trout Production (tonnes) and Value (€'000) by year (2003 to 2007) (BIM).

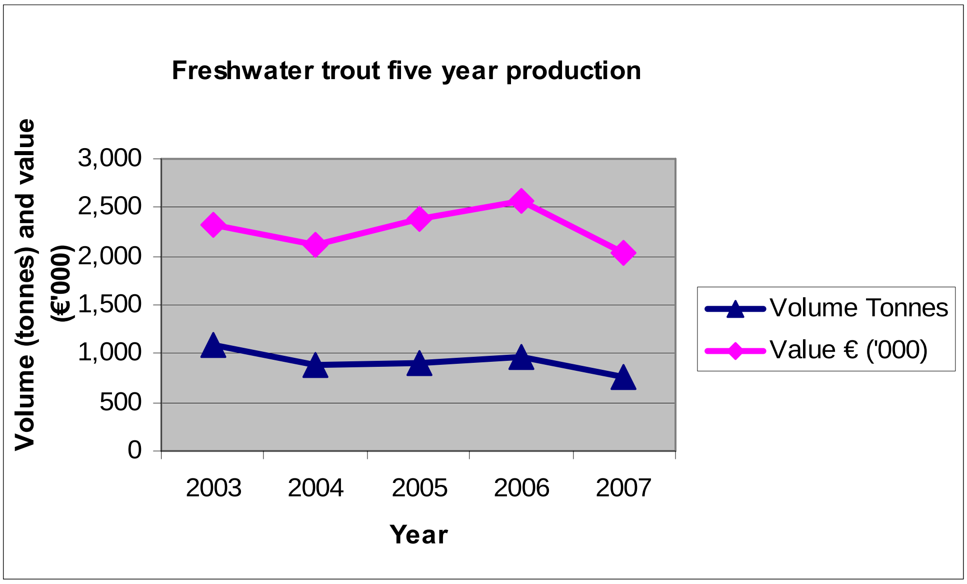
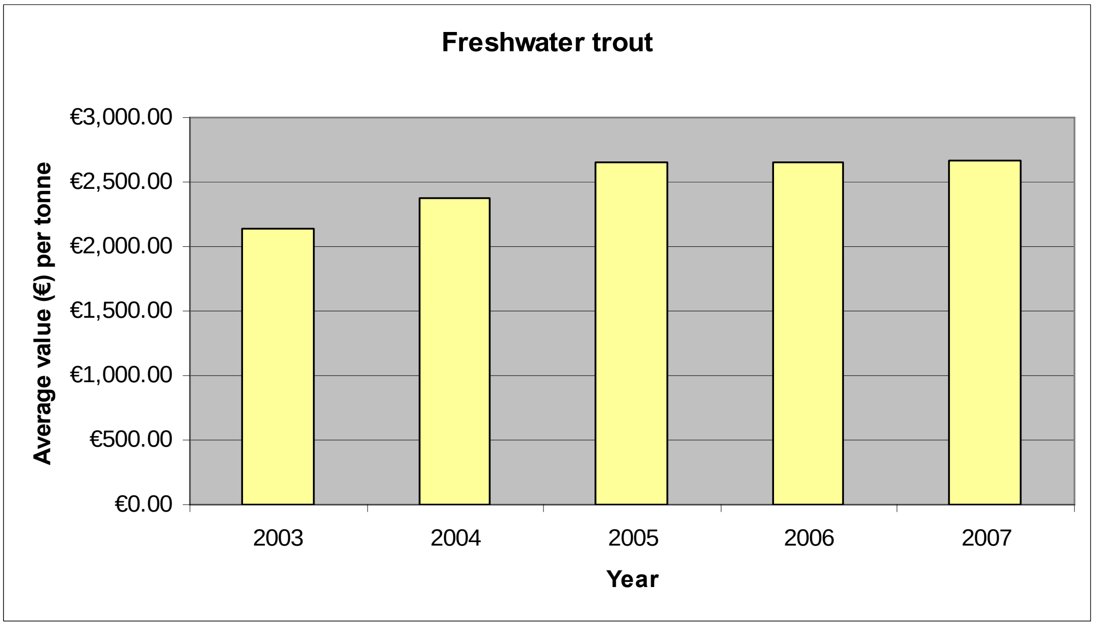


Figure 2:31. Freshwater Trout Average Value (€) per Tonne by year (2003 to 2007) (BIM).



Sea reared trout

The volume of sea-reared trout that was harvested fell from 546 tonnes in 2006 to 507 tonnes in 2007 (–7%) (Figure 2:32). The total market value also decreased by 20% to €1.9 million partly due to the above average price paid for sea reared trout in 2006 (Figure 2:32). The average price for sea reared trout fell by €666 (-15%) in 2007 (Figure 2:33).

Figure 2:32. Total Sea Reared Trout Production (tonnes) and Value (€'000) by year (2003 to 2007) (BIM).

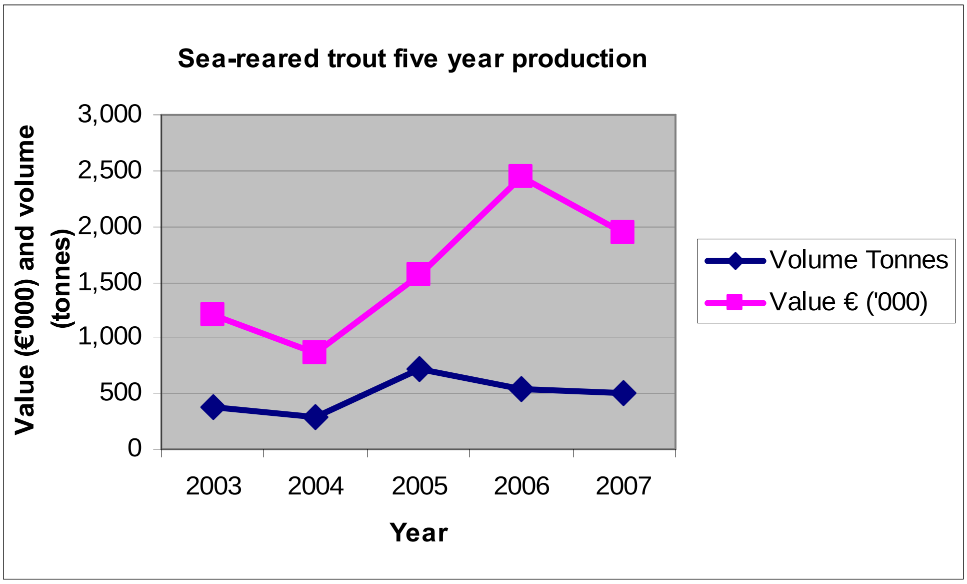
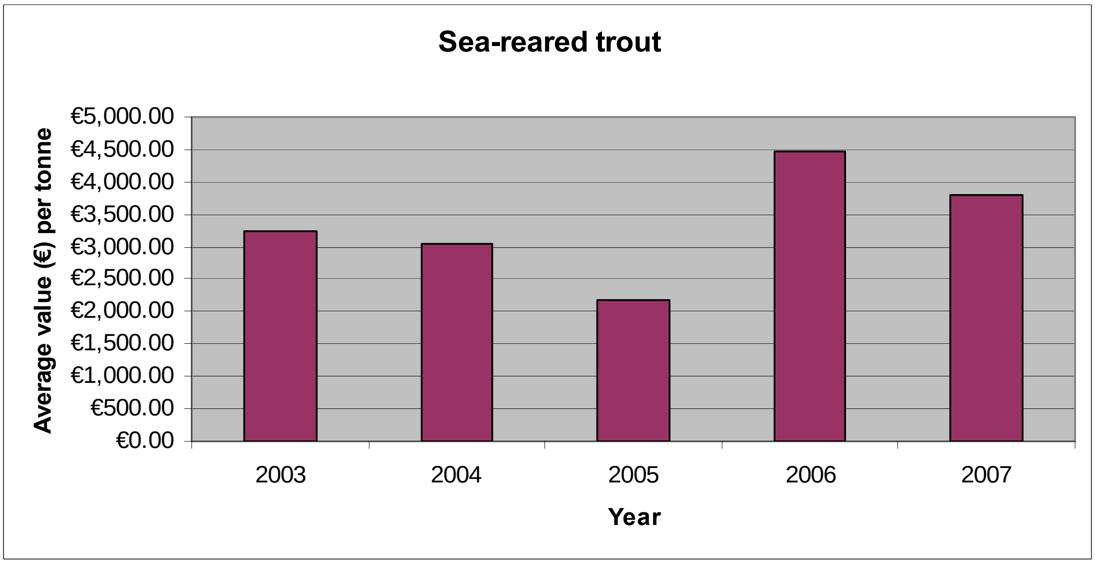
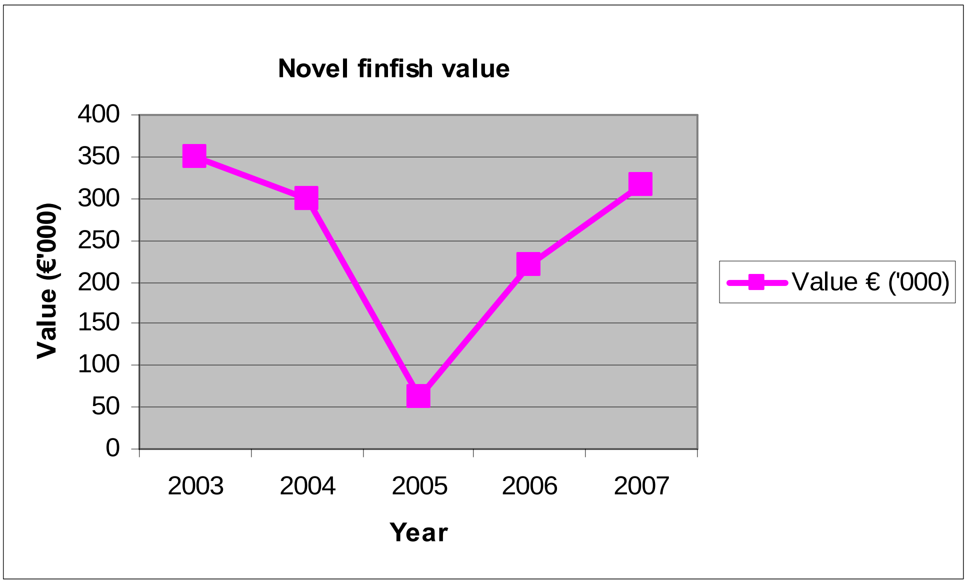


Figure 2:33. Sea Reared Trout Average Value (€'000) per Tonne by year (2003 to 2007) (BIM).



Novel Finfish
Novel finfish includes cod, perch, Arctic charr and ornamental finfish. The total value for novel finfish in 2007 increased for the second consecutive year to €0.317 million (Figure 2:34) mainly due to an increase in Arctic char production which is the dominant species of novel finfish.

Figure 2:34. Novel Finfish Value (€'000) by year (2003 to 2007) (BIM).



Employment 2007

This section of the report categorises the breakdown of employment in the Irish aquaculture industry and shows employment trends by selected sectors from 2003 to 2007. In 2007, the total number of people employed was 1,981 (Table 2:5). Of this number, 686 were in full time employment, 478 were in part time employment and 817 were employed on a casual basis (Table 2:5). In 2007, there was a decrease of 3.7% in total aquaculture employment compared with that recorded in 2006 (2,058). In 2007, the number of Full Time Equivalent (FTE) positions was 1,061 compared with 1,162 in the year 2006 (see bottom of Table 2:5 for the definitions of FTE, part time and casual).

Table 2:5. Employment in the Aquaculture Industry 2007 (BIM).

Finfish								
Species	Full-Time	Part-Time	Casual	Male	Female	Non EEA	Total	FTE
Freshwater Trout	16	5	0	18	3	2	21	19
Salmon	105	37	54	185	11	0	196	133
Sea Reared trout	8	2	0	10	0	0	10	9
Smolt	34	7	13	47	7	0	54	40
Others	1	4	1	6	0	0	6	3
Total Finfish	**164**	**55**	**68**	**266**	**21**	**2**	**287**	**203**
Plant								
Species	Full-Time	Part-Time	Casual	Male	Female	Non EEA	Total	FTE
Seaweed	0	2	0	0	2	0	2	1
Shellfish								
Species	Full-Time	Part-Time	Casual	Male	Female	Non EEA	Total	FTE
Abalone	7	6	0	9	4	0	13	10
Bottom Mussel	149	98	48	224	71	0	295	206
Clam	14	12	8	37	6	0	34	21
Gigas Oyster	221	204	141	518	48	5	566	347
Native Oyster (fishery)	7	4	417	300	128	0	428	79
Rope Mussel	115	91	107	288	25	28	313	178
Scallop	6	5	28	36	3	0	39	13
Urchin	2	0	0	2	0	0	2	2
Lobster	1	1	0	2	0	0	2	2
Total Shellfish	**522**	**421**	**749**	**1407**	**285**	**33**	**1692**	**857**
Total								
	Full-Time	Part-Time	Casual	Male	Female	Non EEA	Total	FTE
	686	**478**	**817**	**1673**	**308**	**35**	**1981**	**1061**

FTE (Full time equivalent): fulltime=1, part time= 0.5, casual = 0.1667.
Part time: 10-30 hours/week throughout the year or 13-39 weeks of working 40 hours/week.
Casual: <10 hours/week throughout the year or <13 weeks of working 40 hours/week.

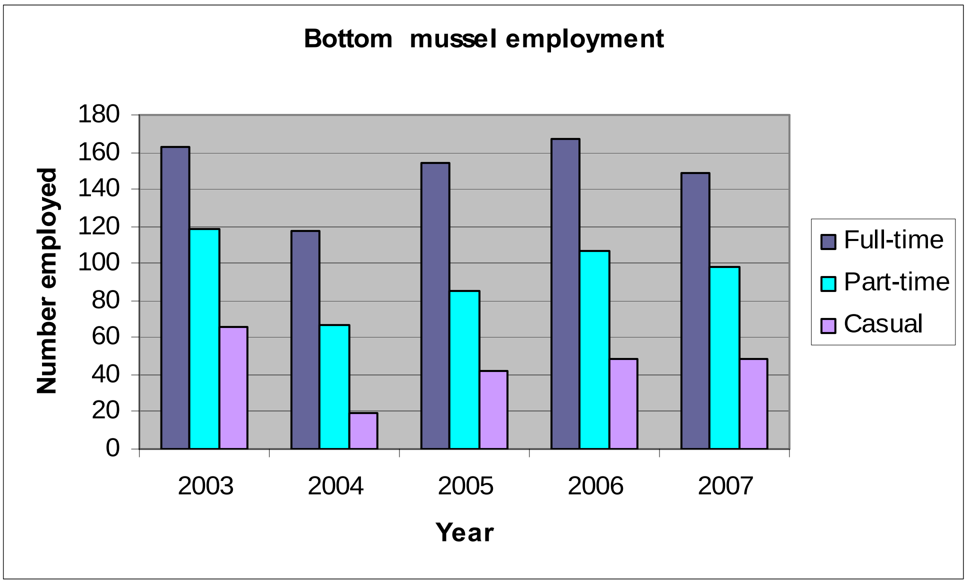
Shellfish

In 2007, the total employment in the shellfish sector was 1,692 (Table 2:5) compared with 1,722 in 2006 (-1.7%). The greatest number of FTE was in the gigas oyster sector (347) followed by the bottom mussel sector (206) and the rope mussel sector (198) (Table 2:5).

Mussel employment

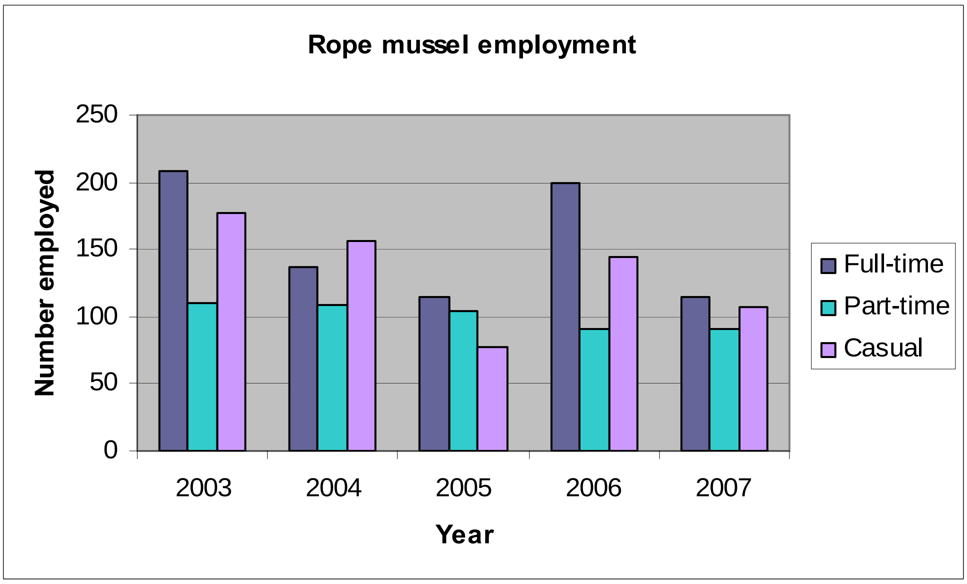
The total number employed in bottom mussel production in 2007, fell by 8.6% to 295 people. This was a decrease of 23 FTE giving a total of 206 FTE in 2007 (Figure 2:35 and Table 2:5).

Figure 2:35. Bottom Mussel Employment by year (2003 to 2007) (BIM).



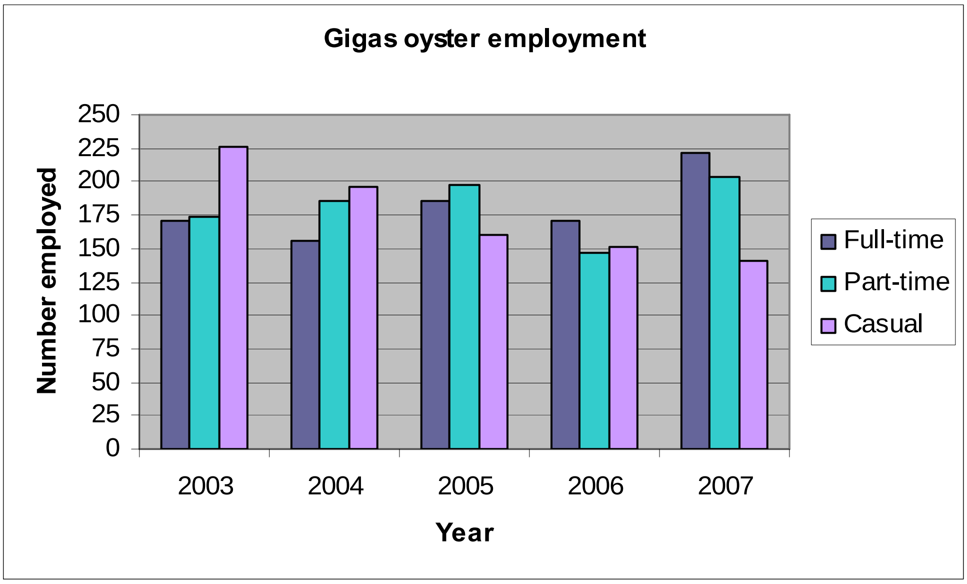
Rope mussel employment decreased from 434 in 2006 to 313 in 2007 (-28%). The number of FTE also declined by 34% to 178 in 2007 (Table 2:5 and Figure 2:36).

Figure 2:36. Rope Mussel Employment by year (2003 to 2007) (BIM).



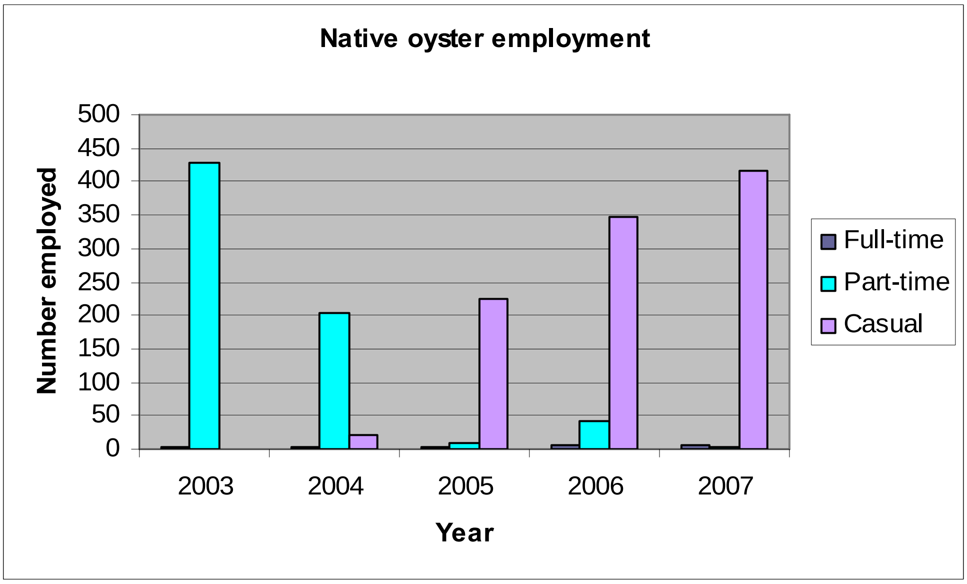
Oyster employment
The total number of employees involved in gigas oyster production increased from 469 people in 2006 to 566 in the year 2007 (+20%). This rise in employment boosted the number of FTE positions by 28.5% to 347 (Table 2:5 and Figure 2:37).

Figure 2:37. Gigas Oyster Employment by year (2003 to 2007) (BIM).



Although total employment in the flat or native oyster sector rose 8.4% to 428 in 2007, the number of FTE declined from 84 in 2006 to 79 FTE in 2007 (-5.9%). This was mainly due to an increase in casual employment in the native oyster sector in 2007 (Table 2:5 and Figure 2:38).

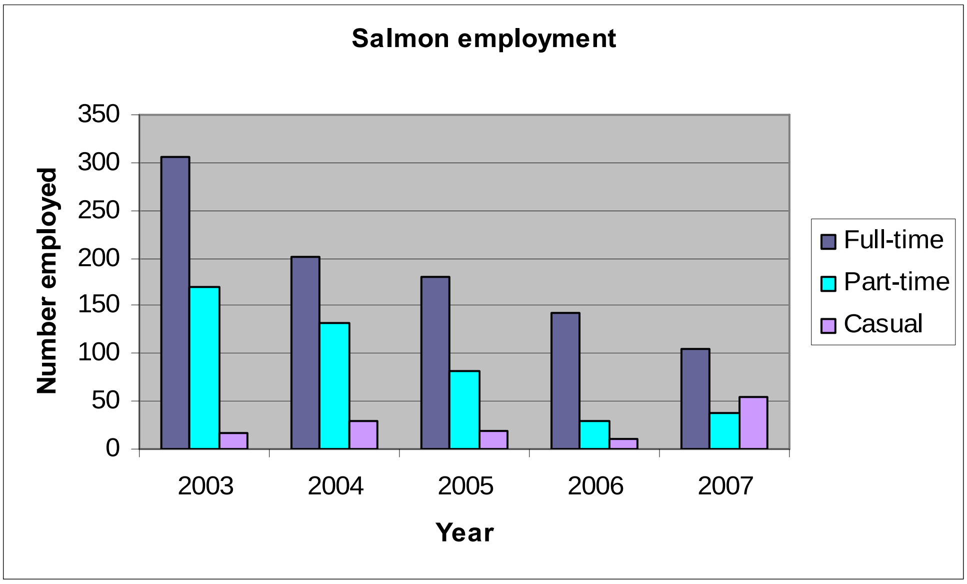
Figure 2:38. Native Oyster Employment by year (2003 to 2007) (BIM).



<u>Finfish employment</u>
In 2007, the total number of people employed in the finfish sector decreased by 12% to 287, which was a FTE of 203 people.

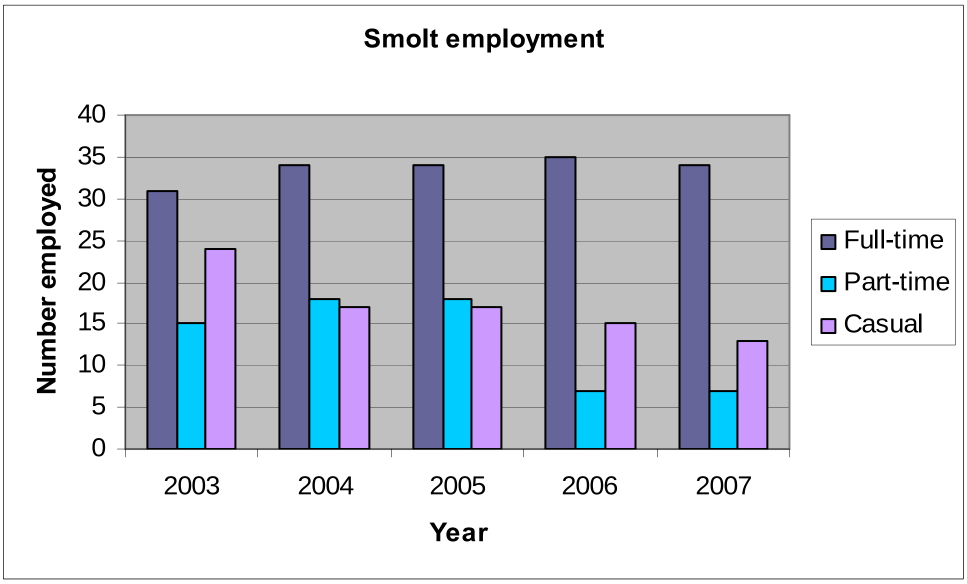
Salmon
Although the salmon FTE fell 16% to 133 total employment rose from 183 in 2006 to 196 in 2007 (Table 2:5 and Figure 2:39).

Figure 2:39. Salmon Employment by year (2003 to 2007) (BIM).



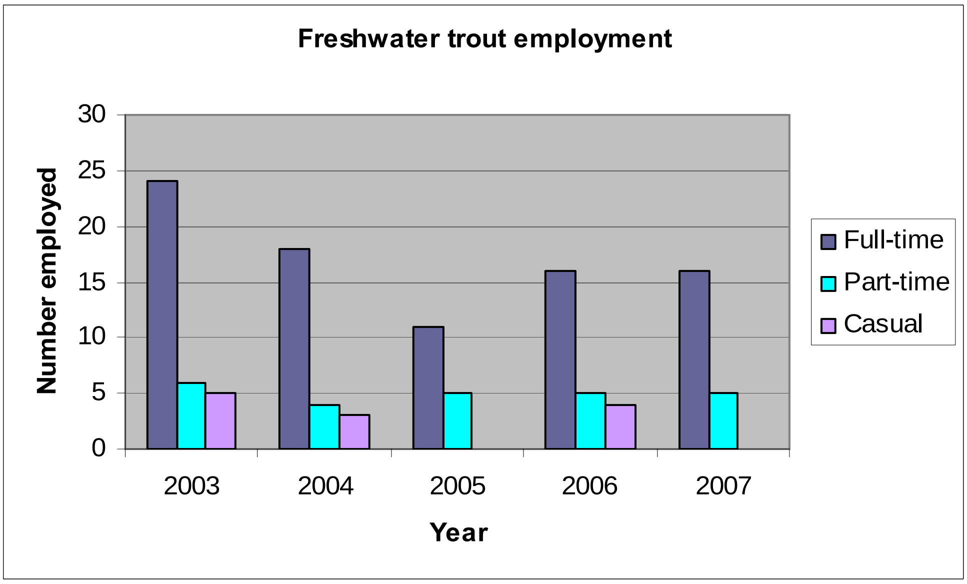
Employment in smolt production decreased by one to 40 FTE in 2007 (Table 2:5 and Figure 2:40).

Figure 2:40. Smolt Employment by year (2003 to 2007) (BIM).



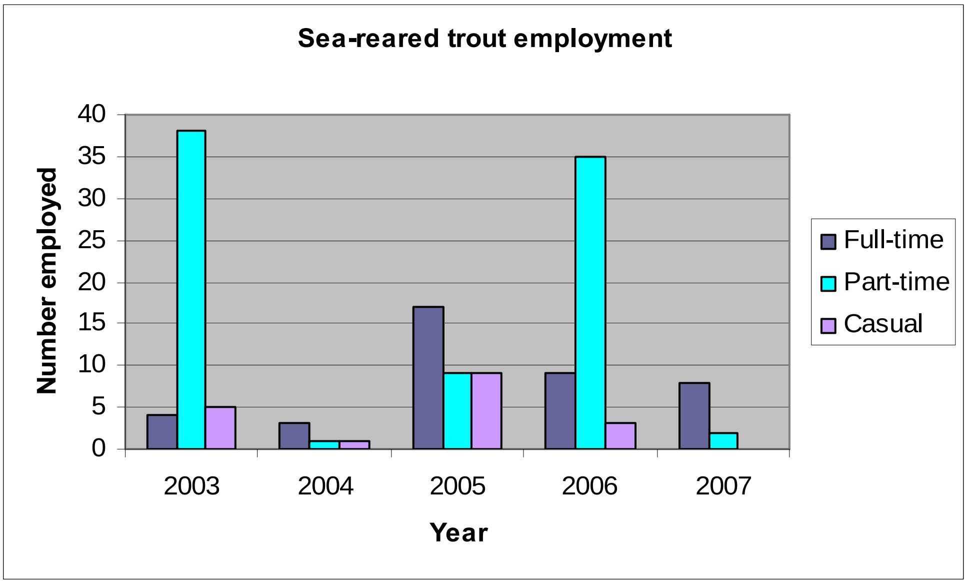
Trout
In 2007, employment in the freshwater trout sector was 19 FTE (Table 2:5 and Figure 2:41).

Figure 2:41. Freshwater Trout Employment by year (2003 to 2007) (BIM).



Employment in the sea-reared trout sector showed a significant decrease from that recorded in 2006 falling by 18 FTE to 9 FTE in 2007 (Table 2:5 and Figure 2:42).

Figure 2:42. Sea-reared Trout Employment by year (2003 to 2007) (BIM).



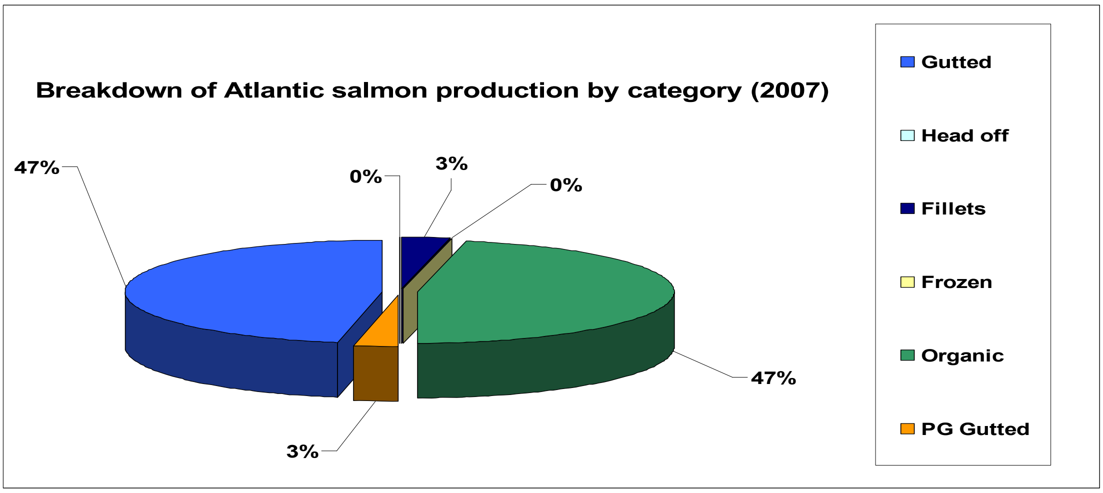
3. EXPORT MARKET SUMMARY

Finfish

Salmon

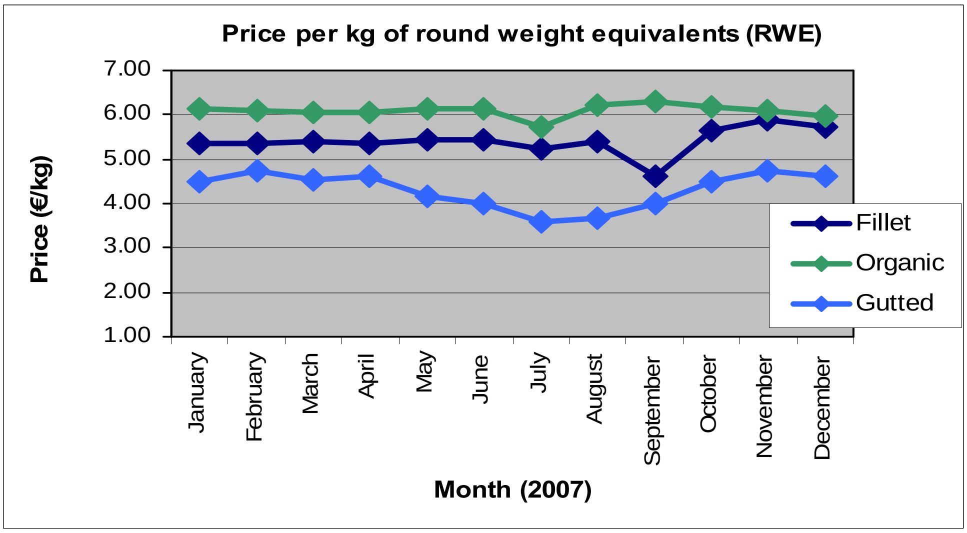
In 2007, gutted fish as a production category had declined from 61% in 2006 to 47% in 2007 (Figure 3:1). This was mainly due to the steady increase of organic salmon as a production category which increased significantly for the second consecutive year. Organic salmon accounted for 47% (Figure 3:1) of all salmon processed in 2007 which was up from 36% in 2006 and 24% in 2005.

Figure 3:1. Percentage Breakdown of Atlantic salmon by Production Category (BIM).



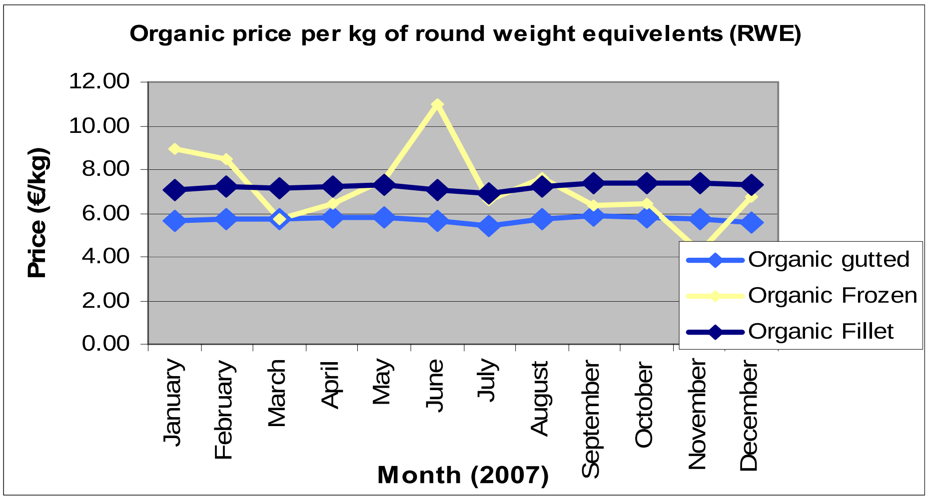
During 2007 the price per kilo for gutted fish ranged from a high in February of €4.76 to a low in July of €3.58 per kg (Figure 3:2). The mean price of gutted fish per kg in 2007 was €4.24. The price of gutted fish remained above €4.00 per kg for much of the year except in the months of July and August. Organic salmon production which can be broken down into sub categories had a mean value of €6.09 per kg with a maximum value achieved in September of €6.32 per kg and a minimum price of €5.74 per kg in July 2007 (Figure 3:2).

Figure 3:2. Mean Monthly Price per kg, for Salmon Production Categories (fillet, organic and gutted) (BIM).



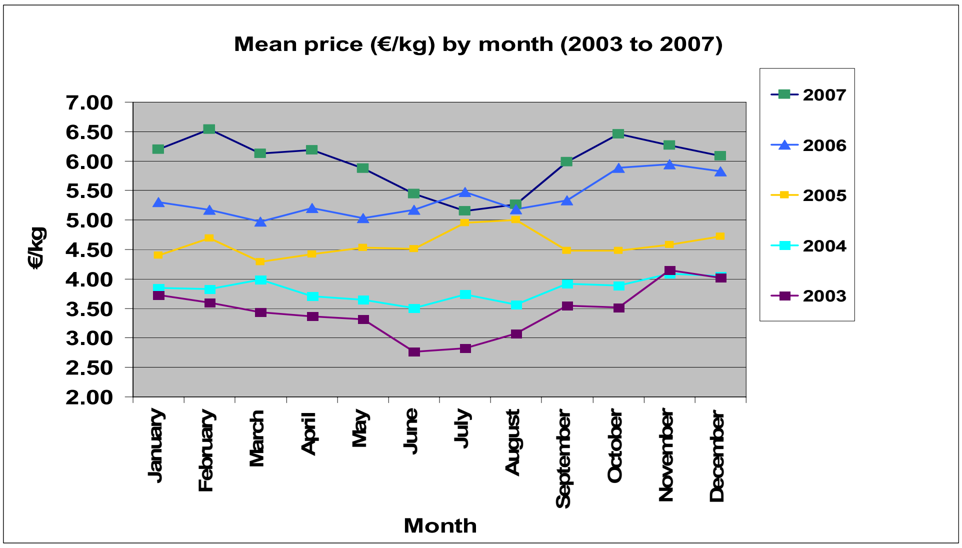
During 2007 the mean price for organic frozen salmon fluctuated on a monthly basis. It reached a maximum price of €10.99 per kg in June and a minimum price of €4.20 per kg in November (Figure 3:3). The mean price for the year was €7.47 per kg. However, the higher than normal price achieved in June has skewed the mean value. The monthly mean prices for organic and gutted remained relatively constant (Figure 3:3). Mean prices for organic gutted ranged from €5.42 to €5.90 per kg and the mean price per kg in 2007 was €5.72. Fillet prices ranged from €6.89 to €7.40 per kg and averaging €7.24 per kg (Figure 3:3).

Figure 3:3. 2007 Mean Monthly Price for Organic Salmon Categories (BIM).



The mean monthly price for Atlantic salmon in 2007 remained constantly higher than that recorded in 2006. With sales figures in all but one month where they took a small mid-summer decline in July to €5.15 per kg (Figure 3:4) which was 33c per kg less than that recorded in 2006.

Figure 3:4. Mean Monthly Price (€) per kg paid for Salmon (2003 to 2007) (BIM).



It would appear that the best prices for salmon were obtained in the size classes 1kg and 2kg (Figure 3:5). However, this analysis is misleading as it is the nature of these products that fundamentally increases their value, i.e. many smaller fish go for value added processing, e.g. filleting.

Figure 3:5. Average Value (€) per kg per Salmon Size Class in 2007 (BIM).

Salmon exports

In 2007, there was a significant decline (-67%) in the volume (Table 3:1) of fresh salmon exports to 1,596 tonnes (Table 3:1). This was due to an increase in the amount of salmon supplied by Irish growers to the domestic market and a decline in the overall level of production. For Irish producers, France remained the key export market followed by Germany. During 2007, the average price per tonne of Irish fresh salmon exports decreased by 7%. However, this was significantly better than the 17% decline in the Norwegian export price for fresh salmon (Table 3:1). The price decreases shown in Table 3:1 were a result of the inability of the key suppliers from Norway to balance market demand with supply. The export volumes from Norway in 2007 increased by 24% to 494,025 tonnes (Table 3:1).

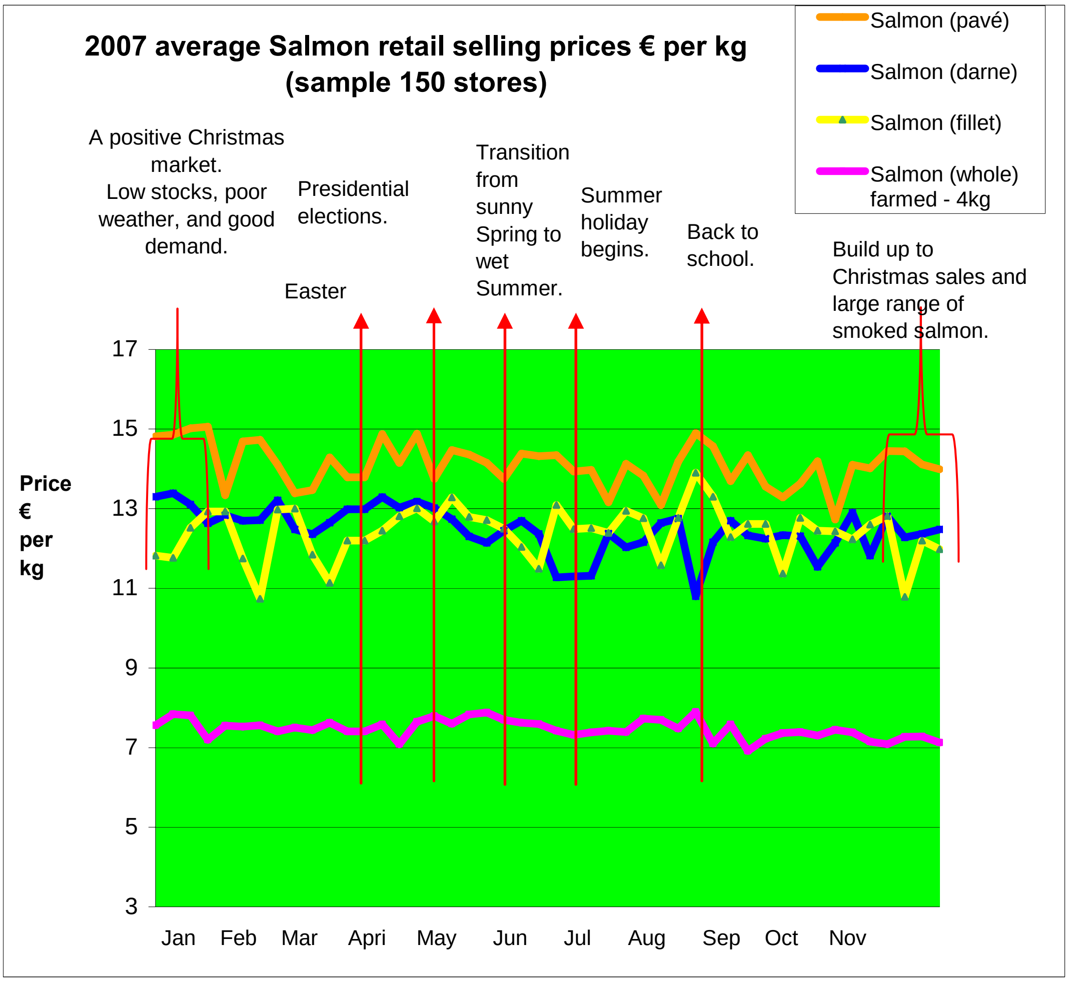
The UK salmon industry also suffered from these competitive market conditions and the average price of fresh salmon fell by 10% in 2007. Export volumes from the UK were also lower in 2007, decreasing by 5% (Table 3:1).

Table 3:1. Fresh Salmon Exports (volume), Value (€ per tonne) and Percentage change (2006) from Ireland, Norway and UK in 2007 (BIM).

Country	Volume Tonnes	% Change	Price (€) per tonne	% Change
Ireland	1,596	-67	4,954	-7
Norway	494,025	+24	3,305	-17
UK	40,497	-5	4,448	-10

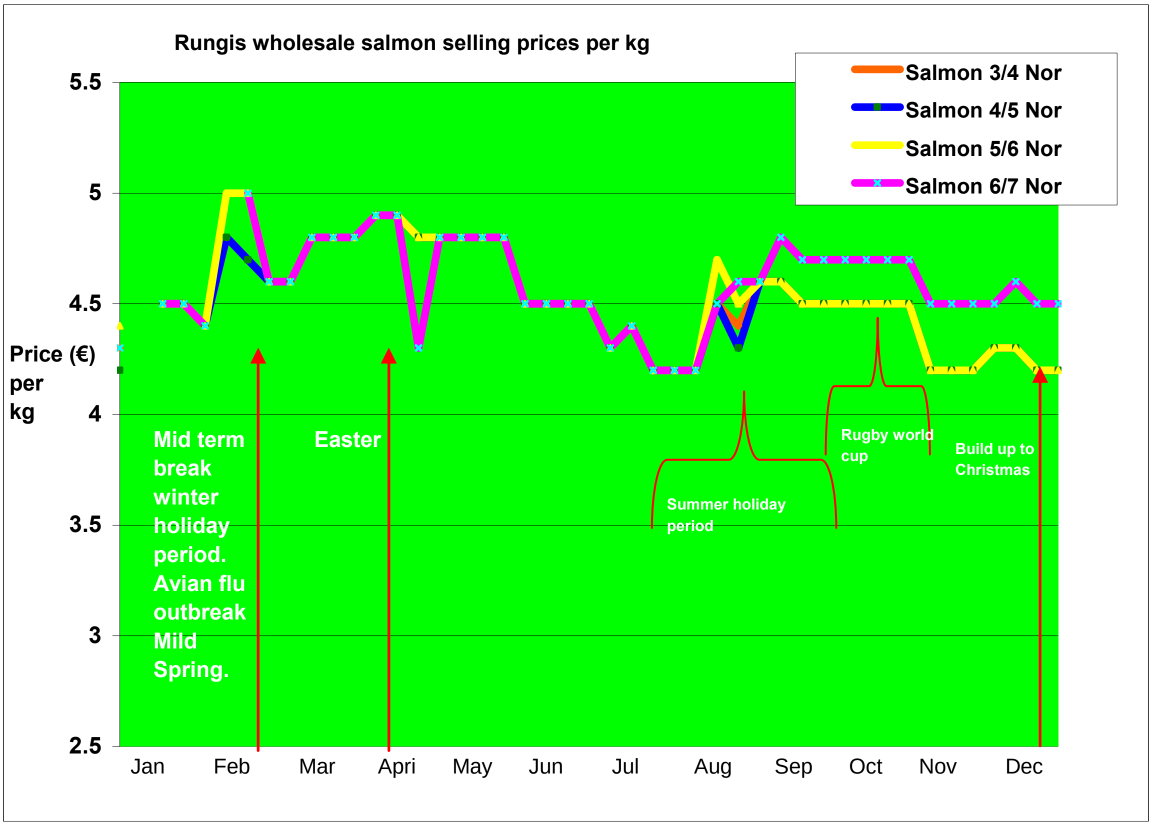
In France, 2007 began with strong salmon prices following a good Christmas market in 2006. The average weekly French retail prices in euro per kg for Salmon (Pave, Darne, Fillet and Whole) are shown in Figure 3:6. As a result of these strong festive sales the cold stores were empty by the 2007 New Year, promoting further healthy demand for salmon in the first quarter of 2007. This demand was also boosted by poor weather that resulted in a reduced supply of whitefish for the market and a consequential increase in demand for salmon. The announcement of avian flu outbreak in February also bolstered salmon demand. Overall the salmon market benefited from positive press coverage throughout 2007 for its health benefits that were relayed by the French authorities through their National Plan for Nutrition and Health (PNNS).

Figure 3:6. Average Weekly Retail Prices € per kg for Salmon (Pave, Darne, Fillet and Whole) in France (sample of 150 shops) (BIM).



Chronologically the year 2007 was marked by a number of significant events which affected French consumer behaviour. The presidential elections in May followed an exceptionally warm spring, both of which helped boost consumer demand. However the weather changed into one of wettest summers on record and as a result consumer habits changed from having outdoor barbeques to indoor salads which potentially can have an adverse effect on some of the pre-cut market. Fortunately the “Rugby World Cup” during the autumn boosted demand in the catering sectors due to the increase in tourist numbers (Figure 3:7).

Figure 3:7. The Rungis Wholesale Selling Price 2007 (BIM).



A relatively cool summer in 2007 provided reasonably good salmon growth rates in Norway and resulted in an increase in their production volumes. The market absorbed this increased availability of salmon and prices remained relatively stable up to the fourth quarter of 2007.

2007 was an active year for mergers and acquisitions which affected the salmon market. Nexia, the second largest French chilled cargo company was taken over by the Dutch logistic company E brex which resulted in some disruption of chilled dry transport. The Icelandic giant Alfresca added the delicatessen manufacturer Le Traiteur Grec to their significant portfolio of companies which includes market leader Labeyrie (25% retail market share for smoked salmon) and Delpierre, (5% retail market share for smoked salmon). Marine Harvest acquired the Breton smoked salmon company Kritzen which is an addition to their Panfish smoked salmon factory. Guyader Gastronomie a French delicatessen company acquired the salmon smoker Wilmar, which is based in Nantes. A promotion of brands was announced by Labeyrie with the launching of three new product positions under the theme "Well being, choose your own salmon". The products were:

1. Norwegian smoked salmon containing 25% less salt.
2. Alaskan smoked salmon with a 4% reduced fat content.
3. Irish AB certified organic salmon, which was targeted at the four out of ten French consumers who eat organic products at least once per month.
4. Picard and JC David launched an Irish organic smoked salmon in the fourth quarter of the year.

During 2007, the Label Rouge accreditation scheme was broadened to include machine slicing for Norwegian, Irish and Scottish smoked salmon. This resulted in an increased market share from own label/ brand retail outlets.

Some 42% of French consumers buy at least one organic product per month and the market for organic foods has grown by approximately 10% per year over the previous five years according to the French organic agency "L'Agence Bio". In December 2007 a smoked salmon product survey was undertaken by BIM at a French Hypermarket. This survey indicated similar price levels compared to those achieved in 2006. However, there was a net increase in geographically identified marketed products to the detriment of those of generic Atlantic origin.

Trout Market

The Irish retail market for trout in 2007 was valued at €4 million; this was a slight increase on the 2006 value of €3.7million. In terms of total volume this equated to a live weight equivalent of 500 tonnes. The average retail price per kg of trout was €11.75 which is a drop of 12% from that obtained in 2006. Foodservice sales of trout in 2007 were estimated to be similar to those for the retail market.

Exports of trout were reported to be 113 tonnes valued at €430,000. Imports of trout to Ireland over this same period amounted to 162 tonnes valued at €754,000.

Shellfish

In 2007, France was the key shellfish export market for Ireland with a total market share of approximately 33% (Table 3:2 shows total shellfish exports which includes fishery and aquaculture), followed by Spain at nearly 22%. Total Irish exports in 2007 remained relatively unchanged (-1%) compared with the year 2006. It is thought that the total shellfish exports to France declined due to the decreased value of crab exports. The increase in exports to Spain is attributed to the increase in sales of crab and *Nephrops*. Exports to Italy decreased partly due to a decline in frozen processed mussel sales. The 50% drop in sales value of Irish shellfish to the Netherlands was largely caused by the decline in value of live mussel exports, following an exceptionally good previous export season in 2006.

Table 3:2. Total Irish Shellfish Export Statistics (BIM).

Ireland Export Statistics UDG: Shellfish (Group), Annual Series: 2005 - 2007							
	European Union Euros			Share %			Change %
Year	2005	2006	2007	2005	2006	2007	
Country							
World	128,312,420	154,943,180	153,500,740				-1%
France	46,706,820	53,188,560	51,253,690	36%	34%	33%	-4%
Spain	25,673,830	32,072,190	34,210,490	20%	21%	22%	+7%
United Kingdom	14,574,480	20,430,390	22,787,390	11%	13%	15%	+12%
Italy	21,726,550	19,975,040	18,535,510	17%	13%	12%	-7%
Netherlands	6,934,400	13,867,490	6,880,990	5%	9%	4%	-50%
Korea South	552,350	1,887,370	4,220,180	0%	1%	3%	+124%
United States	1,796,530	3,837,370	4,196,170	1%	2%	3%	+9%
Sweden	2,173,910	3,485,210	3,522,920	2%	2%	2%	+1%
Germany	1,381,940	1,596,910	1,669,420	1%	1%	1%	+5%
Others	6,791,610	4,602,650	6,223,980	5%	3%	4%	+35%

N.B. This table includes lobster, crab, whelk, prawns, etc.. The export figures collected from Eurostat may be under evaluated. Therefore caution must be applied when interpreting these figures.

Oysters

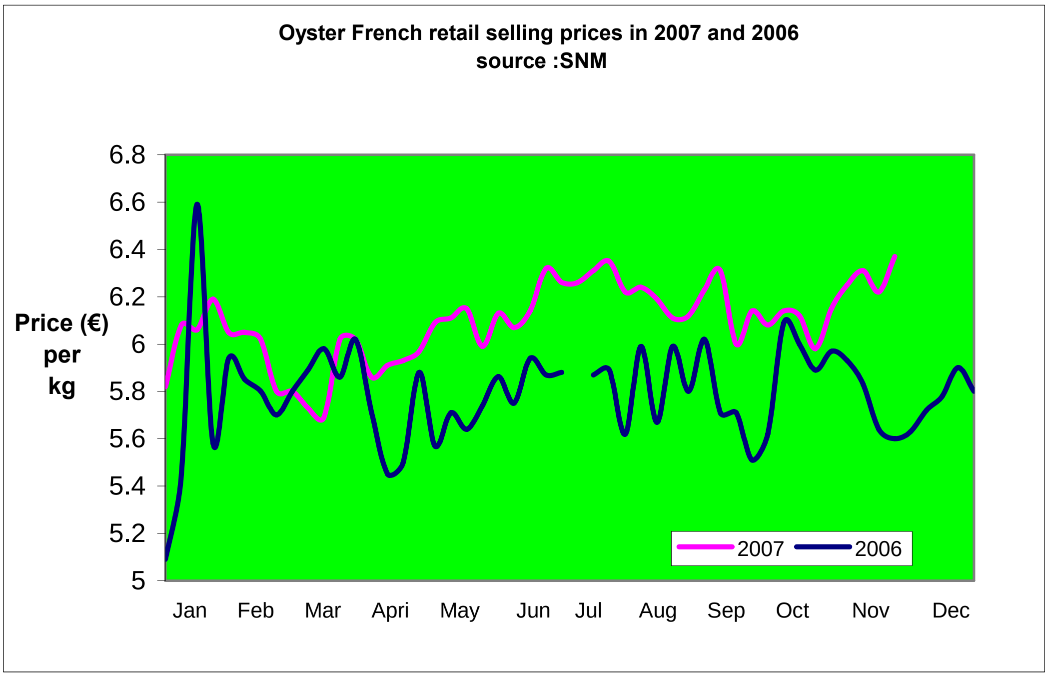
Bulk oyster market (Crassostrea gigas):

Bulk oyster prices during 2007 were similar to those of 2006 with average prices for Irish oysters delivered into France typically obtaining €2.20 to €2.30 per kg and €2.70 per kg for special oysters. There were some exceptional prices paid of €3.50 per kg. Unfortunately, prices for Irish oysters declined towards the end of the year by eight to ten per cent, due to poor French demand in November. This reduced demand occurred for the following reasons:

- Transport strikes brought about stock carry over into the month of December.
- Poor consumer demand during the first weeks of December.
- Good 2007 autumn growing conditions in France resulted in a production increase and improved quality.
- The late re-absorption of gonad/or "milkyness" of Irish oysters impeded their early export to France.
- Increasing controls on the sales of "French" oysters under the Marennes - Oléron brand discouraged some of the traditional packers from using Irish oysters.

Retail oyster (C. gigas) market:
Despite the volatility of the bulk oyster market (*C. gigas*) the average retail price (Figure 3:8) increased throughout the year, with an average selling price to the consumer (for all grades and quality) of approximately €6.10 per kg compared to €5.80 per kg in 2006 (Figure 3:8). This was an increase of 5%. Despite this price improvement, the industry is concerned by the general poor financial health of the packing sector which continues to be squeezed between high bulk prices and poor retail buying prices. As a result the market share for traditional sales (fishmongers, restaurants and direct sales) where margins are generally more attractive, increased.

Figure 3:8. The Retail Selling Price for Oysters (*C. gigas*) during 2006 and 2007 in France (BIM).



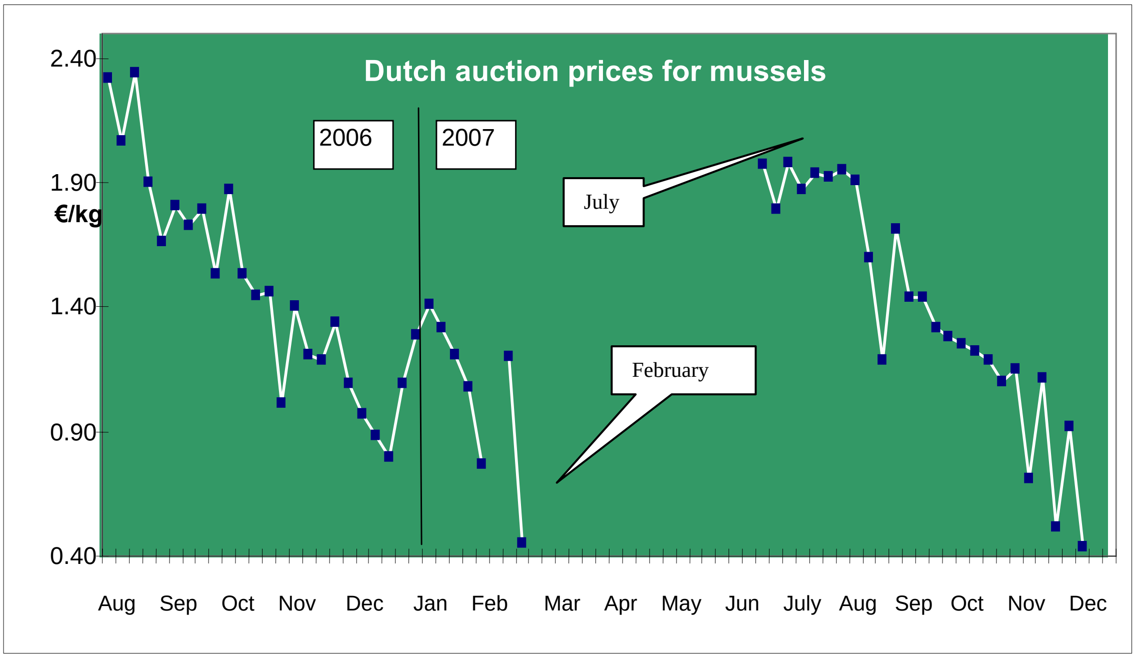
Mussels

Bulk mussel market:
During the first half of the year a shortage of mussels (as the Barfleur fishing grounds were closed and Dutch mussel stock levels were low, which brought about an early closure of the fishing beds in February) resulted in good bulk prices across Europe. Selling prices delivered to the stores in France were around €1.80 per kg for Dutch, Irish and Italian mussels.

Bulk Irish rope mussels delivered into France achieved €1.30 to €1.40 per kg and bottom mussels (80 to 100 pieces per kg) obtained approximately €1.00 per kg to France and €1.30 to €1.50 per kg delivered into the Netherlands. Figure 3:9 shows the Dutch auction price for mussels which were high in June/July and declined by the winter.

Reduced sales during a disappointing tourist season in France were caused by a combination of poor weather conditions coupled with high summer prices. This subsequently resulted in mussel stock carry over into the month of September. The unusual opening of the Barfleur beds in October further compromised the market. Dutch packers lost the summer French retail market due to excessively high prices and they had significant difficulties in moving their product when the market changed from being under supplied to an over supply situation.

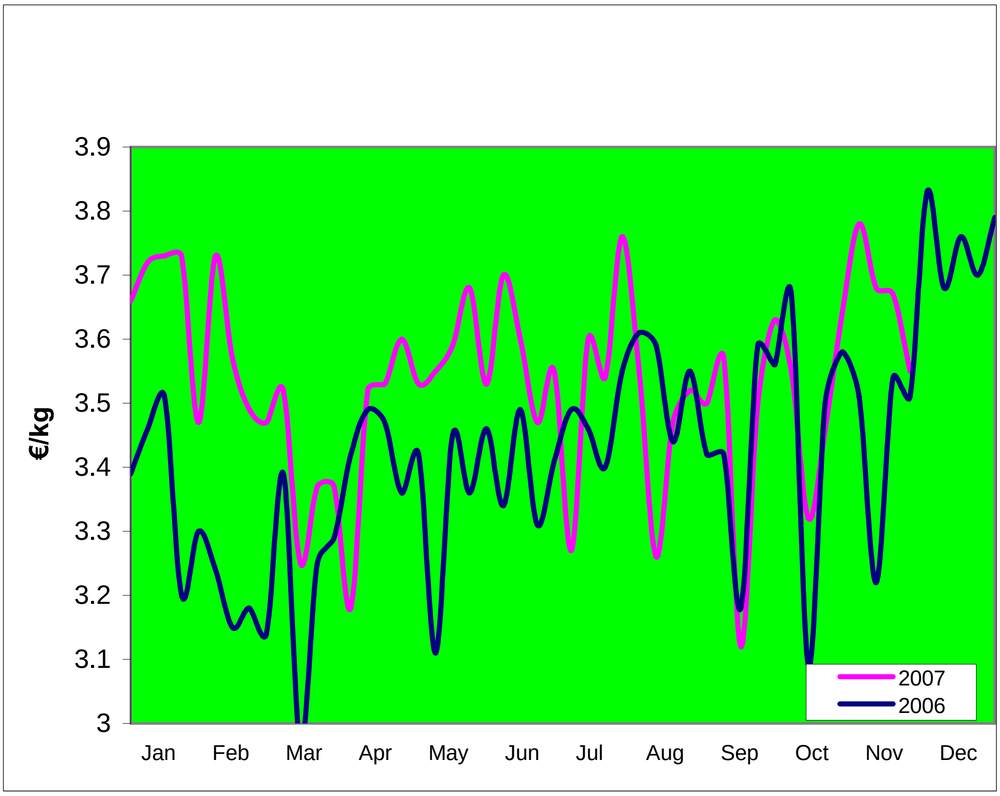
Figure 3:9. Dutch Auction Mussel Prices (€ per kg) in 2006 and 2007(BIM).



Retail mussel market:

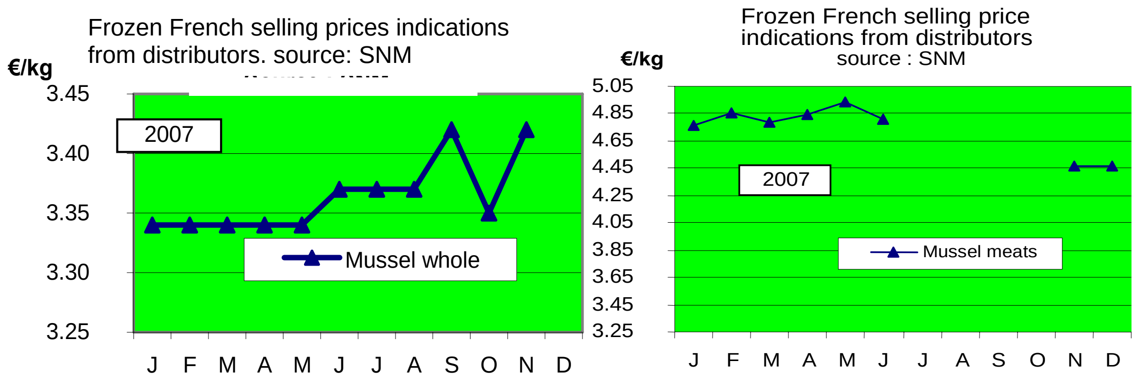
Prices to the French consumer increased by 3% during the year with an average selling price of fresh mussels from all origins of €3.53 per kg. Figure 3:10 shows the price per kg for mussels achieved in 2007 and compares them with the 2006 prices.

Figure 3:10. French Retail Selling Prices for Mussel (€ per kg) in 2007 and 2006 sourced from SNM (BIM).



Frozen mussel market in France:
The market price for cooked whole frozen mussels was inelastic during 2007, with very strong competition from Chilean production (Figure 3:11).

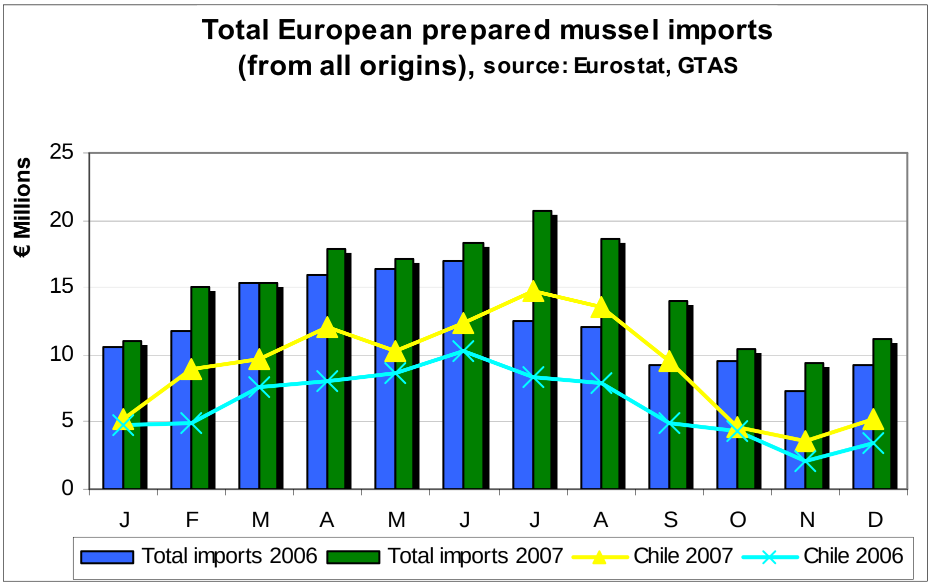
Figure 3:11. Frozen Whole Mussel (left) and Frozen meats (right) price per kg by month (BIM).



Import data
The continuous decline of the value of the US dollar ($) versus the European euro (€) continued to boost imports from third countries, especially from Chile (Figure 3:12).

Imports from Chile into the EU declined after July, with import levels in October 2007 being similar to those of October 2006 (Figure 3:12). The drop in growth of Chilean exports towards the end of 2007 may have been caused by the availability of cheap fresh European mussels. However, by examining 2007 export data from Chile we observe that the total value of these exports increased by 22%, with virtually a doubling of sales into France. There was an increase of 13% into Italy, 50% into Germany and 90% into the Netherlands. The drop in exports to Spain by 12% suggests that Chilean exporters are now bypassing the Spanish traders and penetrating the core European markets directly.

Figure 3:12. Total Value (€ millions) of Imports of Prepared Mussel into Europe (BIM).



4. AQUACULTURE LICENCES AND APPEALS

Aquaculture Licences

Table 4:1 shows the number of Aquaculture Licences and their distribution according to BIM's GIS Database. This data is compiled from information supplied to BIM by the Department of Communications Marine and Natural Resources (DCMNR) and the Department of Agriculture Fisheries and Food (DAFF). In the year 2007 there were 573 active licences, of these there were 494 active shellfish licences (86% of total), 75 finfish licences and 4 algae licences. The greatest number of licences is for oyster farming (268 licences) and there were 167 mussel licences. The county with the greatest numbers of licences is Donegal (122 licences) closely followed by Galway (113 licences) and Cork (105 licences). The greatest numbers of finfish licences (23) were located in County Galway.

Table 4:1. Distribution of Aquaculture Licences 2007, compiled from Available Data supplied to BIM by DCMNR and DAFF.

County	Salmon & Smolts	Trout (FW & Marine)	Other Finfish	Oysters	Mussels	Clams	Scallops	Other Shellfish	Algae	Total
Louth		1		14	16					31
Wexford				8	10					18
Waterford				11	5				1	17
Cork	6	3	1	26	48	1	2	16	2	105
Kerry	1		1	27	10	4	3			46
Limerick	1			1						2
Clare		1		14	2	1				18
Galway	19		4	36	42	2	1	8	1	113
Mayo	3	1	1	45	7	1	2	2		62
Sligo	1		1	5	1	8		1		17
Donegal	7		1	81	26	1	5	1		122
Kildare	1									1
Leitrim	1									1
Tipperary	3	1	1							5
Westmeath	1									1
Carlow		1								1
Cavan	1		1							2
Monaghan			1							1
Offaly			1							1
Kilkenny	1		2							3
Wicklow	1	2								3
Roscommon			3							3
Total	**47**	**10**	**18**	**268**	**167**	**18**	**13**	**28**	**4**	**573**

Notes: i) There may be multiple sites associated with one licence.
ii) Other shellfish includes lobster, abalone and sea urchins.
iii) Other finfish includes Arctic Charr, Perch and ornamental fish.

Aquaculture Applications and Decisions

Applications

All aquaculture sites must be licenced under the Fisheries (Amendment) Act 1997. Licences in the year 2007 were issued by the Minister for the Department of Communications, Marine and Natural Resources (DCMNR). In the year 2007, DAFF reports that there were a total of 36 outstanding Aquaculture Licence Applications (Table 4:2).

Table 4:2. Distribution of Outstanding Aquaculture Licence Applications in the year 2007 by County for the Principal Aquaculture Species (Source: DAFF).

County	Salmon	Trout (FW & Marine)	Other Finfish	Oysters	Mussels	Clams	Scallops	Other Shellfish	Algae	Total
Louth					1					1
Dublin										-
Wexford					2					2
Waterford					1					1
Cork				1	6					7
Kerry				2	1					3
Limerick				1						1
Clare				2						2
Galway	1		1	1	1					4
Mayo				4	1			1		6
Sligo										-
Donegal				6	3					9
Total	**1**	**1**		**17**	**16**			**1**		**36**

Notes: i) There may be multiple applications associated with one site.
ii) Certain applications may be licenced or have other decisions made about them, but the decision has not been recorded in the data analysed.
iv) Other shellfish includes cockles, abalone and sea urchins.
v) Other finfish includes Arctic Charr, Perch and ornamental fish.

The majority of the applications in 2007 were for oyster and mussel farms in counties Donegal, Cork and Mayo.

Decisions
Aquaculture applications (new and renewals) and decisions on Aquaculture licences from 2003 to 2007 are summarised in Table 4:3 (also see Parsons et al. 2003 & 2004, Browne et al. 2005 & 2006). This information was sourced from DCMNR and DAFF. Table 4:3 shows the number of applications received by the DCMNR and DAFF (new and renewals) from the year 2003 to the year 2007. This table shows that the number of applications (new and renewals) was 57 in the year 2007. (N.B.Table 4:2 is the list of applications received but not decided on in 2007. While Table 4:3 is a list of decisions made in 2007 but the applications would have been received in previous years).

Table 4:3. Summary of Aquaculture Licence Applications and Decisions during 2003 to 2007 (DAFF and DCMNR).

Applications	Year 2003	Year 2004	Year 2005	Year 2006	Year 2007
Applications	58	70 (62+8)	73 (63+10)	NA	38 35 +3
Licence renewal application	55	30 (24+6)	14 (8+6)	NA	19 17+2
Decisions					
Grant	33 (25+8)	25 (22+3)	7	15	6
Refusals	1	5 (4+1)	1	2	1
Renewals granted	12 (7+ 5)	10 (6+4)	16	28	5
Ministerial decisions appealed to ALAB	7	1	2		
Refusal to renew		1 (shell)	2		
Licence amended		4	1	2	
Reassignment of a licence		17 (11+6)	9	12	13
Trial licence		8 (2+6)			
Revocation		6 (3+3)		3	

Brackets (Number of Shellfish & Aquatic Plants + finfish) NA – not available at the time of drafting.

Aquaculture Licence Appeals Board (ALAB)

There were no appeals received by ALAB (Appendix II, box 1) in the year 2007 compared with six appeals in the year 2006 (Table 4:4). Five appeals were carried over from 2006 to 2007. These were in relation to four decisions of the Minister to:

- Grant a licence for salmon smolt production,
- Grant a licence to collect mussel spat.
- Grant a licence for the bottom cultivation of mussels
- Refuse to grant a licence for the cultivation of pacific oysters.

The Board made five determinations in 2007. This resulted in the granting of three aquaculture licences and the refusal to grant one licence (The reader should note that the number of determinations is not necessarily the sum of the decisions as several appeals may have been received against one ministerial decision). There were no ministerial decisions appealed in 2007 and there were no appeals carried over into 2008.

Table 4:4. Aquaculture Licence Appeals Received and Board Determinations by the Aquaculture Licences Appeals Board 1999 to 2007 (ALAB).

Year	Appeals Received	Withdrawn/ Invalid	Board Determinations	Licences Granted	Confirmed Minister's Decision	Appeals Upheld
1999	88	2	25	16	7	0
2000	38	2	83	37	5	2
2001	76	31	38	14	1	1
2002	13	5	29	24	0	2
2003	7	0	16	2	1	6
2004	22	5	14	12	1	1
2005	17	0	5	4	0	2
2006	6	0	1	1	0	1
2007	0	0	5	3	4	0

N.B. The number of Board determinations in a given year is not necessarily the sum of the last three columns (licences granted, confirmation of ministerial decision and appeals upheld). For example, several appeals may be received against one ministerial decision, with the Board making a determination on each appeal.

5. AQUACULTURE MONITORING - SHELLFISH

Ireland has established a comprehensive system of environmental and food safety monitoring for the shellfish and finfish sectors which meet EU and market demands. The findings of these monitoring programmes are set out in the following pages.

Shellfish.

Biotoxin and Phytoplankton Monitoring.

Irish National Biotoxin Monitoring Programme 2007 (Appendix II, Box 2).
Samples of shellfish, including mussels, gigas oysters, native oysters, cockles, clams, razor fish and scallops are routinely collected from both wild fisheries and aquaculture production sites as part of the National Biotoxin Monitoring Programme (NBMP). These samples are analysed for the presence of toxins belonging to the Amnesic Shellfish Poison (ASP), Diarrhetic Shellfish Poison (DSP), Paralytic Shellfish Poison (PSP) and Azaspiracid Shellfish Poison (AZP) toxin groups using biological and chemical test methods. In addition, water samples are collected from both shellfish and finfish sites and the number of known toxin producing phytoplankton species and harmful/nuisance phytoplanktonic species is determined via light microscopy.

Sample Turnaround.
In 2007, of all the analyses carried out by the Marine Institute and its contract laboratories, 93.4% of the results were reported to the industry regulators and consumers within three working days from laboratory receipt. This was an improved turnaround compared to 2006 when 91.8% of samples were reported within three working days. All results were issued by e-mail, published on the Marine Institute web site (www.marine.ie/habs) and sent by SMS text message.

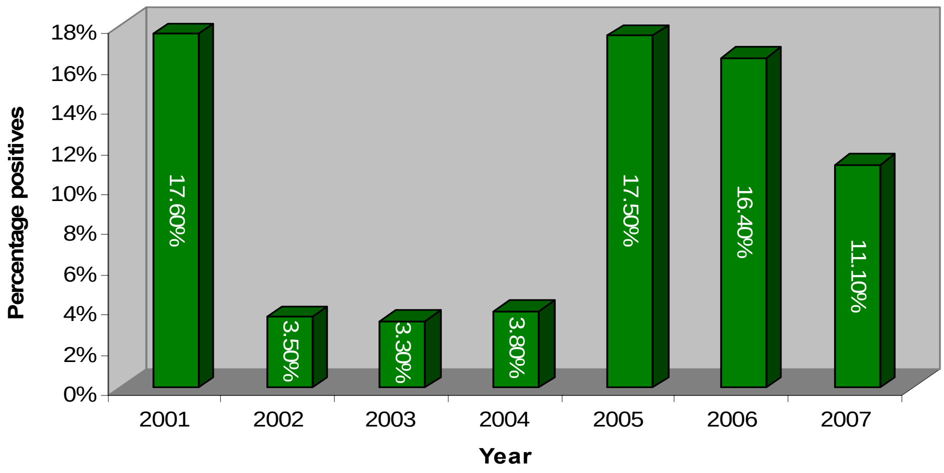
Paralytic Shellfish Poisoning (PSP) via bioassay analysis.
The number of samples analysed for PSP toxins in 2007 was 158 compared to 146 samples analysed in 2006. The majority of samples received were part of the monthly sentinel site monitoring programme (Table 5:3). Additional analysis was carried out when *Alexandrium* species were observed in water samples. Of the 158 samples analysed, all were found to be below the regulatory level. The highest level measured was 39µg/STXdiHCL100g^{-1} whole flesh in a sample of mussels collected in Cork Harbour at the end of June 2007

Amnesic Shellfish Poisoning (ASP) via HPLC analysis.
A total of 506 scallop tissue samples were analysed by HPLC for domoic and epi-domoic acid in 2007. The majority of samples received were processed scallops, hence the majority of the tissues analysed were adductor muscle (242) and Gonad (233). Additional analyses were carried out on remainder tissues (15) and total tissue (16).

Of the 233 gonad tissues analysed, six were above the regulatory level for ASP, where the highest level measured was 66.3µgg^{-1}. All of the 242 adductor muscle samples analysed, were below the regulatory level. Of the remainder tissues and total tissue analysed, over 40% were above the regulatory level. The highest concentrations observed were 227.6µg/g^{-1} in the remainder and 114.6µg/g^{-1} in the total tissue.

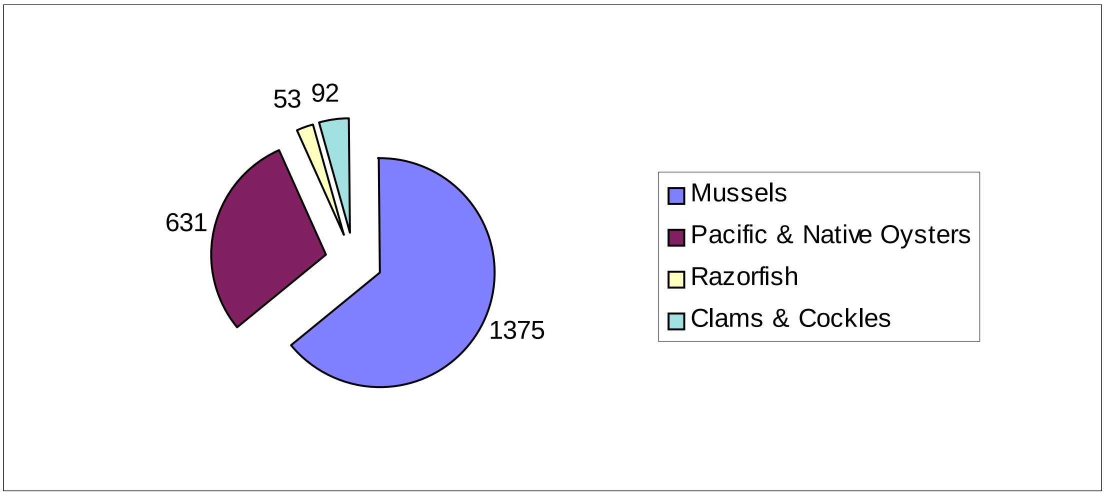
Lipophilic toxins (Diarrhetic Shellfish Poisoning (DSP) and Azaspiracid Shellfish Poisoning (AZP also referred to as AZA) by bioassay and LC-MS/MS analysis.
During 2007 a total of 1,891 samples were submitted for bioassay analysis compared with 2,384 samples submitted in 2006. This decrease in sample numbers can be attributed to the very infrequent and low level of occurrence of DSP toxins in shellfish flesh in the third quarter of 2007 compared with previous years. A total of 211 (18.9%) positive bioassays were observed in mussel samples (n=1,116). This equates to 11.1% positive of all samples submitted compared with 16.4% positive results in 2006 (Figure 5:1). All other shellfish species analysed were negative.

Figure 5:1. Percentage Positive Results for Shellfish Sampled from 2001 to 2007 (MI).



A total of 2,151 samples (Figure 5:2) were submitted for LC-MS/MS chemical analysis for DSP and AZP, of which 125 samples (5.8% of total samples or 9.1% of mussels) exceeded the regulatory level for Azaspiracids. The highest level measured was 1.4µg/g^{-1} in October and occurred in Bantry Bay. None of the samples analysed contained DSP toxins (Okadaic acid, Dinophysis-toxins 1,2) above the regulatory level. The highest level measured was 0.07µg/g^{-1} from Kenmare Bay in July. The majority of samples contained DSP toxins at a level less than the LOD (limit of detection) or less than the LOQ (limit of quantification).

Figure 5:2. Number of Samples by Species Submitted for DSP and AZP Analysis during 2007 (MI).



During 2007, AZP (also referred to as AZA) was the main toxin recorded with some production area closures occurring from June to July, and again from early October through to December (Figure 5:3). These closures occurred mainly in the south west, and affected mussel sites in Bantry, Kenmare and Dunmanus Bays. Quantifiable levels of AZP's below the regulatory level were measured from sites in the west and north west. (Figure 5:4). Closures due to AZP were also observed at the beginning of 2007, in January and early February due to the carryover of AZP toxicity in samples from the end of 2006. Again, the majority of these closures were in the south west, with one closure in Inverin in the west of Galway Bay.

Figure 5:3. Site Closures During 2007 n = 99 (note AZP can also be referred to as AZA) (MI).

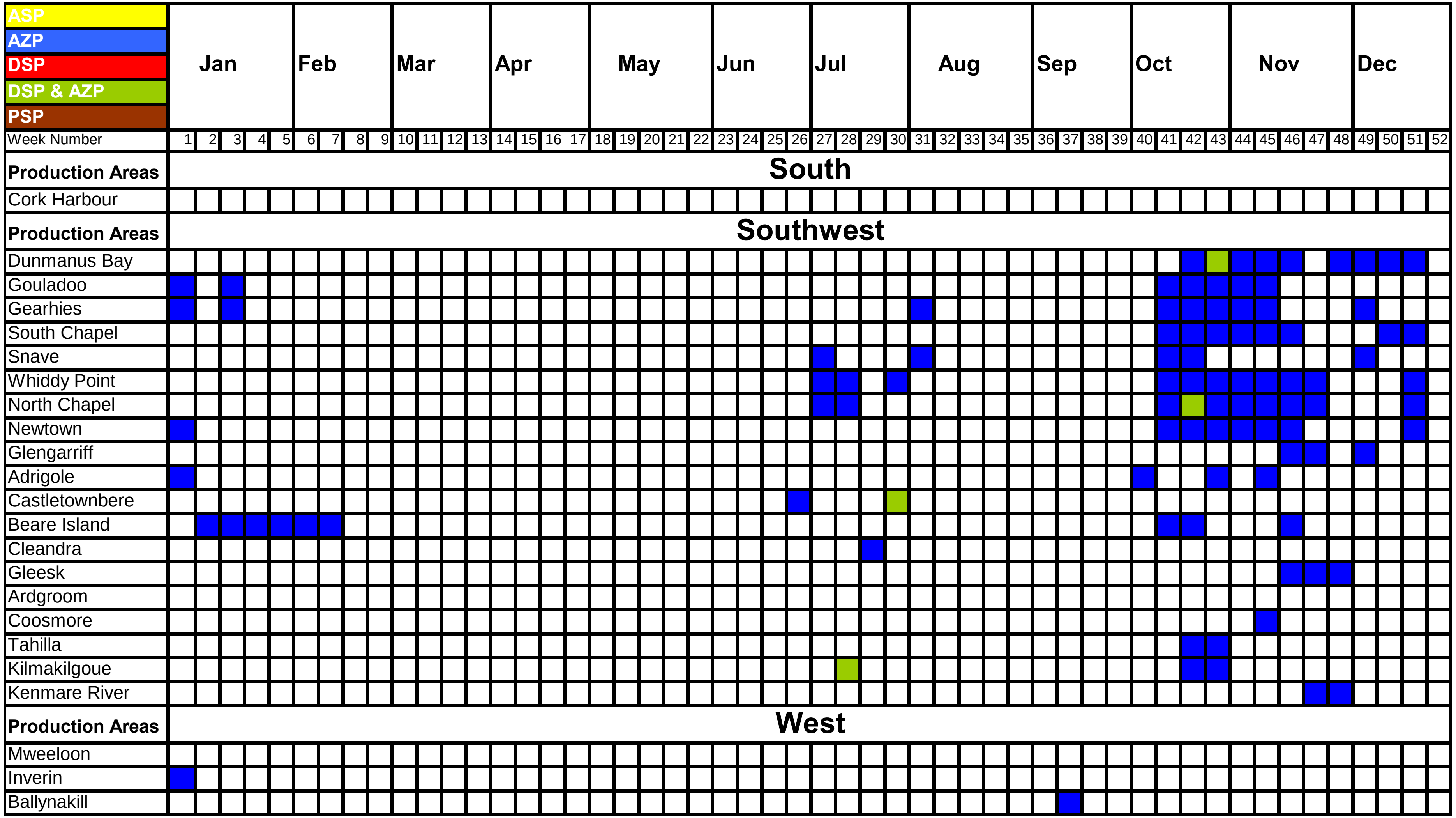
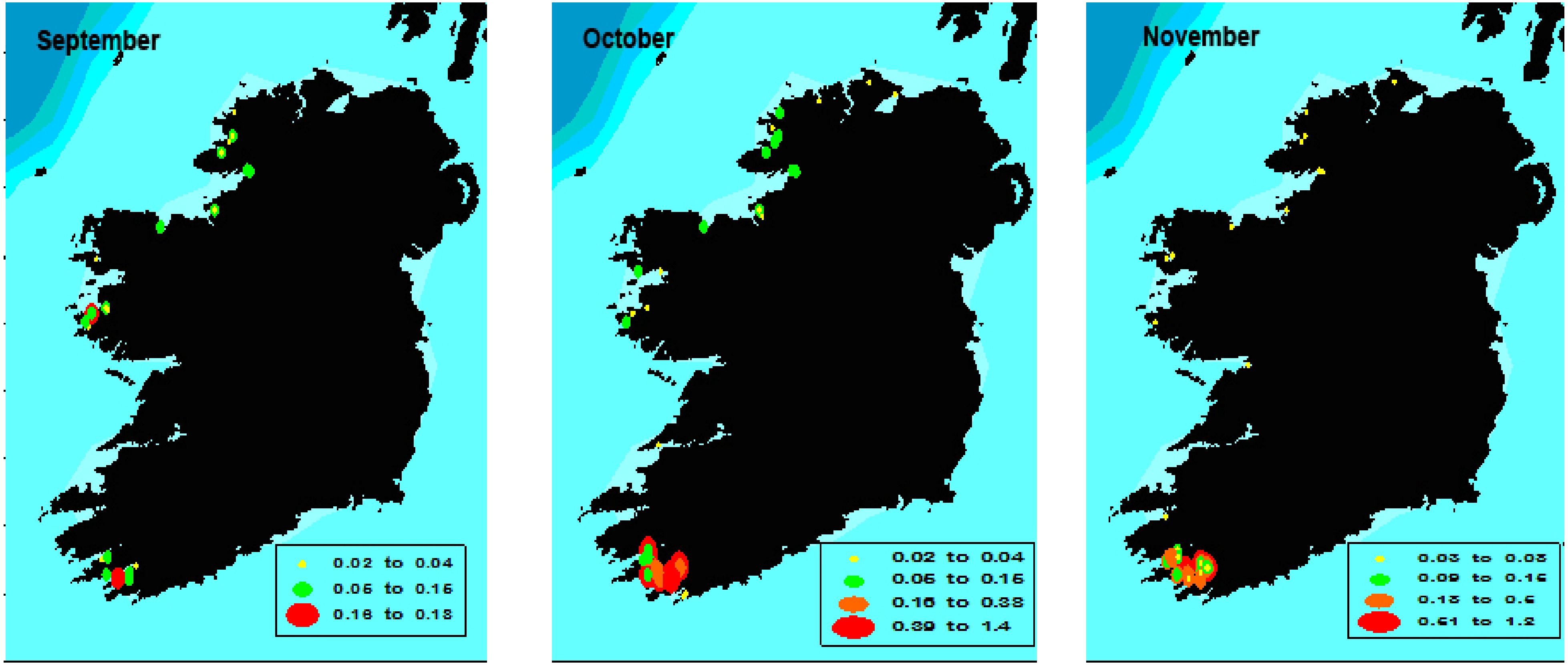


Figure 5:4. AZP (also referred to as AZA) Concentrations µg/g[-1] during the months September, October and November 2007 (MI).



Quality Control.
The full suite of biotoxin and phytoplankton test methods conducted in the Marine Institute remain accredited by the Irish National Accreditation Board, to ISO 17025 standards. The MI also participated in intercomparison exercises (organised by the Community Reference Laboratory) and proficiency schemes (QUASIMEME), and also organised intercomparison exercises with national (bioassay sub-contract laboratories) and international laboratories (BEQUALM). An integral part of the Quality Control systems in place is the regular internal and external audits which are routinely conducted on all aspects of the laboratory analysis.

Management Cell Decisions.
The Management Cell was set up by the Molluscan Shellfish Safety Committee to manage the potential risk presented by marine biotoxins. The Committee includes members from the Food Safety Authority of Ireland, Sea Fisheries Protection Authority, Marine Institute, Irish Shellfish Association and Shellfish Industry members. The aim of the Management Cell is to enable rapid decision making in non routine situations. During 2007, there were a total of 36 Management Cell decisions raised and implemented compared with 103 during 2006. Table 5:1 shows a breakdown of Management Cell decisions taken in 2007.

Table 5:1. Management Cell Decisions in 2007 (MI).

Original Decision	MC Decision	Frequency
Closed	Open	4
Closed	Closed Pending	2
Closed Pending	Closed Pending	3
Closed Pending	Open	6
Open	Closed Pending	4
Open	Closed	2
Open	Open	12
Other (i.e. sample frequency, production sites)	-	3
Total Management Cell Decisions		**36**

Phytoplankton monitoring 2007.
The objective of the Phytoplankton Monitoring Programme is to analyse marine water samples from aquaculture production areas, both shellfish and finfish, to gather information on the phytoplankton communities present in the water at the time of sampling. The total phytoplankton content in a sample is quantified and identified for the presence of toxic/harmful and nuisance phytoplankton species. Also the programme records any algal blooms that may affect species in aquaculture sites and the natural environment. The species of concern are shown in Table 5:2.

Table 5:2. Toxic/Harmful Phytoplankton Species (MI).

Phytoplankton species	Toxic/ Harmful effect
Dinophysis spp.	DSP Toxins producer
Prorocentrum lima	DSP Toxins producer
Lingulodinium poliedrum	Yessotoxins producer
Protoceratium reticulatum	Yessotoxins producer
Alexandrium minutum	PSP toxins producer
Alexandrium spp.	PSP toxins producer
Pseudonitzschia spp.	ASP toxins producer
Azadinium?	AZA toxins producer
Karenia mikimotoi	Harmful/nuisance/aerosols
Noctiluca scintillans	Harmful/nuisance
Phaeocystis spp.	Harmful/nuisance
Heterosigma akashiwo	Toxic
Chaetoceros spp. (Phaeoceros group)	Harmful/nuisance
Chrysocromulina spp.	Toxic
Prymnesium spp.	Harmful
Karlodinium spp.	Harmful

During 2007, a total of 1,300 samples were examined by the Marine Institute Phytoplankton Monitoring Programme. Of these samples, 84% came from shellfish aquaculture sites. The number of samples analysed was less than in previous years (e.g. 1,740 in 2006). One of the reasons for this decrease was that 2007 was a relatively quiet year in terms of toxicity. For example, in 2007 weekly sampling for phytoplankton was triggered at the beginning of April, compared with the year 2005 when weekly sampling started in February because of the toxicity events. Also, phytoplankton sampling in 2007 became more focused on sentinel sites, as their number had increased from 10 to 19 sites (Table 5:3). Sentinel sites are marine sites where total phytoplankton species count and identification are undertaken, while at toxic only sites, only the toxic/harmful species are identified and counted. So, in 2007 a higher number of sentinel sites samples were received in comparison with less samples coming from toxic sites. Another reason for the decline of samples in 2007 was a lower amount of research samples. In previous years, research samples would account for 200 or 300 samples of the total. In 2007, less than 100 samples were received. The lower number of research samples resulted from the ending of research projects like MATSIS and PHYTOTEST. Also, the phytoplankton monitoring unit began to move towards adopting molecular analytical techniques. As a result, time had to be allocated to learn and practice these new techniques for the future deployment as confirmatory tests on a number of toxic phytoplankton species such as *Pseudonitzschia spp., Alexandrium spp. and Dinophysis spp.* The Phytoplankton Unit also invested more efforts in culturing and toxin production studies during 2007.

Table 5:3. Phytoplankton Sentinel Sites in the year 2007 (MI).

• Carlingford Lough (new)
• Greencastle
• Millstone
• Eany
• Drumcliff Bay (new)
• Sealax
• Portlea
• Rosroe
• Inverin (new)
• Ballylongford (new)
• Cromane East (new)
• Ardgroom (new)
• Roancarraig
• Dunmanus Bay (new)
• Roaringwater Bay (new)
• North Channel
• Sherkin North (new)
• Waterford
• Wexford Harbour

The year 2007 was a quiet year in terms of toxic events. *Dinophysis spp.* (DSP toxin producers) were in the water at very low cell numbers. The highest cell concentration found was less than 1,000 cells per litre as compared to 10,000 cells per litre in 2005. This corresponds with low OA and DTX (DSP toxins) levels in the shellfish. The sample turnaround for phytoplankton samples by the Phytoplankton Unit was 80% next day analysis from sample receipt and 95% within two days of sample receipt.

***Pseudonitzschia spp.* (ASP toxin producers)** were found in similar cell concentrations and were as widespread as in previous years in the water throughout the year. However, no toxic episodes were observed in shellfish, with the exception of scallops.

PSP toxicity and *Alexandrium spp.* 2007 was the first year that a bloom of *Alexandrium spp.* had not been detected since monitoring commenced. So, no toxicity events due to PSP were observed in 2007, including Cork harbour, which previously had regularly become toxic during the summer for a couple of weeks.

AZP toxicity has become the most worrying toxic event in Ireland over the last three years. It has become a regular feature during the later part of the year (September and October) causing closures in the shellfish industry during the winter months. In the last two years we have seen AZA toxicity worryingly appearing also in the month of May. The AZA toxin producer was detected and cultured for the first time in September 2007 by AWI scientists. This species has not been named yet, but appears to be a new phytoplankton genus. This species has been provisionally named as *Azadinium*. But, this name will change as the taxonomy of the organism is ascertained. This discovery means that *Protoperidinium spp.*

for years thought to be the causative organism of toxicity has been demoted to a possible vector of the toxins. However, this has not been proven. Also, it is thought that other organisms could be vectors of toxic events (*Favella spp.* a ciliate was found to prey on the AZA organism), this is a new area and challenge for the Phytoplankton Monitoring Programme to rise to in the next few years.

Harmful algal events. The year 2007 followed a typical pattern of events, which saw a *Phaeocystis spp.* bloom in spring (April) followed by a *Coccolithophorids* bloom in June and a *Noctiluca scintillans* bloom in September. These are regarded as typical annual features of the Phytoplankton communities in Irish waters. Fortunately there was no *Karenia mikimotoi* bloom in 2007.

Phytoplankton monitoring results can be found in the web site hyperlink (http://www.marine.ie) and phytoplankton reports can be found by name, area or time interval.

Bacteriological Contamination.

Shellfish production areas are usually classified yearly by the Sea Fisheries Protection Authority (SFPA) based on the monitoring results of shellfish for bacterial contamination and in accordance with the terms of E.U Regulations 853 and 854 of 2004 (Table 5:4, Appendix II Box 3). However there was no review or change of classifications during the year 2007. The production areas sampled in the monitoring programme are principally oyster and mussel cultivation areas, but some clam, sea urchin, cockle and razor shell areas are also included. A diagrammatic summary of designations made in October 2006 (and not changed in 2007) is shown in Figure 5:5. Some production areas shown are sub-divided and may have more than one classification. Additionally, production areas can have different classifications for different species, meaning different levels of treatment may be required for different shellfish species originating from the same harvest area (Appendix IV).

Harvesting areas were not reclassified in 2007 as new procedures for classification were being developed for implementation in 2008. The classification of monitored sites (Appendix II, Box 3 and Appendix IV) can change and the summary for October 2006 includes a combination of upgrades and downgrades of some of the October 2005 classifications.

Table 5:4. Classification of Bivalve Mollusc Harvesting areas (SFPA).

Criteria for the classification of bivalve mollusc harvesting areas are under Regulation (EC) No. 854/2004 and by cross reference in the Council Regulation on microbiological criteria for foodstuffs (Regulation (EC) No. 2073/2005) and the 2005 and 2006 production areas classifications. There was no review of these classifications during the year 2007 (SFPA pers. com) Note: This table includes four areas with non-aquaculture species (Razor clams and Cockles) (SFPA).

Category	Microbiological Standard	Treatment Required	October 2005[1]	October 2006[2]
Total No. Production Areas			**57**	**57**
A*	<230 *E. coli* per 100g flesh and intra-valvular liquid.	May go direct for human consumption.	17	14
B	<4,600 *E. coli* per 100g flesh and intra-valvular liquid.	Must be depurated, heat treated or relayed to meet class A requirements.	31	32
C	<46,000 *E. coli* per 100g of flesh and intra-valvular liquid.	Relay for two months to meet class A or B requirements – may also be heat treated.	0	0
D	>46,000 *E. coli* per 100g of flesh and intra-valvular liquid.	Harvesting prohibited.	0	0
A & B	As per relevant category.	As per relevant category.	8	10
B & C	As per relevant category.	As per relevant category.	1	1

1. - Live Bivalve Molluscs (Production Areas) (No 2) Designation, 2005, made under EU Directive 91/492
2. - Live Bivalve Molluscs (Production Areas) Designation, 2006

*Shellfish going directly for consumption must also be free from *Salmonella* spp.

Figure 5:5. Microbiological Classification of Shellfish Production Areas October 2007 as per 2006 (SFPA).

There was no review of the classifications during the year 2007 (SFPA). In accordance with EU Regulations 853 and 854 of 2004. Source: Live Bivalve Molluscs (Production Areas) Designation, 2006. Please note this figure is only intended as a guide to classifications in Oct 2006 and that classifications change (Appendix III).

Virological Contamination.
Monitoring for bacteriological contamination of shellfish is well established and carried out on a regular basis. However, outbreaks of viral illness associated with shellfish consumption are also known to occur; e.g. gastroenteritis caused by noroviruses (NoVs) and infectious hepatitis caused by hepatitis A virus (HAV). The Marine Institute as the National Reference Laboratory introduced a virus testing facility in 2006. The Marine Institute may undertake virus testing either for surveillance purposes or in response to outbreak investigations at the request of the SFPA or the Food Safety Authority of Ireland (Appendix II Box 4).

During 2007, samples of shellfish (mussels, gigas oysters and native oysters) from 27 locations were analysed for metals. The results for 2007 are presented in summary format in Table 5:5 and compared with guidance and standard values for the various contaminants. The principal points are as follows:

- Water quality parameters measured during sampling of the shellfish growing areas in 2007 generally conformed to the guidelines of Council Directive 2006/113/EC with respect to pH, temperature, salinity and dissolved oxygen. However, the Directive does not require 100% compliance for these parameters and breaches of the guidelines are not considered serious unless the conditions persist over an extended period.
- All shellfish samples tested for mercury were well within the respective maximum limits of 0.5 mg kg^{-1} wet weight, as set by the European Commission to protect consumers.
- The highest concentration of cadmium was detected in mussels (*M. edulis*) sampled in Tralee Bay, Fenit (1.08 mg/kg^{-1}) and this is consistent with previous years showing higher cadmium concentrations in this area. Taking into account the uncertainty of measurement all shellfish samples tested for cadmium were within the limit of 1.0 mg/kg^{-1} wet weight, as set by the European Commission. Elevated levels of cadmium were found in oysters (*O. edulis*) from Tralee Bay with one sample (*O. edulis* sampled in Tralee Bay, Castlegregory - 0.84 mg/kg^{-1}). This is consistent with previous results for *O. edulis* from this area.
- No specific growing area stands out as having notably elevated levels of zinc, silver, chromium or nickel in comparison with other areas.

Table 5:5. Results of Monitoring of Shellfish-growing areas in 2007 and Standard Values for Contaminants (MI).

Contaminant	Species (No. Samples)	Range for 2007 (mg/kg^{-1} wet wt)	No. Samples <LOQ	Standard Value ($mg\ kg^{-1}$ wet wt)	Qualifier	Country
Cadmium	*O. edulis* (4)	0.43 – 0.84	0	1.0	Max. Limit	EC[1]
	C. gigas (9)	0.16 – 0.52	0	1.0	Max. Limit	
	M. edulis (23)	0.07 – 1.08	0	1.0	Max. Limit	
Mercury	*O. edulis* (4)	<0.02 – 0.03	1	0.5	Max. Limit	EC[1]
	C. gigas (9)	nd – 0.03	4	0.5	Max. Limit	
	M. edulis (23)	<0.02 – 0.05	12	0.5	Max. Limit	
Copper	*O. edulis* (4)	4.30 – 20.3	0	-	-	-
	C. gigas (9)	3.43 – 45.6	0	60	Standard	Spain
	M. edulis (23)	1.00 – 2.46	0	20	Standard	Spain
Zinc	*O. edulis* (4)	289 – 513	0	-	-	
	C. gigas (9)	92.0 – 340	0	-	-	
	M. edulis (23)	9.84 – 24.2	0	-	-	
Chromium	*O. edulis* (4)	0.10 – 0.20	0	-	-	
	C. gigas (9)	0.06 – 0.15	0	-	-	
	M. edulis (23)	0.07 – 0.68	0	-	-	
Silver	*O. edulis* (4)	1.37 – 2.37	0	-	-	
	C. gigas (9)	0.19 – 2.78	0	-	-	
	M. edulis (23)	<0.013 – 0.06	9	-	-	
Nickel	*O. edulis* (4)	<0.13	4	-	-	
	C. gigas (9)	<0.13 – 0.17	8	-	-	
	M. edulis (23)	<0.13 – 1.01	5	-	-	

Notes: [1.] European Commission Regulation (EC) No. 1881/2006/EC repealing European Commission Regulation (EC) No. 466/2001/EC and subsequent amendments – setting maximum levels for mercury, cadmium and lead.
For values reported as "nd" Substances were not detected above the Limit of Detection (LOD).
For values reported as "< value", value = Limit of Quantification (LOQ) for the relevant determinand.
Lead results were not available at the time of going to press.

Concentrations of metals in bivalve molluscs provide a very good indicator of water quality compared to individual spot water samples. The results for 2007 are consistent with those from previous years and are evidence of the continued clean, unpolluted nature of Irish shellfish and shellfish producing waters.

Shellfish Waters
In accordance with the monitoring requirements of Council Directive 2006/113/EEC, seawater samples were collected from the 14 Irish shellfish waters, designated under SI 268 of 2006, twice during 2007 (summer and winter). Samples were collected by BIM officers, and analysed for trace metals (dissolved) and organohalogens (total) by the Environment Agency National Laboratory Service, UK. Analyses were co-ordinated by the Marine Institute (Table 5:6).

Table 5:6. Contaminants in Seawater - Summary Results for Samples Collected from Shellfish Growing Waters during 2007 (MI).

	No. of Samples	Range (µg/l^{-1})	Median (µg/l^{-1})	No. <LOD
Mercury	27	All < 0.01	<0.01	27
Silver	29	All <1.00	<1.00	29
Cadmium	29	<0.04 - 0.68	0.11	21
Chromium	29	<0.50 – 5.19	1.23	26
Copper	29	0.23 – 6.85	1.52	0
Lead	29	<0.04 – 45.2*	1.64	1
Nickel	29	0.33 – 72.4*	2.26	0
Zinc	29	0.45 – 278*	12.8	0
Arsenic	29	<1.00 – 1.78	1.17	7

No organochlorine results were detected above the minimum reporting value (LOQ). All results were <0.01 µg/l^{-1}. The metal concentrations varied widely for some elements, e.g. zinc and lead (Table 5:6).

* One sample, taken in Mulroy Bay in winter 2008, exceeded the Imperative Values of the SI 268 standard for lead, nickel and zinc. Results of follow-up re-sampling fell below the Imperative values for all three metals.

Shellfish Health Status

The Marine Institute's Fish Health Unit (FHU) is responsible for monitoring the health status of shellfish stocks within the country in compliance with Council Directive 91/67/EEC and associated legislation (Appendix II Box 6). The main diseases of interest under this legislation are Bonamiosis and Marteiliosis – both of which occur in the native (flat) oyster *Ostrea edulis*. The diseases are caused by the protistan parasites *Bonamia ostreae* and *Marteilia refringens*. Under the current legislation, a minimum of thirty *O. edulis* are sampled twice annually from each growing area. In the spring time they are screened for the presence of the parasite *Bonamia ostreae* only whilst in the autumn they are screened for the presence of both *Marteilia refringens* and *B. ostreae*. In 2007, 1,256 *Ostrea edulis* were examined for Marteiliosis and / or Bonamiosis.

The entire coastline of Ireland is considered to be free of the parasite *Marteilia refringens*. However, *Bonamia ostreae* is now endemic in eight bays. These are Cork Harbour, Inner Galway Bay, Clew Bay, Ballinakill, Achill Sound, Blacksod Bay, Lough Foyle and Lough Swilly. The remainder of the coast is designated free of the disease. Movements of shellfish susceptible to these diseases are not permitted from infected or "non-approved" zones to free or "approved zones".

Bonamia ostreae was first detected in Cork harbour in 1987 and has since been detected in the other sites listed above. Most recently the disease emerged in Lough Swilly in late 2006. As a result of this finding an epizootic investigation was initiated to identify the source of infection and to determine whether the disease had been transferred to another site prior to its detection in Lough Swilly. The investigation which was completed in 2007, revealed a number of possible routes through which the disease may have entered the Lough including the movements of shellfish from other infected areas, movements of boats and discharges of potentially infected waters into Lough Swilly.

In addition to the monitoring for Bonamiosis and Marteiliosis the FHU also receives samples of shellfish for diagnostic purposes. This may be in the event of abnormal mortalities or on suspicion of the presence of a disease or disease agent. In 2007 the FHU examined 319 molluscs and crustaceans following reports of abnormal mortalities.

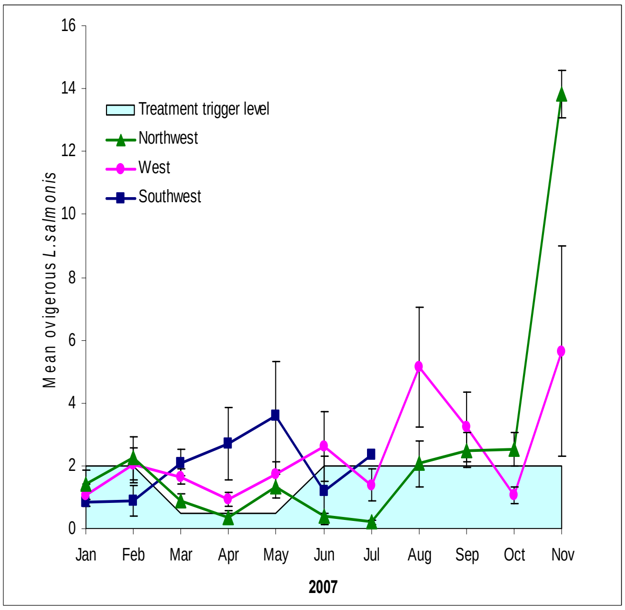
The FHU provides advice to DAFF (formerly DCMNR) in relation to movements of shellfish within the country and for import. The FHU provided advice on 52 applications received in 2007. Also on advice from the FHU documents were issued to cover the export of 4 consignments of shellfish.

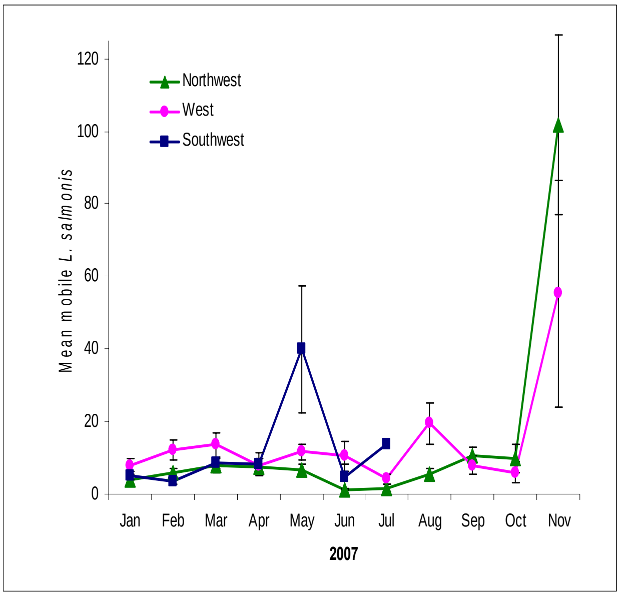
6. AQUACULTURE MONITORING – FINFISH

Sea Lice Monitoring 2007

Sea lice *Lepeophtheirus salmonis* monthly mean figures for one-sea-winter salmon are shown in Figures 6:1a and 6:1b for each of the three regions (north west, west and south west). Regional monthly mean *L. salmonis* levels were in excess of treatment trigger levels (TTL) (Appendix II Box 7) in all three regions for all three spring months (February, March & April) in 2007 with the exception of the north west in April (Figure 6:1). The south west exceeded treatment trigger levels again in July prior to harvest. In the west monthly mean ovigerous levels were in excess of treatment trigger levels outside of the spring period in February, June, August, September and November. In the north west monthly mean ovigerous levels exceeded the treatment trigger levels in February and again from August to November inclusive outside of the spring period.

Figure 6:1a (left). Mean (SE) Ovigerous *L. salmonis* per Month per Region in 2007 and Figure 6:1b (right). Mean (SE) mobile *L. salmonis* per Month per Region in 2007 (MI).

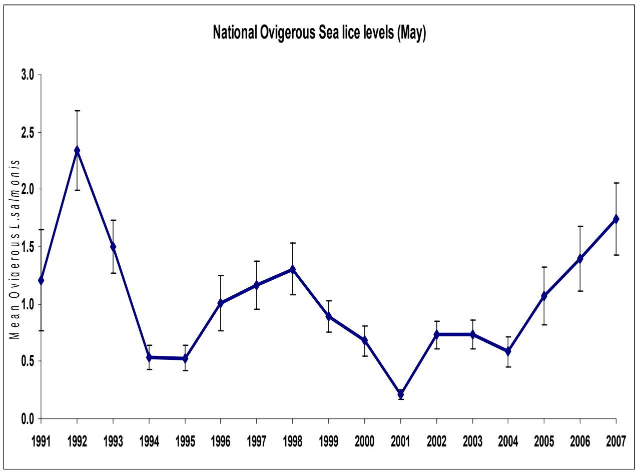


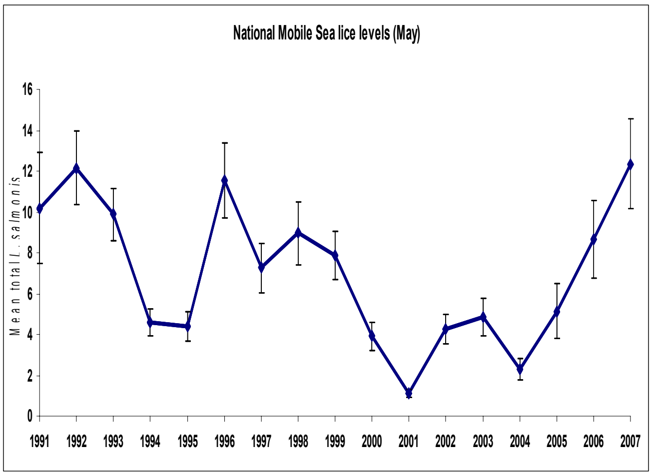


Total mobile sea lice levels exceeded 10 sea lice per fish in February, March, May, June, August and November in the west region. In the north west total mobile levels exceeded 10 per fish in September and November and in the south west in May and July.

L. salmonis ovigerous and mobile level trends are compared in Figures 6:2a and 6:2b for one-sea-winter salmon in the month of May from 1991 to 2007. The mean number of ovigerous sea lice per fish and the mean number of mobile sea lice per fish are presented.

Figure 6:2a (left). Annual Trend (May mean) (SE) Ovigerous *L. salmonis* on One-sea-winter Salmon. Figure 6:2b (right). Annual Trend (May mean) (SE) Mobile *L. salmonis* on One-sea-winter Salmon (MI).





Sea lice levels were at their lowest levels on record in 2001 for both ovigerous and total mobile lice. Mean ovigerous *L. salmonis* levels have increased steadily since 2004. Levels in 2007 were at 1.74 ovigerous per fish, the highest since 1992 which reached 2.34 ovigerous per fish. Mean mobile levels show a similar pattern with the lowest levels recorded in 2001. There has been an increase in mobile sea lice levels from 2004 to 2007, which are the highest on record at 12.35 mobile sea lice per fish. *C. elongatus* levels remained low throughout the year on 2007 smolts.

In 2007, of the 355 sea lice inspections (Table 6:1) carried out on salmonids, 72% of Atlantic salmon samples and 96.3% of rainbow trout samples were below the treatment trigger levels outlined in the Departments protocols (Appendix II Box 7). In the smolt stock, 97% of inspections did not exceed the treatment trigger levels, 51.9% of inspections on one-sea-winter salmon were below the treatment trigger levels and 44.4% of inspections on two-sea-winter salmon were below treatment trigger levels.

Table 6:1. National Breakdown of Inspections for All Fish Farm Sites in 2007 (MI).
(Please note that the three samples shown as 'Salmon 2008' were inspections undertaken in November of 2007 on 2008 S1/2 salmon. These fish were inputted to sites around October of 2007.)

	Rainbow Trout 2006	Rainbow Trout 2007	Salmon 2005	Salmon 2006	Salmon 2007	Salmon 2008	Total All	Totals Trout only	Totals Salmon only
No. of inspection in spring	14	12	5	84	49	0	164	26	138
No. over TTL in spring	0	0	3	50	0	0	53	0	53
No. of inspections outside spring	11	17	4	72	84	3	191	28	163
No. over TTL outside spring	1	1	2	25	4	0	33	2	31
Total no. of Inspections	25	29	9	156	133	3	355	54	301
Total no. over TTL	1	1	5	75	4	0	86	2	84

On one-sea-winter salmon sea lice levels exceeded treatment trigger levels for 70% of inspections in the south west, for 52.1% of inspections in the west and for 36.5% of inspections in the north west. During the spring period 100%, 66.7% and 37% of inspections exceeded the treatment trigger in the south west, west and north west respectively (Table 6:2). The monthly trend of sea lice levels on one-sea-winter salmon show that in the south west, sea lice levels were in excess of treatment trigger levels for the whole spring period. Despite high mobile levels in May, control was achieved in June and levels rose again in July prior to harvest. Mean sea lice levels in the west region on one-sea-winter salmon were elevated for the spring period, and again in June, August, September and November. In the north west, sea lice levels were elevated twice in spring, with control being achieved over the summer months. Levels steadily increased from July to October, with a large increase observed in the November inspection.

Table 6:2. National and Regional Breakdown of Inspections for All 2006 Fish (one-sea-winter) at Farm Sites in 2007(MI).

Region	Samples in Spring	Over TTL in Spring	Samples outside Spring	Over TTL outside Spring	Total Samples	Total Over TTL
South west (total)	6	6	4	1	10	7
West (total)	51	34	43	15	94	49
North west (total)	27	10	25	9	52	19
National (total)	84	50	72	25	156	75

In 2007, regional mean sea lice levels on one-sea-winter salmon, for all regions, were in excess of treatment trigger levels for the entire spring period, barring the north west in April. Levels held steady for most of the year but reached regional peaks of 101.86 total mobile *L. salmonis* per fish in November in the north west and 55.24 total mobile *L. salmonis* per fish in the west.

Of the nine inspections carried out on two-sea-winter fish, between December and January 2007 and the last inspection in May, prior to completion of harvest, the maximum regional level reached was an average of 87.16 mobile sea lice per fish in the west and 35.86 mobile sea lice per fish in the north west, compared to 12.74 mobile sea lice per fish and 62.04 mobile sea lice per fish respectively in 2006.

Out of a total of 355 inspections in 2007 (Table 6:1) of all stocks, sea lice numbers greater than a mean of 10 *L. salmonis* per fish were recorded on 69 inspections in 2007 compared with 55 out of 317 inspections in 2006. Means greater than 20 *L. salmonis* per fish were recorded on 29 of these inspections, an increase from 26 in 2006 (O'Donohoe *et al*., 2006). Sea lice are known to cause damage to fish at these levels (Wooten *et al*., 1982). The maximum level recorded for an individual site was 142.5 mobile *L. salmonis* per fish in 2007, compared to 85.93 in 2006.

Comparing the May mean annual trend *L. salmonis* graphs of one-sea-winter fish it shows that there was an increase in both the May mean ovigerous levels and May mean mobile levels nationally. The mean ovigerous level is the highest since 1992 and the mobile is the highest since inspections began.

Complicating factors in controlling sea lice in 2007 were: disease; plankton blooms and ineffective treatments. Pancreas Disease (PD) was present on many sites in 2007; this causes difficulties when treating fish for sea lice. The reduced appetite renders in-feed treatments unsuitable and poor health adds complications to bath treatments. Plankton blooms damage fish and fish-gills and this renders bath treatments more difficult to carry out as the health of the fish is already compromised.

A variety of treatments were used throughout the country in 2007 with varying results. There were cases where treatment effort did not achieve full clearance of the sea lice and multiple treatments were required. Combinations of two treatments proved effective at some sites. Achieving near zero sea lice proved very difficult on occasions and this led to population recovery being more rapid and hence, the need for more frequent treatments. It is suspected that there may be reduced sensitivity in some sea lice populations to certain chemotherapeutants.

The industry has trialed other novel approaches to combat sea lice by incorporating alternative treatments, such as Bioemitters® and Bio-mos®, with varying results.

Warmer sea temperatures have been a complicating factor in the management of sea lice. Increases in water temperatures leads to an acceleration in the life cycle of the sea louse and also an increase in reproductive output (Hogans and Trudeau, 1989). In the last number of years mean monthly sea temperatures have been steadily climbing with the average sea temperature in 2006 being 1.38°C higher than the 30 year mean (worked from source data from Met Éireann - www.met.ie).

Benthic Monitoring

In the year 2000, following consultation with the industry and a number of statutory bodies protocols detailing monitoring requirements at finfish farm sites were published by the (then) Department of Communications Marine and Natural Resources. In 2001, a revised Benthic Protocol was produced and adherence to the protocols are now included as a condition in all new marine finfish aquaculture licences (Appendix II Box 8).

In an effort to accurately determine the number of sites for which monitoring surveys should have been carried out and reports submitted annually, the Marine Institute relies on two information sources:

1) Direct communication from operators responding to the Department and,
2) Direct communication by the Marine Institute with operators allied with a review of other monitoring programmes (e.g. residues and sea lice programs).

As a consequence, the number of sites for which surveys were eligible was down on 2006 at 33 (Table 6:3). Nationally, the level of reporting compliance with the protocol was 32 sites out of 33 eligible sites i.e. 97% (Table 6:3). Since the introduction of the Benthic Protocol (Appendix II Box 8) environmental compliance has been very good with few breaches of environmental standards observed.

Table 6:3. Summary of Compliance with Reporting Requirements and Environmental Standards 2001 to 2007 (MI).

Year	Number of Sites (subject to protocols)	Reporting Compliance	Surveyed Sites % Compliance with Environmental Standards
2001	**27**	**65%** (17/27)	**94%**
2002	**55**	**62%** (34/55)	**94%**
2003	**54**	**54%** (29/54)	**100%**
2004	**50**	**50%** (25/50)	**100%**
2005	**48**	**60%** (29/48)	**100%**
2006	**36**	**80.5%** (29/36)	**100%**
2007	**33**	**97% (32/33)**	**100%**

All of the sites (100%) for which reports were submitted during 2007 had conditions that were within agreed environmental standards and thus deemed acceptable as per the protocols (Table 6:3). Nevertheless, it must be pointed out that while all sites were deemed compliant overall, individual reports (n=2) did highlight problems mostly related to uneaten feed reaching the seafloor and heavy coverage of bacterial mats. Better management of feed input or modification (reduction) of stocking densities can help to alleviate this issue. A reduction in the amount of feed wastage would be of economic benefit to the farm operators and would minimise any environmental impact.

It is encouraging to note the increase in reporting compliance (to 97%) over the last 4 years. This high rate of compliance allied with the acceptable environmental conditions observed at the sites gives a more comprehensive picture of the impacts of this activity on a national scale and highlights, to a certain degree, the environmental sustainability of this activity.

As with previous years there are a number of recommendations which may increase the efficiency of the reporting and ensure as close to full environmental compliance as possible. Of critical importance is good and timely communication between the regulatory authorities and the operators to ensure that environmental and reporting compliance continues to remain high.

Recommendations:

1. Sites that are adjacent and in close proximity to one another can be covered by one survey. However, this must be indicated in the report or in communications to DAFF and the MI.
2. Survey reports should continue to include all details outlined in Box 8 (Appendix II).
3. Operators should review the surveys themselves in order to instigate suitable management actions so as to minimise impacts on the seafloor, e.g. reduce food input.
4. Sites that are subject to monitoring protocols that have fish located there during the year or part of the year should be required to have a survey carried out each year. A site that is vacant for the entire year should not have a survey requirement. The operator should be requested to communicate to the DAFF and MI as to the status of each site subject to monitoring protocols each year.

Residues Monitoring in Finfish

In the aquaculture sector, the Sea Fisheries Protection Authority (SFPA) with support from the Marine Institute (MI) is responsible for residue controls on farmed finfish for the national residue-monitoring plan (Appendix II Box 9). Where the MI is the Competent Authority for residue sampling and analysis and the SFPA is the Competent Authority for verification of compliance with animal remedy Regulations on fish farms.

The objectives of the residues programme are to:

- ensure that Irish farmed finfish are fit for human consumption and do not contain unauthorised substances or substances exceeding their Maximum Residue Limit (MRL)[1]
- provide a body of data to ensure that Irish farmed finfish is of a high quality -this is particularly important for supporting the marketing of finfish
- promote good practice in aquaculture

During 2007, target samples were collected on 33 sampling events (salmon were collected on 28 occasions, sea reared trout twice and freshwater trout three times) from fish farms and packing plants for residues testing in accordance with the NRCP. Generally, five fish were taken from each producer. In total 162 target (surveillance) samples were collected from fish farms and packing plants in accordance with the NRCP for 2007 as follows:

- 103 target samples taken at harvest which comprised 86 farmed salmon and 10 sea reared trout and 7 fresh water trout
- 59 target samples were also taken at other stages of production; 51 salmon smolts and 8 freshwater trout, from thirteen farms for Group A and malachite green analysis

There were no suspect samples taken in 2007.

The main findings of the 2007 residues target-monitoring programme were:

i. A total of 148 screening tests were carried out for Group A substances; no non-compliant (i.e. no positive) results were obtained for banned (Group A) compounds.

ii. Of the 103 samples screened for '*Antibiotic Residues*' (Group B1), no non-compliant (i.e. no positive) results were obtained.

iii. Group B2 contains treatments that are classed as '*Other Veterinary Drugs'* - generally authorised or unauthorised sea lice treatments. During the 2007 residue surveillance-monitoring programme, a number of samples were found to have concentrations of authorised treatments below the MRL. These results are reported as compliant (i.e. not positive) but care should be taken to observe withdrawal periods to ensure that no residues of treatments remain when harvesting.

[1] Authorised compounds have Maximum Residue Limits (MRL) prescribed by the EU. This is the maximum concentration allowable in the edible portion of the animal at the time of harvest. Generally, MRLs will not be exceeded if withdrawal periods are adhered to; *i.e.* the animal is not slaughtered for a set period of time after treatment. Unauthorised substances have no MRL and should not be detected. A "residue" is defined as "a residue of substances having a pharmacological action, of their metabolites and of other substances transmitted to animal products and likely to be harmful to human health". This includes banned and authorised substances such as steroids, therapeutic treatments and environmental contaminants.

iv. "*Other Substances and Environmental Contaminants*" (Group B3) includes dyes (malachite green and its metabolite, leuco malachite green), metals, PCB's and chlorinated pesticides. All target samples tested for malachite green and its metabolite, leuco malachite green was found to be compliant (i.e. not positive). For the remaining substances in this group, all samples were compliant with the relevant EC Regulations for metals and guidance levels for PCBs and chlorinated pesticides as set by a number of OSPAR member states - and were consequently reported as negative.

Similar to 2006, no non-compliant (i.e. positive) results were detected in the national monitoring programme for farmed finfish in 2007. This welcome outcome continues the downward trend (Figure 6:3) of very low levels of residues in farmed finfish in recent years (0.48% in 2003, 0.23% in 2004, 0.09% in 2005 and 0% in 2006). A summary table of the residue results since 2003 to 2007 and a summary of the results for 2007 residues monitoring are outlined in Table 6:4 and 6:5 respectively.

Figure 6:3. Percentage Non-compliant Residue Results for Farmed Finfish 2003-2007 (MI).

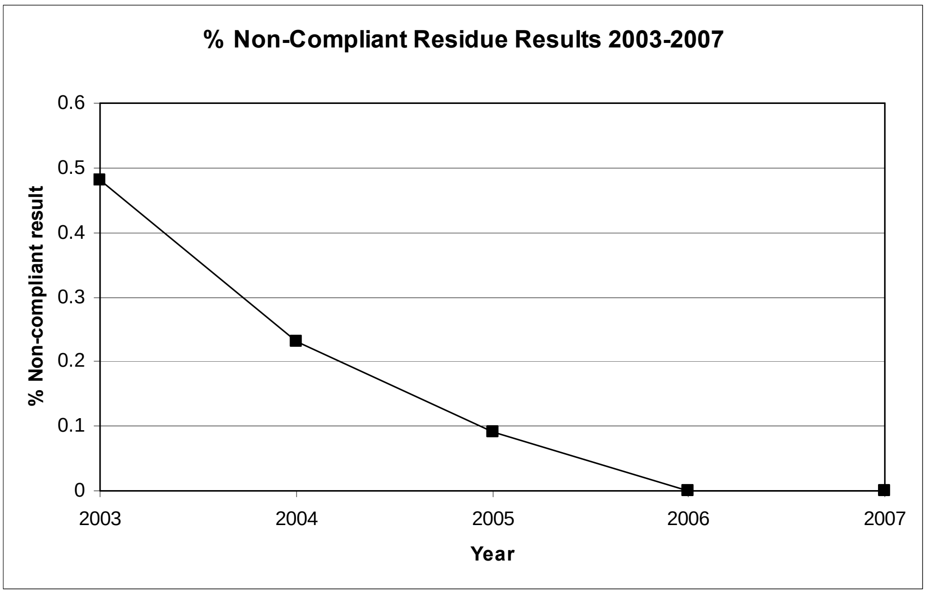


Table 6:4 Summary Results for Residue Program 2003 to 2007 (MI).

	2003	2004	2005	2006	2007
No. Target samples[1]	180 (168, 12)	183 (124, 59)	164 (105, 59)	162 (104, 58)	162 (103, 59)
Total Group A[2]	80/0	145/0	163/0	162/0	148/0
Total Group B[2]	163/13	130/5	105/2	104/0	103/0
Total No. of Results[3]	2733/13	2214/5	2251/2	2207/0	2219/0
% non -compliant results	**0.48**	**0.23**	**0.09**	**0**	**0**

[1]Target samples (sampled at harvest, sampled at other stages of production)
[2] No. of samples tested/No. of samples non-compliant
[3] Total no. of results as samples taken for Group A and Group B substances are tested for multiple residue categories within each group

Table 6:5. Summary of 2007 Residue Monitoring Results for Target Samples (MI).

RESIDUE	GROUP	NUMBER EXAMINED	COMPLIANT	NON-COMPLIANT	Source of Maximum Level to assess compliance #
Group A – Banned Substances					
Corticosteroids	A3	53	53	0	(v)
Methyltestosterone	A3	47	47	0	(v)
Betaestradiol	A3	48	48	0	(v)
Chloramphenicol	A6	54	54	0	(v)
Nitrofurans	A6	46	46	0	(v)
Group B – Authorised and Unauthorised Substances					
B1 - Antibacterial substances					
Antibacterial Screening:					
Tetracyclines	B1	103	103	0	(i)
Nitrofurans	B1	103	103	0	(i)
Quinolones	B1	103	103	0	(i)
Sulphonamides	B1	103	103	0	(i)
B2 - Other Veterinary Drugs					
Emamectin B1a	B2a	103	103	0	(i)
Ivermectin	B2a	103	103	0	(ii)
Cypermethrin	B2c	103	103	0	(i)
Deltamethrin	B2c	103	103	0	(i)
Teflubenzuron	B2f	103	103	0	(i)
Diflubenzuron	B2f	103	103	0	(i)
B3 - Other Substances & Environmental Contaminants					
ICES 7	B3a	21	21	0	(iii)
CB Congener 28	B3a	21	21	0	-
CB Congener 52	B3a	21	21	0	-
CB Congener 101	B3a	21	21	0	-
CB Congener 118	B3a	21	21	0	-
CB Congener 138	B3a	21	21	0	-
CB Congener 153	B3a	21	21	0	-
CB Congener 180	B3a	21	21	0	-
α-HCH	B3a	21	21	0	n.a.
b-HCH	B3a	21	21	0	n.a.
γ-HCH	B3a	21	21	0	(iii)
δ-HCH	B3a	21	21	0	n.a.
DDT-o,p'	B3a	21	21	0	n.a.
DDT-p,p'	B3a	21	21	0	n.a.
DDD-o,p'	B3a	21	21	0	n.a.
DDD-p,p'	B3a	21	21	0	n.a.
DDE-o,p'	B3a	21	21	0	n.a.
DDE-p,p'	B3a	21	21	0	n.a.
Hexachlorobenzene	B3a	21	21	0	n.a.
Aldrin	B3a	21	21	0	n.a.
Dieldrin	B3a	21	21	0	n.a.
Endrin	B3a	21	21	0	n.a.
Isodrin	B3a	21	21	0	n.a.
cis-Chlordane	B3a	21	21	0	(iii)
trans-Chlordane	B3a	21	21	0	(iii)
oxy- Chlordane	B3a	21	21	0	(iii)
trans-Nonachlordane	B3a	21	21	0	n.a.
ICES 7	B3a	21	21	0	n.a.
Lead	B3c	21	21	0	(iv)
Cadmium	B3c	21	21	0	(iv)
Mercury	B3c	21	21	0	(iv)
Aflatoxins	B3d	7	7	0	n.a.
Malachite Green	B3e	85	85	0	(ii)
Leuco Malachite Green	B3e	85	85	0	(ii)

i) Maximum Residue Limit set according to Council Regulation (EEC) No 2377/90; ii) These compounds are not authorised for use in finfish, and should not be detected.; iii) Strictest standards applied by OSPAR contracting countries. (OSPAR: A compilation of standards and guidance values for contaminants in fish, crustaceans and molluscs for the assessment of possible hazards to human health, Update 1992, JMP 17/3/10-E); iv) Commission Regulation (EC) No 466/2001 as amended by Regulation (EC) 221/2002; (v) Substances banned by Council Regulation (EEC) No 2377/90 (Annex IV) and should not be detected; (vi) n.a.- not available.

Finfish Health Status

The disease classification outlined in EU Directive 91/67/EEC forms the basis for trade in live fish within the EU. According to this framework, Ireland has obtained the highest classification possible for finfish and can trade freely with any country within the European Community and beyond. The Fish Health Unit (FHU) of the Marine Institute supports the aquaculture industry and the inland fisheries sector in maintaining Ireland's superior fish health status. It provides statutory services in line with EU Directives and diagnostic support.

It is on the basis of maintaining Ireland's Approved Zone Status (the highest health status achievable under the current regime) for Viral Haemorrhagic Septicaemia (VHS) and Infectious Haematopoetic Necrosis (IHN) that most of the statutory testing is carried out. In 2004, Ireland also obtained 'Additional Guarantees' in relation to the List III diseases *Gyrodactylus salaris*, Bacterial Kidney Disease (BKD) and Spring Viraemia of Carp (SVC) allowing the Competent Authority to insist on certification showing freedom from these pathogens prior to importation.

The work programme in relation to finfish diseases consists of three strands:

i. All marine and freshwater finfish sites in the country are inspected at least once per year. Farms holding broodstock are inspected twice per year. A farm visit consists of a full inspection of all ponds/cages and full post-mortem (including bacteriological, virological and histological analyses) of at least 30 fish.
ii. Under the terms of each Aquaculture Licence, any farm experiencing 'abnormal' mortality must report it to DAFF/ Marine Institute. All such mortalities are investigated by the Marine Institute, generally in conjunction with the farm veterinarian, and findings are reported back to DAFF.
iii. In order to prevent the spread of disease through the movement of fish between sites (e.g. smolt transfer to sea), a movement permit is required. When an application is made to DAFF for a movement permit, the health status of the fish is ascertained either by site inspection by the Marine Institute or via the submission of a recent veterinary report by the farmer's practitioner. Only clinically healthy fish may be moved between sites.

The following are the main points relating to the finfish health monitoring programme during 2007:

i. All marine and freshwater finfish sites were inspected and sampled as outlined in Council Directive 91/67/EEC. A total of 1,478 finfish were tested for the presence of diseases listed in Annex A of the Directive. Ireland continues to remain free of ISA (Infectious Salmon Anaemia), VHS, IHN, BKD, SVC and *G. salaris*.
ii. On the diagnostic side, FHU staff examined 452 finfish during 2007, generally as a result of mortality events in aquaculture facilities. *Yersinia ruckerii* was isolated from two freshwater sites and *Pseudomonads* and various motile *Aeromonads* were isolated from both farmed and wild freshwater fish. Perch Fry Rhabdovirus was isolated from a single perch farm. The IPN virus was isolated from a total of 11 marine salmon sites in 2007, however clinical disease was only observed on 1 site, with low mortalities. The virus was not isolated from any freshwater facilities in 2007.

iii. The FHU carried out extensive testing and pre-movement clinical checks to facilitate the export of live fish and shellfish to other EU member states and to third countries such as Chile. In total, 40 Movement Documents were issued for finfish movements within the EU and an estimated 10.75 million salmon ova and 1.3 million live salmonids were exported for on-growing or re-stocking, mainly in the United Kingdom, but also in France. An additional 15 Sanitary Certificates were issued for the export of salmon ova to Chile. In total, approximately 20.9 million ova were exported to Chile in 2007.

Research into Pancreas Disease.

Research into pancreas disease has continued, both at an international level through the Tri-nation Consortium and at a national level through the NDP Marine RTDI Strategic Programme. The Tri-nation Consortium on pancreas disease and related pathologies (established in 2005) is a group of third level institutes, government agencies and industry members from Ireland, Scotland and Norway. In 2007, two seminars were held in Aberdeen and Bergen with presentations given on the current status of pancreas disease in each country, research and industry presentations regarding vaccine development and the formulation of specific diets. Copies of presentations can be found on the Marine Institute website.

At a national level, the NDP funded project "Site investigations and disease management of the PD virus", continued in 2007. The projects objective is to increase knowledge on the epidemiology of PD, diagnostic capabilities and management strategies. The latest research findings from the project were presented at the 13th International Conference of the European Association of Fish Pathologists in Grado, Italy. This project will finish in 2008 and a report will be published as part of the Marine Environment and Health Series.

Infectious Pancreatic Necrosis

In 2006, 5 salmon hatcheries and 1 marine site suffered mortalities due to the viral disease IPN. The industry, in close collaboration with state agencies, worked to control the disease with the result that the virus was not isolated in freshwater facilities in 2007. One clinical case was recorded on a marine site, although the losses were not significant. A report on the disease and its impact on the aquaculture and wild fish sectors was published called the 'Marine Environment and Health Series No. 30'. In conjunction with the Fisheries Research Services, Aberdeen, work on the modelling of the spread of the virus in Ireland was presented at the 13th International Conference of the European Association of Fish Pathologists in Grado, Italy.

7. AQUACULTURE DEVELOPMENT AND QUALITY

Commercial Developments 2007

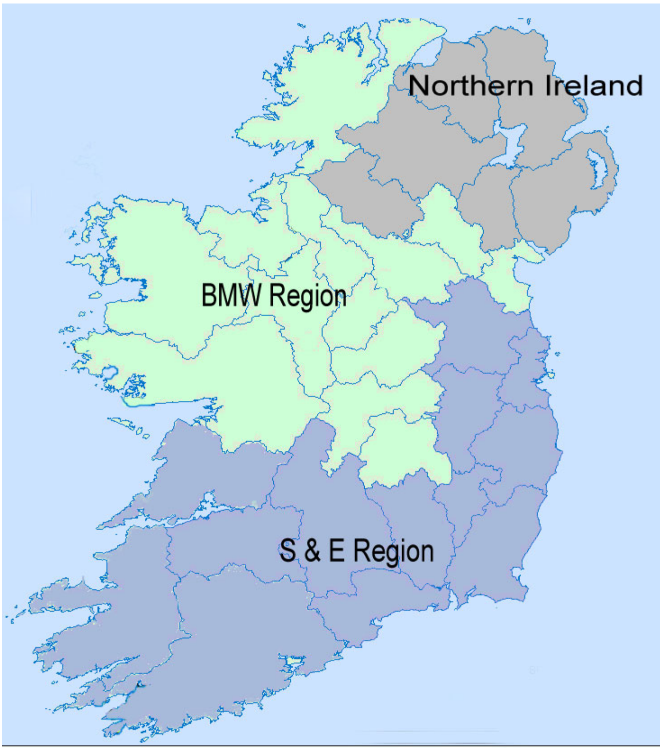
Overall grant allocation framework and investment in aquaculture during 2007.
During the year 2007, the total investment in aquaculture projects supported by BIM under the National Development Plan (NDP) EU co-funded Measures and BIM's non EU co-funded Pilot and Resource Development Grant Schemes was €13.062 million compared with €13.352 million during 2006.

The Aquaculture Development Measures of the two Regional Operational Programmes of the NDP 2000-2006, which are co-funded by the European Union, have provided the overall framework for the commercial development of aquaculture and these programmes will finish in 2008.

NDP Approvals.
The Aquaculture Development Measures of the National Development Plan 2000 to 2006 have been the main instruments of policy in promoting investment in aquaculture. The last public call for applications under the Aquaculture Development Measures of the two Regional Operational Programmes was in January 2006 and decisions on these applications were taken in July 2006, when the available funding in the Programme was fully committed. Thirty eight BIM sponsored aquaculture projects, with an aggregate eligible investment cost of €19.291 million, were approved for combined FIFG (Financial Instrument for Fisheries Guidance) and Exchequer grant assistance of €8.908 million in 2006, the private sector contributing the balance of funding of €10.38 million. Work on the implementation of these projects was on-going during 2007.

In order to ensure full take up of available FIFG funding, BIM operated an open call for qualifying applications in respect of funds decommitted from Údarás na Gaeltachta and BIM and projects previously approved. Seven BIM sponsored projects were approved for combined FIFG and Exchequer grants of €0.93 million on investment costs of €2.282 million.

Figure 7:1. Border Midland and Western region (BMW) and the South and Eastern Region (SE).



Of the thirty eight original aquaculture projects sponsored by BIM, twenty one projects with an investment of €8.68 million, were located in the Border, Midlands and Western Region (BMW) and seventeen projects, with an outlay of €10.609 million, were located in the Southern and Eastern Region (S & E) (Table 7:1).

Table 7:1 shows the total FIFG (Financial Instrument for Fisheries Guidance) and Exchequer grant approvals for these projects by species. Five of the projects supported by BIM were assisted under the Technical and Economic Support Programme for Aquaculture (TESP) to improve the environmental impact and competitiveness of salmonid farming.

Table 7:1. NDP Grant Approvals (€) during 2006 for BIM Sponsored Projects in the BMW and S&E regions by species cultured (BIM).

Species	Southern & Eastern Region		Border, Midlands and Western Region		
	Approved FIFG Grant	Approved Exchequer Grant	Approved FIFG Grant	Approved Exchequer Grant	Total Public Grant Aid Approved
	€	€	€	€	€
Oysters	620,198	222,968	469,247	67,308	1,379,721
Rope Mussels	1,023,301	464,381	72,876	10,411	1,570,969
Bottom Mussels	0	0	139,664	19,952	159,616
Salmon	0	0	1,013,899	501,100	1,514,999
Scallops	0	0	167,219	23,889	191,108
Abalone	1,096,627	313,322	0	0	1,409,949
Sea Water Trout	64,750	55,500	131,579	99,957	351,786
Freshwater trout	261,849	37,407	0	0	299,256
Other Aquaculture	0	0	461,777	153,926	615,703
Other Finfish	271,950	77,700	828,846	236,813	1,415,309
Totals	**3,338,676**	**1,171,278**	**3,285,107**	**1,113,356**	**8,908,416**

NDP Grant Payments during 2007.
Grant payments of €5.695 million towards investment costs of €11.015 were made to 34 aquaculture projects supported under the NDP, comprising €4.577 million in FIFG grants (Financial Instrument for Fisheries Guidance) and €1.117 million in Exchequer grants. Investment in finfish included special measures announced by the Minister of State to improve the environmental impact and the competitiveness of the salmon farming sector in Ireland. An analysis of NDP grant payment by species is shown in Table 7:2 and this table also shows the distribution of NDP grant payment to BIM sponsored projects by County:

Table 7:2. BIM NDP Grant Payments (€) by Species, County and Percentage Breakdown (BIM).

Aquaculture Development Measure of the NDP 2000-2006. NDP Grant Payments from 1st January 2007 to 31st December 2007 by Species.		
Species	€	%
Salmon	1,061,125	18.6
Perch	251,939	4.4
Trout	196,671	3.5
Rope Mussels	800,147	14.1
Bottom Mussels	520,459	9.1
Oysters	980,409	17.2
Abalone	846,166	14.9
Ornamental	153,443	2.7
Clams	2,123	0
Other	882,353	15.5
Total	**5,694,835**	**100**

Aquaculture Development Measure of the NDP 2000-2006. NDP Grant Payments from 1st January 2007 to 31st December 2007 by County		
County	€	%
Cork	1,623,640	28.5
Galway	721,406	12.7
Donegal	1,118,991	19.7
Kerry	183,967	3.2
Louth	209,385	3.7
Mayo	654,027	11.5
Offaly	153,443	2.7
Sligo	2,123	0
Tipperary	251,939	4.4
Waterford	370,387	6.5
Wicklow	137,470	2.4
Public Projects	268,057	4.7
Total	**5,694,835**	**100**

BIM aquaculture grant scheme.
Complementing the NDP Aquaculture Development Measure, BIM administers an Aquaculture Grant Scheme under which small-scale aquaculture projects are promoted in a pilot development phase prior to full-scale commercial development under the NDP. The Aquaculture Grant Scheme also promotes the introduction of new technology, new species and the establishment of new site locations for aquaculture. During 2007, 94 projects were approved for Exchequer grant assistance of €1,886,395 on aggregate investment costs of €4,639,534.

BIM Grant Payments during 2007.
During 2007, grant payments of €0.863 million were paid to 63 Aquaculture projects under BIM's Pilot and Resource Development Grant Scheme. Of this amount, 33.1% was paid towards the development of finfish species, 59.3% was paid towards investment in shellfish and 7.6% was paid towards the development of seaweed aquaculture. Payments by species and county are set out in Table 7:3.

Table 7:3. BIM Aquaculture Grant Scheme Payments in 2007 by Species, County and Percentage Breakdown (BIM).

BIM Grant Scheme Payments from 1st January 2007 to 31st December 2007 by Species		
Species	€	%
Salmon	122,604	14.2
Perch	68,316	7.9
Charr	76,763	8.9
Barramundi	4,500	0.5
Trout	14,012	1.6
Rope Mussels	350,726	40.7
Oysters	70,033	8.1
Lobsters	23,424	2.7
Scallops	58,437	6.8
Seaweed	65,853	7.6
Other	8,438	1
Total	863,106	100

BIM Grant Scheme Payments from 1st January 2007 to 31st December 2007 by County		
County	€	%
Cavan	35,918.00	4.1
Cork	222,067.54	25.7
Donegal	267,145.54	30.1
Dublin	30,030.51	3.5
Galway	130,873.25	15.2
Kerry	45,557.61	5.3
Louth	4,500	1
Mayo	31,252	3.6
Roscommon	32,398	3.7
Sligo	35,851.76	4.2
Tipperary	5,400.38	1
Wexford	13,500	1.6
Wicklow	8,611.90	1
Total	863,106.49	100

Non Project based expenditures
In addition to the non co-funded Aquaculture Grant Scheme, BIM (on behalf of the Department of Agriculture, Fisheries and Food) is engaged in a multi stakeholder project to develop a capability to model the aquaculture "carrying capacity" of a number of bays as a pilot project. The objective of this project is to create a computer based application which will allow for improved spatial management and decision making in the location and licensing of aquaculture installations. It will also provide the Department of Agriculture, Fisheries and Food with a means of calculating "cumulative impacts" in the context of carrying out "appropriate assessments" of aquaculture licences in Natura 2000 designated sites. These capabilities are urgently required to address shortcomings in the aquaculture regulatory and licensing system as highlighted in a European Court of Justice ruling against Ireland in December 2007.

The 2007 BIM development programme also funded:

- The gathering of information and the implementation of local actions in relation to the CLAMS Programme (Co-ordinated Local Aquaculture Management Systems) and the publication and dissemination of all technical material.
- The ongoing development of quality standards for shellfish and finfish aquaculture. In 2007, work continued on the Irish Quality Oyster standard and accreditation was achieved. The broadening of the scope of the salmon scheme continued in 2007 and organic and ECO components were added.
- The implementation of ECOPACT (*Environmental code of practice for aquaculture companies and traders*) in bays. This continued in 2007 through the medium of the CLAMS (Co-ordinated Local Aquaculture Management Systems) groups.

- The provision of support services to Department of Communications, Marine and Natural Resources/ Department of Agriculture Fisheries and Food towards a position of compliance with the Shellfish Waters Directive.

- The carrying out of resource surveys and sampling programmes in support of the inter-jurisdictional seed mussel management regime.

- A review of the bottom grown mussel sector on the island of Ireland was carried out by BIM on behalf of the Department of Agriculture, Fisheries and Food, the Department of Agriculture and Rural Development in Northern Ireland and the Loughs Agency. This review was launched jointly by Ms. Mary Coughlan, the Minister for Agriculture, Fisheries and Food and by Ms. Michelle Gildernow, the Minister for Agriculture and Rural Development in Northern Ireland.

Údarás na Gaeltachta grant approvals.

Commercial and R&D grants, administered by Údarás na Gaeltachta, are available to operators in the Gaeltacht areas of counties Donegal, Mayo, Galway, Kerry, Cork and Waterford. In 2007, aquaculture projects received approval for grant aid under NDP funding totalling €2.698 million (Table 7:4) compared with €2.406 million in 2006. Salmon projects received 54% of the total funds, indicating the continued importance of salmon farming. The remaining funds were approved for abalone (41%) and gigas oysters (4%).

Figure 7:2. An Ghaeltacht.

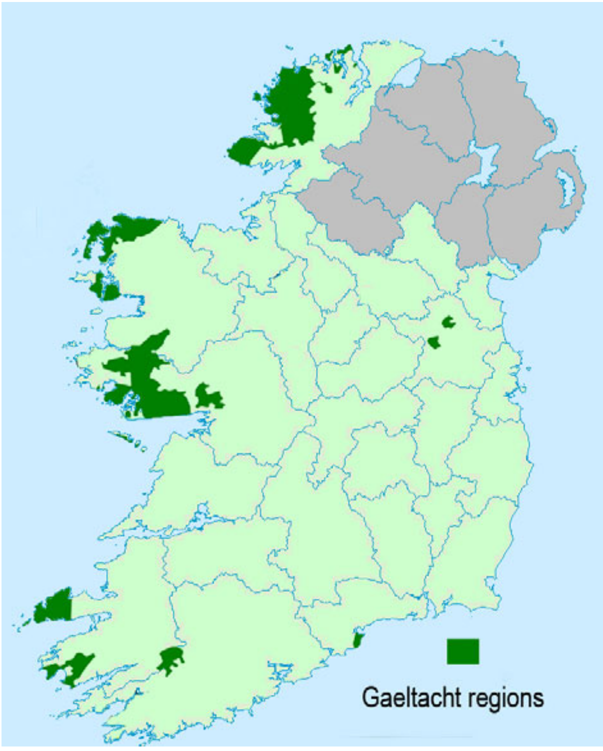


Table 7:4. Approvals by Species in 2007 (Údarás na Gaeltachta).

Species	BMW	S & E	Total
Gigas Oysters	22,341		22,341
Mussels	131,076		131,076
Salmon	661,189		661,189
Turbot	847,447		847,447
Ornamentals	536,406		536,406
Salmon (investment)	500,000		500,000
Total	2,698,459	0	2,698,459

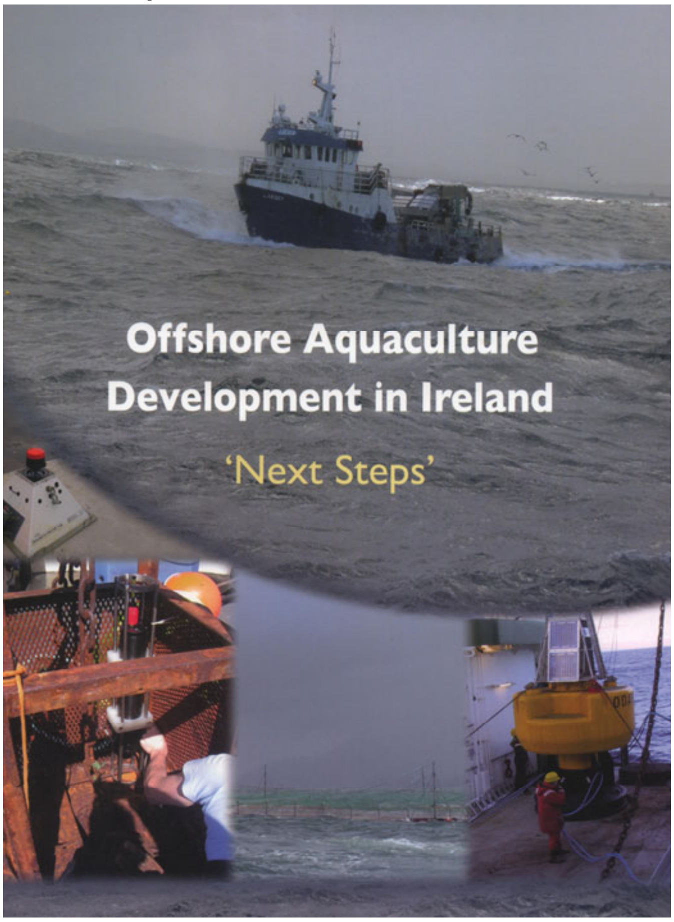
During 2007 there was a total of €1.613 million drawn down on grants allocated (Table 7:5).

Table 7:5. Grant paid by Species in 2007 (Údarás na Gaeltachta).

	BMW	S&E	Total
Gigas Oysters	11,805	41,096	52,901
Abalone	361,934	65,544	427,478
Cod	134,975		134,975
Salmon	791,333		791,333
Ornamentals	78,929		78,929
Mussels	128,250		128,250
Total	1,507,226	106,640	1,613,866

Technical Developments 2007

'Offshore Aquaculture Development in Ireland – Next Steps'



This Technical Report was jointly commissioned by BIM and the Marine Institute and launched in 2007. The document represents a joint initiative by technical staff in BIM and the MI, setting out a detailed Irish vision for the development of a significant offshore aquaculture capability for Ireland. Forty six sites are initially identified in the document and are presented as being worthy of further investigation. Within the report these are further short listed to five sites, on the basis of more complete analysis of water depth, shelter and proximity of landing facilities. The most promising sites are general areas of several square miles.

The five site areas are:-

1. North east of Gola Island, Donegal.
2. East of Inishturk Island, Mayo.
3. North east of Skerd Rocks, south Connemara, Galway.
4. North east of Inisheer Island, Galway Bay.
5. Dunmanus Bay, Cork.

These opportunity sites are to be the subject of further technical appraisal by BIM and MI staff to establish and understand the broad principals of their character and suitability as potential offshore aquaculture sites. A programme of investigation is proposed to log and understand site dynamics such as wave energy, current speeds, temperature profiles and site bathymetry. Profiling the sites in such a way will allow BIM and MI personnel to assess the suitability of the available technologies for these sites and will focus attention on knowledge gaps.

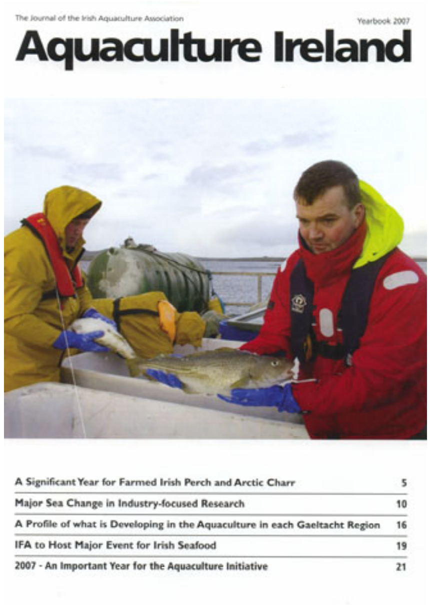
Perch Culture

In 2007 activity intensified at the two Irish perch hatcheries, PDS Irish Waters Perch Ltd and Keywater Fisheries Ltd. This coincided with the completion of Clune Fisheries Ltd., one of the two planned state of the art grow out farms. Further technical and fish handling expertise was gained from grow-out of egg ribbons imported from New Zealand as part of an exercise to augment the stock of fish in the country. These southern hemisphere ribbons were imported under strict conditions from the Mahurangi Technical Institute and were divided between the two Irish hatcheries. The eggs provided an opportunity for comparative growth trials between Irish and Danish stock. The Mahurangi Technical Institute is based on the North Island and is the only accredited and licenced perch hatchery in New Zealand. This stock spawns during the northern hemisphere autumn (September to October) and may provide stock when Irish fish are not spawning. In addition, these fish have a higher temperature tolerance (up to 28^{0}C) which is of particular interest to farmers operating warmer water recirculation systems.

Both Irish perch hatcheries continued with ambitious plans to extend grow out capacity and to train and retain key specialist staff in the areas of live feed and fish larval production. Co-operation between these units and the staff at the Martin Ryan Institute Carna Laboratories also provided learning opportunities and synergies. The first batches of fed fry were moved to the grow out farm during the summer and initial growth results of fish were encouraging. Perch fry proved to be hardy during transportation and adapted well to the new environment at a small average size of 0.5 to 1g. It is thought that ideally, fish should be larger than this to ensure greater survival, but space constraints at the hatcheries dictate the time of transfer. In particular, where efforts are made to maximise spawning by manipulation of broodstock to produce 'out of season' spawn, there is also a concern that spawning will 'overlap', putting pressure on resources.

Arctic charr
Ireland has two state of the art recirculation systems specifically designed for growing this unusual salmonid. The farm in Sligo, Cool Springs Arctic Charr Ltd., operating under the brand name, 'Cloonacool Arctic charr', produced 47.17 tonnes of product in 2007. It is planned that full production volume of 60 tonnes will be reached in 2008. The fish produced in Sligo are sold on the home market and in continental markets. Further technical progress was made in 2007 with the detailed investigation of different proprietary feeds on growth and performance of fish. The charr farm located in Galway, Stofnfiskur Ireland Ltd. (SIL), produced 19 tonnes of fish. In 2007, SIL completed a programme of building work at their site in Corrandulla, Co. Galway that incorporated the installation of a recirculation system for both the production of charr and salmon smolts.

Cod
The first Irish farmed cod were harvested in February 2007 from the Trosc Teoranta site in Beirteraghbui Bay, Connemara in County Galway. Cod was identified as a worthwhile candidate for further investigation in the "New Species Development" report published in 1999. The Marine Institute through their Marine RTDI Measure supported a fellowship in the hatchery rearing of cod at the MRI Carna Laboratory. In the year 2003 the best international cod culture practice was studied and a pilot scale marine finfish hatchery was established at MRI Carna laboratory with financial support from Údarás na Gaeltachta.



The development of cod culture in Ireland has involved the following key steps:

- In 2004, cod eggs were hatched and the resultant larvae were fed on a combination of rotifers, brine shrimp and micro algae. The post larvae were then successfully weaned onto dry feed.
- In February 2005, the first batch of cod juveniles (fry) were transferred to sea cages at Trosc Teoranta's fallowed salmon site. Another batch of juveniles was produced at the MRI Carna and subsequently transferred to sea in October/November 2005.
- In 2006, the first batch of cod went through maturation and their second summer at sea. More sea sites were tested with the second batch of fish and a second site was established within the same bay to test the efficacy of putting smaller cod juveniles to sea at 10g compared with 100g fish. This study proved to be successful resulting in a larger capacity potential for the hatchery due to smaller fish being sent to sea.
- The cod were reared at sea by Trosc Teoranta with technical assistance from Taighde Mara Teo. The cod were cultured under "organic" conditions and the company hope to be fully organic accredited by the end of 2008.
- No parasite/lice treatment was required in the first two years of sea cage culture. The health of the cod at sea was good despite challenging environmental conditions (high summer water temperatures, algal blooms etc.).
- The cod harvested early in 2007 had been put to sea in February 2005 at an average size of 100g. The fish harvested in 2007 achieved an average weight of 2.2kgs.
- An Aquareg Project "Optimization of environmental conditions for cultivating marine finfish larvae" OPEL was undertaken at the MRI Carna Laboratories and Fosen Aquasenter As (Norway). This project investigated a number of key factors (water quality and feeding) involved in the cultivation process in an effort to enhance production and reduce costs in producing juvenile marine finfish.

The establishment of a cod/ marine finfish hatchery in the west of Ireland was the culmination of an integrated programme of innovation between the private and state sectors. The organisations involved were NUI Galway (MRI Carna), Údarás na Gaeltachta, Marine Institute, Taighde Mara Teo, Western Development Commission, BIM, local salmon farmers and the Department of Communications, Marine and Natural Resources.

Fish Health Management

Pancreas Disease
Viral diseases such as Pancreas Disease (PD) are a major cause of mortality in salmonid farming. The Irish salmon farming industry has estimated that the economic impact of PD alone was €12m in lost profit in the years 2003-2004. The average mortality due to PD for 2007 was 23 % (ranging from 5% to 45%). The farms in the west of Ireland are the most affected by PD, presenting a mortality of 33.8% in 2007.

Investigative PD trials were undertaken in 2007 in conjunction with a number of farms. Results from the trials are somewhat inconclusive with mortalities tending to increase despite a decrease in the percentage of positive samples for PD and a decrease in the severity of the pathologies associated with PD. A possible explanation for this is that mortalities in the later part of the cycle may have been due to causes other than PD.

Alphamax (deltamethrin)
Studies undertaken on the use and efficacy of Alphamax against sea lice were carried out during 2007. These trials have informed the process of developing well boat protocols for Alphamax treatment of salmon with lice.

Wrasse
Several studies to assess the potential of wrasse as a cleaner fish for farmed salmon continued during 2007. Experiments were undertaken to estimate the success of lice clearance of different age/size wrasse with different sized salmon. In addition, a breeding programme for wrasse was established. Rearing of farmed wrasse has already been successful in Norway.

IPN
Following on from a serious IPN problem in 2006, the year 2007 proved more successful for hatcheries. Disinfection procedures and careful restocking in 2007 resulted in successful eradication of IPN and restocking of salmon hatcheries.

Oxygen Injection Systems for improved water quality
An oxygen injection and monitoring system was investigated at a marine site in 2007 as a mechanism for delivering oxygen during warm weather spells when high water temperatures cause poor water quality. Using a network of oxygen sensors connected to a PC system, the injection system delivers a set quantity of dissolved oxygen into the cages. Results of this trial showed a decrease in fish mortality from 25% in 2006 to 3% in 2007 with fish showing an optimal feeding behaviour. As a result, fish health noticeably improved at the site during 2007 and fish growth rates increased when compared with previous years.

Likewise, surface temperatures in Irish lakes during summer can increase to 22^{o}C. In surface waters, the oxygen concentration can be as low as 5 ppm. In these conditions trout can suffer from stress due to oxygen limitation. Trials to compare four different types of aeration / water lift or up-welling units in an Irish lake were carried out during 2007 to examine and identify the most economic system. The best results were obtained by a diffuser aerator system where compressed air was released at 5 m depth providing an up welling of oxygen rich water into trout cages.

Aquatic Emitter Systems (Sealice Control)
During the spring months of 2007, the first units of the bioemitter system initially tried in 2006 were installed at sites in Killary and Mayo. Units were also installed in Golam and Lettercallow in Connemara. Preliminary results from using these units are encouraging, indicating that numbers of gravid females may decrease significantly and can remain at a low level during trials.

Bottom grown mussels

2007 was a good year for the bottom mussel sector, which is so heavily dependent on the success of the seed mussel fishery. Seed was fished in all the areas traditionally fished with approximately 29,600 tonnes reported as transplanted during the year by 34 vessels. The east coast fishery proved to be the most fruitful with 21,000 tonnes fished. Of this, 11,500 tonnes were taken from Wexford and 7,400 tonnes from Wicklow. Seed quality was judged by the fishermen to be generally good with efforts made to lift the seed as quickly as possible after the settlement of starfish on the beds. The building of the new inshore aquaculture vessel, the 'T. Burke' continued during 2007. This 11 m (33 foot) vessel is fully equipped with sampling capability including 'roxswath', dredge and grab equipment and sophisticated underwater cameras.

Seaweed

Alaria esculenta continued to be cultivated at a licenced site in Roaringwater Bay in 2007. This is the fourth consecutive year that collectors seeded with *Alaria* were prepared at the Daithi O' Murchu Marine Research Station in Bantry. Deployment of these at sea involved a new suspension configuration. Half the seaweed lines were deployed using the traditional surface method while the other half were deployed as submerged lines in an effort to remove the plantlets from surface water movement. Unfortunately, the submerged lines did not perform as well as the traditional method. In total, three tonnes (wet weight) of *Alaria* was harvested and dried. The dry weight of material recovered was 348 kg. The product was chopped and bagged for use in abalone feed trials.

UISCE Carrying Capacity and Water Quality Modelling

The main goal of the UISCE (Understanding Irish Shellfish Culture Environments) project is to develop a desktop computer system that will allow end users to run aquaculture and water quality scenarios that are of interest to them. This application has been developed to provide a decision support tool that will assist the mussel and oyster industries in Ireland. Its objective is to help shellfish producers plan their operations by allowing them to model and run different aquaculture production scenarios. As a result, growers will be able to develop site specific husbandry strategies based on the output from this desktop application.

The graphical user interface (GUI) of the application is being embedded within a GIS (Geographical Information System) and is designed to reflect the specific requirements of the oyster and mussel shellfish industries. The system will help growers answer questions related to the following broad areas:-

A. Optimal usage of shellfish stock at farm and bay scales. Seed spreading or seed stocking density scenarios are central to this.

B. Optimisation of husbandry techniques and deployment of aquaculture structures at farm scale. For example, what is the productivity impact of stock thinning? Or, what is the potential productivity impact of a reorientation of an aquaculture structure (e.g. trestles).

C. Water quality considerations at bay and farm scale; the identification of sources and causes of poor water quality is the main area addressed by the application's water quality module.

The UISCE project partners are making good progress with respect to their individual efforts and an extensive sampling programme is nearing completion. The UISCE project has completed an extensive schedule of water quality and shellfish test site monitoring in Dungarvan, Wexford and Killary Harbours.

Partner project contributions are summarized below:-

Marcon Computations (Galway); Marcon have developed hydrodynamic models for Dungarvan, Wexford and Killary Harbours. Water quality models for Wexford and Dungarvan have also been developed. A database with historical information and BIM sampling programme data has been created and is now available to project partners. Work has been done with respect to the integration of various predictive models into the MarGIS framework (computer desktop environment).
Martin Ryan Institute (Galway); MRI are looking after the analysis of shellfish and water samples from the pilot bays. Protocols for the analysis of shellfish samples have been drawn up and analysis of phytoplankton and nutrient samples is on-going.
Plymouth Marine Labs (UK); PML are assisting Marcon with the integration of ShellSIM (oyster and mussel growth model) into the MarGIS framework. ShellSIM is currently being enhanced and developed for inclusion into the project.
Longline Environmental / IMAR (Portugal) & NOAA (USA); Longline Environmental are assisting Marcon with model coupling and are developing FARM and E2K (ecological) models with a view to integration of these models into the UISCE project. Work on the integration of the ASSETS (tropic status modelling) is also underway. Longline Environmental continues to play an advisory role on the BIM sampling program.
Blue Hill Hydraulics and Carter Newell; MUSMOD (mussel aquaculture modelling) has successfully been integrated into the MarGIS application framework. Flow models have been developed for Irish aquaculture structures. BHH and Carter have also advised on the BIM sampling program.
AQUAFACT International (Galway) and **Compass Informatics (Dublin)** have played roles in data acquisition and project database design.

Urchins

The AFDC UrchinPlatter™ patent reached the Nationalisation Stage during 2007. Patent submissions go through a staged process of acceptance: Initial submission, PCT (Patent Common Treaty) stage and Nationalisation. The Nationalisation Stage is the final stage and it is when the patent is considered 'granted' and not 'patent pending'.

The UrchinPlatter™ System is novel, land-based method for culturing sea urchins. It can be used both for ongrowing juvenile animals and roe enhancement of wild, market-size animals. This technology uses custom-made cages, called Stacks™, in a raceway-type tank. The UrchinPlatter™ System has been patented worldwide by UCC.

Originally, a predecessor of the UrchinPlatter™ System was assessed for abalone culture using funding from the Marine Institute's Applied Scheme. As it is not appropriate for abalone, funding from Enterprise Ireland's Commercialisation Fund was used to re-design, assess and validate this system for sea urchins.

Health and Safety

BIM provided financial support to companies so that they could adopt "best work practices" on vessels and feed barges used in salmon farming operations.

Quality Programme 2007

Quality is a vital factor for enhancing the profitability of any product and being able to demonstrate this to the consumer is equally important. In 2007, the Quality and Environment Section of BIM's Aquaculture Development Division continued to provide the industry with the schemes by which to do this. Work to develop and enhance their effectiveness as a communication tool for the industry was prioritised.

Irish Quality Mussels (IQM).

The Irish Quality Mussel Scheme was launched in 2002 and is the first fully integrated shellfish scheme in the world to be accredited to EN45011, the international standard for product quality certification.

A Certified Quality Mussel is one which is traceable to a stringent product specification with regards to meat content, shell appearance, taste and texture and which also has been produced and processed by a company that operates to best industry practice with regards to food safety, employee and environmental welfare. The Mussel Quality Standards were developed by an independent technical committee of experts in mussel farming and processing. Separate standards exist within the scheme for mussel farming and harvesting as well as mussel processing. The standards for Quality Mussel products are based on best industry practice and go beyond the basic legislative requirements. The standards are also aligned to the Marine Biotoxin Programme to protect against potential biotoxins. The standards are continually reviewed to ensure they remain up-to-date and relevant.

Presence of a scheme mark assures buyers that the mussels have guaranteed meat yield, and excellent flavour and texture. It also assures that they have been harvested, processed and packed under the strictest levels of food hygiene, while also proving the product can be fully traced from harvest to packed processed product.

Irish Quality Oysters (IQO).

The Irish Quality Oyster Scheme is currently being piloted as part of the accreditation process. BIM's Environment & Quality Section in conjunction with the Paris Marketing Office are currently working on developing a website to support the Irish Quality Oyster programme and provide a focussed information resource primarily for retailers, the food service industry, consumers and members.

A Certified Quality Oyster is one which is traceable to a stringent product specification with regards to meat content, shell appearance, taste and texture and which also has been produced and processed by a company that operates to best industry practice with regards to food safety, employee and environmental welfare. The IQO Standards were developed by an independent technical committee of experts in farming and processing. The standards for Quality Oyster products are based on the best industry practice and go beyond the basic legislative requirements and are continually reviewed to ensure they remain up-to-date and relevant.

The presence of the mark assures buyers that the oysters have been grown, harvested, processed and packed under the strictest levels of food hygiene, while also proving the product can be fully traced from harvest to packed processed product.

Irish Quality Trout (IQT).

The Irish Quality Trout Scheme was the first all island EN45011 accredited food quality scheme in Ireland. Standards exist for the Fresh Water Rainbow Trout and Salt Water Sea Trout. The Irish Quality Trout Scheme is designed to transparently demonstrate the integrity of product and processes used in the production and processing of trout by participating company members. The scheme has three fully integrated standards covering the whole supply chain from broodstock to the final packed product. A separate standard exists for each of the freshwater rearing, saltwater rearing and, packaging and processing stages of production. The Scheme aims to deliver consistent Quality Irish Trout products to the marketplace and thereby enhance consumer confidence through traceability to best practice.

The IQT Scheme has a distinct quality mark. The Quality mark can only be used by Certified Companies. Presence of the mark assures that the trout has been hatched, raised, harvested and packed under the strictest levels of food hygiene. The mark ensures that the product can be fully traced from hatchery to packing.

Irish Quality Salmon (IQS).

The Irish Quality Salmon Scheme was the first EN45011 accredited food quality scheme in Ireland, being formally launched in October 2001. While the scheme is entirely voluntary, it has been widely embraced by the industry. The Irish Quality Salmon Scheme is designed to transparently demonstrate the integrity of the product and processes used in the production and processing of salmon by participating company members. The scheme has four fully integrated standards covering the whole supply chain from broodstock to the final packed product. A separate standard exists for each of the freshwater rearing, saltwater rearing, packaging and processing and cold smoking stages of production. The Scheme aims to deliver consistent quality Irish salmon products to the marketplace and thereby enhance consumer confidence through traceability to best practice.

The IQS Scheme has a distinct quality mark. The Quality mark can only be used by Certified Companies. Presence of the mark assures that the salmon has been hatched, raised, harvested and packed under the strictest levels of food hygiene. The Quality mark was developed to allow customers to easily identify Irish Quality Salmon and has proved highly successful, and the scheme itself is recognised by retailers and processors both nationally and internationally. The mark ensures that the product can be fully traced from hatchery to packing.

The mark may be obtained once the industry member has applied to become a certified member of the scheme; an independent third party then rigorously audits them. The audit report is submitted to a certification committee, which then decides as to whether the applicant can become a fully certified member. If successful the member can then display the scheme mark on letterheads and packed boxes of fish.

Organic (Irish Quality Organic Standards).

The BIM Irish Quality Salmon Organic Standard was officially launched at the Aqua 20/20 Conference, April 2007. The IQS Organic standard is a further development of the existing Irish Quality Salmon Standard, and is the first nationally recognised standard for the certification of organic farmed salmon in Ireland. The Standard is heavily focussed on environmental issues, minimising any potential environmental impact and also details requirements for freshwater and saltwater salmon farms, primary packing and organic salmon feed production. The Irish Quality Trout Organic standard is currently being piloted as part of the accreditation process.

The Scheme & Standard has been developed in accordance with the requirements of EN45011 Product Quality Certification and is in line with the general requirements of EU Organic Regulation 2092/91 (and the proposed amendments due in 2009). The Standard supports the principles of Organic farming as defined by the International Federation of Organic Agriculture Movements (IFOAM).

The Organic Standard is an extension of scope to the existing EN45011 accredited Irish Quality Salmon Scheme. As such, applicants to the Organic Standard must also meet the requirements of the IQS Standards. This makes the IQS Organic Standard unique in that it represents the highest standards of fish farming recognised through IQS certification and is in accordance with the principles of organic farming and management.

As with the Irish Quality Salmon Standards, applicants for certification to the Organic Standard can include fresh water, salt water, packing and cold smoked salmon operators. As with other Organic Standards operating in accordance with EC Regulation 91/2092, there is a requirement for feed manufacturers wishing to supply organic farms to also become certified under this Standard. Once the industry member has applied to become a certified member of the scheme, an independent third party rigorously audits them. The audit report is submitted to a certification committee, which then decides as to whether the applicant can become a fully certified member. If successful, the member can then display the scheme mark on letterheads and packed boxes of fish.

Sustainability-Irish Quality Eco Standards.

In September 2007 Bord Iascaigh Mhara's new Eco-Standards for Rope Grown Mussels and for Farmed Salmon was accredited by INAB (Irish National Accreditation Board) to ISO65 / EN45011, the internationally recognized benchmark for food product certification. The eco-standards have been established as an extension of scope to the existing Irish Quality Mussel (IQM) and Irish Quality Salmon (IQS) schemes and are the world's first independently accredited eco-standards for aquaculture. The Irish Quality Trout Eco-standard is currently being piloted as part of the accreditation process.

The IQM Eco-standard was officially launched at the 2007 World Seafood Congress. The standard guarantees assurance that the mussels have been produced with due care for the environment, above and beyond all existing requirements To achieve certification growers and processors have to meet a number of key criteria and follow strict environmental management practices in all aspects of their business including:

- *Environmental Management and Commitment*
  - The standard requires evidence of an operational and up to date Environmental Management System
- *Site Selection and Management*
- *Environmental Aspects of operations*
  - To demonstrate efforts made in the prevention and management of spills, taints and odours with respect to chemical purchase and usage.
  - To demonstrate efforts made towards visual, noise and odour impact reduction, and protection from and management of oil contamination
  - The mussel eco-standard requires that all floats are battleship grey apart from those necessary for navigational purposes.
  - The finfish standard requires evidence of feed management system for sustainable product sourcing and efficient use.
- *Nature and Biodiversity*
  - To demonstrate an awareness of and respect for protected areas and their designated features
- *Cultural Heritage*

- *Waste Management & Reduction*
    - The standard requires evidence of a waste management programme based upon reduce, reuse and recycle, progressively working towards the elimination of non-recyclable materials
    - The mussel eco-standard does not permit the use of plastic (pergolari) mesh.

With buyers becoming more conscious in their habits and adopting more sustainable purchasing patterns, the eco-label will differentiate your product from others. In addition, the Environmental Management System adopted will allow improved environmental performance giving a competitive edge, and cost savings in energy and water consumption.

Irish Quality Eco-standards and ECOPACT

As an Environmental Management System (EMS) is a key requirement of the Irish Quality Eco-standards, for those aquaculture operators with ECOPACT, achieving the Eco-standard is the next step in the development of their Environmental Management. While operators set their own targets within the Environmental Management Programme of ECOPACT, and it is very much aspirational, the Irish Quality Eco-standards set minimum criteria that must be attained to achieve certification. ECOPACT is still available to operators wishing to introduce EMS to their businesses, and to those for which the Irish Quality Eco-Standards are not yet available.

In all cases; IQM, IQS, IQO, IQT, Irish Quality Eco Standards and Irish Quality Organic Standards, the presence of the scheme mark is an assurance of the highest quality of product and standard of production. The mark may be obtained once the industry member has applied to become a certified member of the scheme; then an independent third party rigorously audits them. The audit report is submitted to a certification committee, which then decides on whether the applicant can become a fully certified member, The scheme is independently managed by IFQC Ltd. If successful, the member can then display the scheme mark on fresh and processed product.

For more information on:

Irish Quality Salmon Scheme and Irish Quality Trout Scheme contact BIM's Finfish Quality Officer, Vera Heffernan, Telephone 01 2144193, email: heffernan@bim.ie

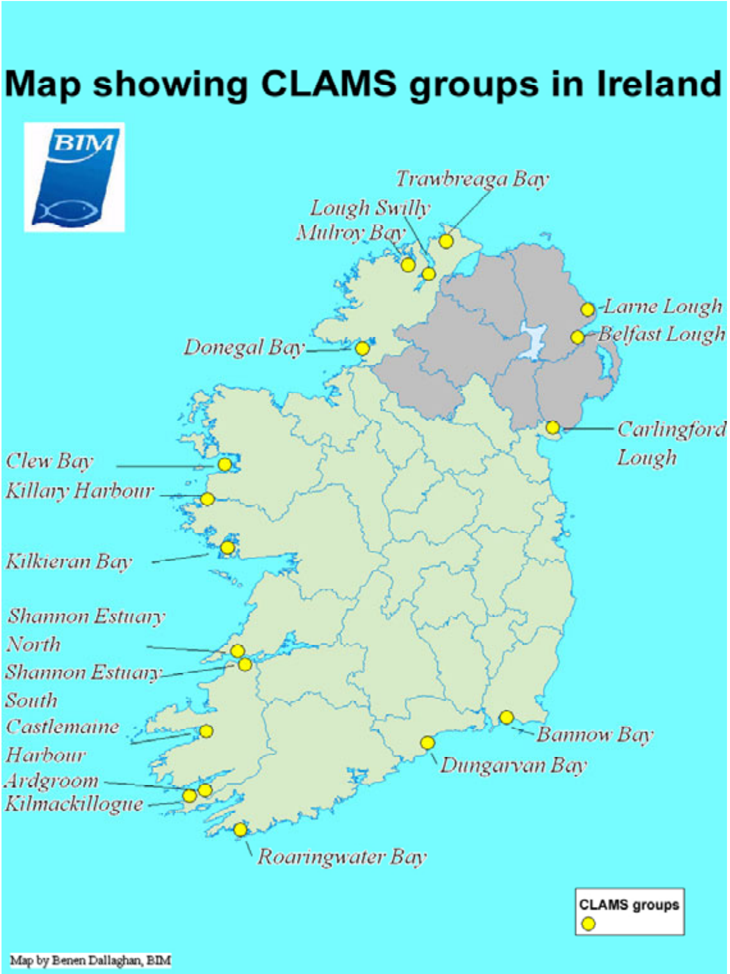
Irish Quality Oyster Scheme please contact BIM's Shellfish Quality Officer, Vicky Lyons, Telephone 01 2144 134, email: lyons@bim.ie

Irish Quality Mussel Scheme please contact BIM's Environmental Officer Gráinne O'Brien, Telephone 01 2144 135, email: obrien@bim.ie

CLAMS and Single Bay Management

The Co-ordinated Local Aquaculture Management Systems (CLAMS) is a nationwide initiative and is also in operation in Northern Ireland to manage the development of aquaculture in bays and inshore waters at a local level (Figure 7:3). The CLAMS process allows for the integration of aquaculture into the coastal zone, whilst recognising the need to improve environmental compliance, product quality and consumer confidence. There are now 18 CLAMS groups established around the coast of Ireland.

Figure 7:3. CLAMS (BIM).



Cross-Border Aquaculture Initiative (CBAIT) CLAMS/ Loughs Agency.

There are seven CLAMS groups currently established in the remit area of the Aquaculture Initiative (EEIG). These are located in Donegal (Swilly, Mulroy, and Trawbreaga), on one of the cross border Loughs (Carlingford) and in Northern Ireland (Larne Lough and Belfast Lough).

Lough Swilly.
During 2007, the Lough Swilly CLAMS group elected Mr Daniel Gallagher as their chairman. This group actively investigated alternative methods of securing mussel seed for bottom mussel producers. Work also continued on the integration of mussel producers with native oyster fishermen and on improving interactions between producers. Efforts were also made to establish suitable berthing for loading and offloading.

Carlingford Lough.
The CLAMS group was involved in developing a navigation plan for the bay. Oyster site markers were deployed to meet the requirements of the relevant agencies in both jurisdictions. Other issues addressed during the year 2007 included:

1. The potential impact of large ferries on relayed mussel beds.
2. The poaching of mussel from aquaculture sites.
3. The proposed dredging at Warrenpoint port.
4. The group became involved with the proposed development at Greenore Port which is adjacent to a number of oyster farms. The group was successful in securing joint funding from BIM and the Loughs Agency for an independent assessment of the proposed development.
5. A concern for the group was the ongoing regulatory issues associated with the cross-border nature of the Lough not being resolved in a timely manner.

Mulroy Bay.
The Mulroy Bay CLAMS group elected Ms Catherine McManus as their chairperson and the CLAMS document was updated for publication. The Mulroy group was active in ensuring that the construction of the new bridge across the bay would not affect aquaculture production. That CLAMS group was also instrumental in securing €325,000 from Donegal County Council for a real-time monitoring programme of potential water quality impacts associated with the development. Other activities included a navigational project plan for the bay and securing funds from BIM for VHF, sea-survival and first aid training.

Trawbreaga Bay.
The Trawbreaga CLAMS group elected Mr Jim Walsh as their chairperson. The group was actively engaged in drawing up a navigational plan and lobbying for changes on licences relating to problems common to many producers in the Bay. The group secured funds from BIM for upgrading an onshore work and safety area. As a result of oyster mortalities the group are seeking funds to place water quality data loggers in the bay.

Larne Lough.
The CLAMS document was printed in 2007. The group continues to liaise with the regulatory authorities and their contractors on the on-going water quality issues in the Lough.

Belfast Lough.
The CLAMS group has been active on a number of issues including, the proposed regulations regarding a no-dredge zone in the Lough, and the unregulated dredging methods employed in the Lough. The group is also liaising with the Crown Estate about lease rates.

The success of all the CLAMS groups and the projects that they undertake are dependent on the dedication and enthusiasm of producer members and regional officers that support them in their efforts.

Summary of Single Bay Management (SBM) 2007
The Single Bay Management (SBM) initiative began in the 1990's shortly after the introduction of the Sea Lice monitoring programme to advise on best practices for sea lice treatments, harvesting procedures and good husbandry. Meetings are held annually in each region and are facilitated by Marine Institute (MI) staff. Single Bay Management meetings were held in each region (Bantry, Kilkieran/Greatman's/Bertraghbui, Mannin, Killary Harbour, Clew Bay, Mulroy Bay and Lough Swilly) at the end of 2007 and into early 2008. The purpose of these meetings was to update the codes of practice in the SBM Plans, particularly in relation to fallowing, autumn-winter sea lice treatment strategies and single-generation stocking. The codes also cover such areas as harvesting practices, disposal of mortalities and sourcing of fish stock. Discussions within the SBM forum are treated as confidential among the participants at each meeting. A variety of issues and initiatives were discussed and these included:

- Synchronising sea lice treatments where possible.
- Synchronised fallows where possible.
- Combination of treatments.
- Co-ordinated bay management, using outer sites for earlier stages of production and summer growth and using inner sites for on-growing and harvest.
- Designation of one site as a harvest only site.
- Fallowing of key sites – some sites in certain bays are being left fallow for a prolonged period to help reduce resident lice levels in the bay. An alternative bay is being used in these cases for inputting smolts in 2008.
- Using well boats for transfers and not towing cages to minimise stress on the fish. Treatments can be carried out during transfer.
- The numbers of harvest fish to be kept to a minimum and be kept distinct from treated fish.
- Providing a system for screening off of lice during harvest to keep them out of the water.
- Keeping adequate sea lice control on brood-stock and considering them in the overall sea lice management strategy.
- Long term planning for the use of sea lice treatments to prevent sea lice resistance to these medicines.

The 2007 round of SBM meetings were particularly useful in highlighting issues and concerns of the producers in relation to services, equipment and treatments at their disposal in the management and control of sea lice on farms. Licensing issues were also a concern to a number of producers both in terms of the length of time taken to process licences and to certain licence conditions. The issues discussed at the meetings included:

- Access to well-boats is a concern for most producers and the ISGA.
- Well-boat operating procedures need to be drafted to ensure proper mix of treatments.
- Since well boat access is out of the control of farms at present there must be alternative plans in place to deal with sea lice control, if the well-boat cannot be sourced when needed.
- License processing times needs to be improved. Licensing of additional sites will help achieve adequate fallowing and separation of generations. Licensing by weight is seen as limiting and using fish numbers would be an improvement.
- There is a need for additional chemical treatments and further research into alternative treatments. Some alternative treatments are available (such as biomoss, bio-emittors, and eco-boost) but studies into their efficacy are necessary. Research into potential vaccines is also important.
- The frequency of monitoring was highlighted. Some farms feel weekly monitoring would be beneficial and lead to more proactive approaches to sea lice control and management.
- Greater access to bio-assays would be welcomed by farms. These should be available to test the prudence of using a particular treatment at a particular site at a particular time.

8. AQUACULTURE TRAINING & RESEARCH

Aquaculture Training 2007

Aquaculture training is integral to the long term development of the aquaculture industry. The document 'Steering a new course' emphasised the importance of providing increased training to the aquaculture sector. It states that BIM's "aquaculture training provision needs to be significantly expanded to reflect its increasing contribution to sustainable Irish seafood production, through strategic training alliances with other State agencies and educational institutions and by refocusing existing training resources as required".

FETAC (Further Education & Training Award Council) accredited training for Irish Aquaculture began in 2000 with a strategic alliance between BIM, County Galway VEC and Údarás na Gaeltachta. Technical assistance on these courses was provided by Taighde Mara Teo and others. Aquaculture training has since developed significantly and provides locally delivered courses as required around the country using BIM's three state-of-the-art mobile Coastal Training Units. BIM's Regional Fisheries Centre in Castletownbere, Co. Cork and the National Fisheries College in Greencastle offer full time training leading to a FETAC Certificate in Commercial Fishing, Aquaculture or Seafood Processing. These courses offer progression to higher education and training through the HETAC Links Scheme (see www.hetac.ie). A number of places are reserved for FETAC students on the National Certificate in Science courses. Students may also accumulate CAO point credits from their FETAC award at Certificate Level 5 should they opt for higher education (see www.fetac.ie)

The overall aim of BIM's training is to develop a competitive knowledge based Irish Seafood industry, whilst ensuring that safety forms an integral part of all training programmes. BIM now offers more than 100 courses to the fishing and the aquaculture industry. Table 8:1 shows the main courses which are available to the aquaculture sector:

Student numbers 2007.

BIM provides FETAC nationally accredited seafood industry training courses emphasising practical training skills. In 2007, BIM was the sole provider of practical vocational training courses to the aquaculture/fishing sector in Ireland and there were a total of **350** attendances during the year. Five people in 2007 completed the full time FETAC Certificate in Aquaculture. This course runs for 15 weeks and includes eight modules (shellfish and finfish ongrowing, hatchery production, communications, information technology, engineering, workboat handling, safety at sea and work experience).

Table 8:1. List of BIM Training Courses Available to the Aquaculture Industry in 2007 (BIM).

Aquaculture training
FETAC Level 5 Finfish On-growing module
FETAC Level 5 Shellfish On-growing module
FETAC Level 5 Seaweed On-growing module
FETAC Level 5 Hatchery Production of Fish module
FETAC Farmed Fish Welfare
Computer and communications training FETAC level 4 Information Technology Skills
FETAC Level 5 Communications module
HETAC Building Advanced Supervisory Skills (BASS)
Safety training GMDSS Short Range Radio course
Elementary First Aid (EFA) Fire Prevention and Safety Awareness (FP&SA) Personal Survival Techniques (PST)
Occupational First Aid (OFA)
Health and Safety
Manual Handling
Diving First Aid
Slinging and Crane Arm operations
Engineering FETAC Level 5 Marine Engineering Processes module
Food safety training FETAC Level 5 Seafood Hygiene Management
FETAC Risk-Based HACCP for Seafood
FETAC Auditing for Seafood Businesses
FETAC Passenger Boat Proficiency Module FETAC Workboat and Powerboat Skills Handling
FULL TIME FETAC Certificate in Aquaculture (Level 5) training course covering a total of eight modules.
Other FETAC Level 5 Work Experience/Practice module D DAY – larvae training for mussel farmers

13 students completed a range of courses funded by INTERREG IIIA cross border programme held in Portaferry, Co. Down as part of a strategic partnership with C-Mar (Queens University Belfast). 14 students attended mussel D larvae workshops, while 40 completed First Aid training which included 25 students doing Occupational First Aid and 15 doing Diving First Aid for fish farm divers. 26 students completed Workboat and Powerboat Handling Skills training.

New training courses developed in 2007.
At the end of 2007 a new FETAC level 6 training course in Farmed Fish Welfare was developed and 48 attendances were recorded for this module. Five participants also completed a new FETAC module in Seaweed On-growing Operations at Level 5. 36 students attended a new HETAC Level 6 module in co-operation with the Institute of Technology, Tallaght. This new module called BASS (Building Advanced Supervisory Skills) involves the use of new technologies and video conferencing to deliver supervisory skills training.

Training course timetable and information can be accessed through the BIM website (www.bim.ie) or by contacting the Regional Fisheries Centre Castletownbere, Co. Cork on 027-71232 (steele@bim.ie).

Aquaculture Research 2007

Aquaculture research is undertaken by industry, third-level institutions and the State sector with funding from national and EU programmes. This section of the report gives an overview of research projects that were initiated and ongoing during the year 2007. Much of the work reported here was funded prior to the year 2007 and for further information the reader should consult the "Status of Irish Aquaculture 2006". There were also a number of projects that received approval in the year 2007 but did not become active until 2008.

Aquaculture projects supported under Sub-Measure 3: Marine Research, Technology, Development and Innovation (NDP 2000 – 2006).

This Marine RTDI Measure is administered by the Marine Institute on behalf of DAFF and Department of Enterprise and Trade and Employment. Sub – Measure 3 was divided into two programmes - Applied Industry and Strategic Projects. The projects which were ongoing in the year 2007 are shown in the "Tables" of this section of the report. For further information the reader can consult "Oceans of Opportunity" and "A Guide to the NDP Industry RTDI Grant Aid Programmes Relevant to the Marine Sector" (Mercer *et al*. 2002).

Strategic Projects.

The Strategic programme objective was to support strategic marine RTDI projects that build national marine research capacity and provide a scientific basis for the sustainable development of marine resources. This goal was achieved through the provision of grant-aid, on a competitive basis, for collaborative, problem-oriented marine RTDI projects. The projects that were ongoing in 2007 are shown in Table 8:2.

Table 8:2. Strategic Projects Grant Aid Approved under the Marine RTDI Measure (NDP 2000 to 2006) (MI).

Strategic Projects.	Project duration (years)
Biological Oceanography of Harmful Algal Blooms off the West Coast of Ireland (BOHAB). Irish Partners - (Lead Partner) Martin Ryan Institute (NUI Galway) and Marine Institute. Overseas partner - Woods Hole Oceanographic Institute, (USA). michael.guiry@nuigalway.ie	3
Isolation and Purification of Azaspiracids from Naturally Contaminated Materials and Evaluation of their Toxicological Effects (ASTOX). Irish Partners - Marine Institute, Galway (Lead Partner) and Conway Institute for Biomedical Sciences, UCD. Overseas partners - Centre for Coastal Environment Health and Biomolecular Research, NOAA, (USA). Chiba University, Japan Food Research Laboratories, Graduate School of Agricultural Science and Tohoku University (Japan). phillip.hess@marine.ie (replaced by Conor Duffy conor.duffy@marine.ie)	3
Resource and Risk Assessment of Mussel Seed in the Irish Sea. Irish Partners - Aquaculture Development Centre, UCC (Lead Partner), South East Shellfish Co-Op Ltd. (Co. Waterford), Aqua-Fact International Services Ltd. (Galway), Seabed Surveys International Ltd. (Cork), Department of Zoology (UCD), School of Biology and Biochemistry, Queen's University Belfast. tasman.crowe@ucd.ie	3
Site Investigations and Disease Management of the Pancreas Disease Virus in Irish Farmed Salmon. Irish Partners - Marine Institute, Galway (Lead Partner), Queens University Belfast, Vet-Aqua International (Galway), Muir Gheal Teo. (Galway) and Eany Fish Products Ltd. (Donegal). neil.ruane@marine.ie	2
An Investigation into the Ability of Pacific Oysters, Scallops & Abalone to Act as Carriers of the Protozoan *Bonamia ostreae.* Partners - Department of Zoology, Ecology and Plant Science/Aquaculture Development Centre, UCC. s.culloty@ucc.ie	2
Finding Aquatic Viral Epitopes for Production of Peptide Based Vaccines. Irish Partner(s) - National Diagnostics Centre, NUI Galway (Lead Partner). Overseas - Norwegian School of Veterinary Sciences and Institute for Animal Health (UK). iain.shaw@nuigalway.ie	2
Novel Vaccines for the Control of Sea Lice on Salmonids. Irish Partner - Faculty of Veterinary Medicine, UCD. The project involves collaboration with the Marine Institute and the University of Technology, Sydney. grace.mulcahy@ucd.ie	2

Post-Doctoral Fellowships.
The purpose of the Marine RTDI Post-doctoral Fellowship Award Scheme was to build RTDI capacity and excellence in selected marine sectors. The Post – Doc fellowships which were ongoing in 2007 are listed in Table 8:3.

Table 8:3. Post Doctoral Fellowships Grant Aid Approved under the Marine RTDI measure (NDP 2000 to 2006) (MI).

Post Doctoral Fellowships.	Project duration (years)
Advanced Technologies for Aquaculture. Host Institute: University of Limerick (UL). daniel.toal@ul.ie	2

PhD Scholarships.
The goals of the Marine RTDI Postgraduate Scholarship Award Scheme was to build Irish RTDI capacity and excellence in selected marine sectors through the provision of grant-aid for PhD scholarships. Table 8:4 shows the PhD scholarship that was active in the year 2007.

Table 8:4. PhD Scholarships Grant Aid Approved under the Marine RTDI measure (NDP 2000 to 2006) (MI).

PhD Scholarships.	Project duration (years)
Advanced Technologies for Aquaculture Fellow/Host Institute: UL daniel.toal@ul.ie	2

Applied Industry Programme.
The objective of the applied industry measure was to facilitate small and micro companies who because of size were generally unable to participate in other R&D grant aid programmes (Table 8:5). Brokering is a feature of the programme where companies who do not have in-house R&D staff are encouraged to link up with third level institutes to carry out research. The maximum grant-aid payable under this scheme was €100,000.

Table 8:5. Applied Industry Projects Grant Aid Approved under the Marine RTDI measure (NDP 2000 to 2006) (MI).

Applied Industry Projects.	Project duration (years)
Acclimatization Potential of Arctic Charr (*Salvelinus alpinus*) to a Marine Environment. Industry Partner: Stofnfiskur (Ireland) Ltd., Co. Galway. Research Partner: Department of Zoology, NUI, Galway. iskur@stofnfiskur.is	1.5
Development of an Alternative Natural Source of Astaxanthin for the Aquaculture Market. Industry Partner: Cybercolours Ltd., Co. Cork. Research Partner: Department of Zoology, Ecology and Plant Science, UCC. noelsexton@cybercolors.ie	1
Evaluation of Selected Biophysical Properties of Salmon Pancreas Disease Virus (SPDV). Industry Partner: Irish Salmon Growers Association Ltd., Co. Galway. Research Partner: Department of Veterinary Science, QUB. richieflynn@ifa.ie	0.75
Development & Assessment of the First Hatchery-Stage Artificial Diets for Sea Urchins (Hatch Feeds). Industry Partner: Dunmanus Seafoods, Ltd. Research Partner: Aquaculture and Fisheries Development Centre-ERI, UCC. seaurchins@eirocom.net	1.5

An example of an applied industry project is “Evaluation of the Promotion of Offshore Aquaculture through a Technology Platform (OATP)”. In November 2006, a group comprising of State agencies, research institutes, aquaculture associations and SME’s from ten European countries successfully submitted a proposal on Offshore Aquaculture under the 6th Framework Programme. The project, which is being led by the Marine Institute’s Aquaculture section, is to investigate the opportunity and usefulness for the aquaculture industry of promoting offshore aquaculture through a technological platform. The OATP project will bring together the available knowledge and experience of offshore aquaculture from across Europe by the most efficient and practical methods available and ensure it is set in a global context. To this end, all participants will be involved in the main project activities, collecting and collating information gathered by a questionnaire survey, participating in the main workshop and contributing to the final report, which was to be submitted to the EU Commission in 2008.

FP7/FP6

There was one project approved (subject to contract negotiation) through FP7 (Table 8:6a) and one project funded under FP6 (Table 8:6b) in 2007.

Table 8:6a. Marine Projects with Irish Partners in FP7 Cooperation Programme (Subject to Contract Negotiation) (MI).

Programme / Project Acronym	Project Title	Total Project Cost €m	Grant-Aid To Project	Irish Partner Organisation	Irish Contact	Funding to Ireland (NB requested)
2007 Theme 6 - Environment	MIDTAIL Microarrays for the detection of toxic algae.	€4.3m	€2.2 m	NUIG	Robin Raine	€363,629

Table 8:6b. Marine Projects with Irish Partners in FP6.

FP6 Project	Project duration (years)
OATP - Offshore Aquaculture Technology Platform. Project Type: Coordination Action. Total Project cost (grant aid and contributions): €201,300. Irish Partners – (Coordinator) Marine Institute. Contact – Dr. Dave Jackson. dave.jackson@marine.ie	1.16

INTERREG III

INTERREG III is a European Regional Development Fund (ERDF) Programme designed to strengthen economic and social cohesion in the European Union (EU) by promoting cross-border co-operation. INTERREG is not a research and development programme, though projects promoting economic, social and environmental cohesion can have an R&D element. Particularly in the areas of marine and coastal resource development.

The various strands of the INTERRREG III programme are:

Maritime INTERREG-IIIA Ireland/Wales (www.interreg.ie);
INTERREG IIIB Atlantic Arc (www.interreg-atlantique.org);
INTERREG –IIIB North West Europe (www.nweurope.org); and
INTERREG-IIIC (www.interreg3c.net).

The Irish groups involved in the INTERREG projects over the years can be broken down as follows:

- **The Higher Education Sector.** Irish third-level institutes (University College Cork, National University of Ireland Galway, University College Dublin and Trinity College Dublin).
- **Public Research Institutes.** Four public research/development institutes (Marine Institute, BIM, Enterprise Ireland and Central Fisheries Board).
- **Local Authority / NGOs.** Regional and Local Authorities and NGOs (e.g. An Taisce, AquaTT).

The list of INTERREG IIIA and IIIB projects in Appendix V was sourced from the "Directory of Irish marine successes in the EU Regional Development INTERREG III Programme (2000 to 2006)." An example of a major project funded under INTERREG is the AquaReg project which was ongoing in the year 2007 (Table 8:7).

Table 8:7. An Example of a Major INTERREG IIIC Project that Received Grant aid Approval (MI).

INTERREG IIIC	Project duration (years)
AquaReg. INTERREG III C. North. Total project cost (grant aid and contributions): € 4,297,000.00 Irish Partners – Irish Institute (BMW Region represented by Marine Institute). Contact – Alan Drumm. alan.drumm@marine.ie http://www.aquareg.com	3

Galicia, the Border Midland & West of Ireland (BMW) and Trøndelag all have strong maritime traditions, situated at different latitudes along the Atlantic Coast. The aim of Aquareg within these regions is to establish long-term co-operation in aquaculture and fisheries and to make more efficient use of the experience and knowledge of aquaculturists, fishermen and scientists, across regional and national borders.

The interregional partnership has outlined three strategies for achieving the objectives of AquaReg:

1. AquaLink: Linking aquaculture/fisheries business and research.
2. AquaEd: Education and training.
3. AquaPlan: Coastal zone planning and management.

For more information visit www.aquareg.com.

Higher Education Authority (HEA).
The HEA have funded a number of projects in the area of Marine Science under PRTLI (the Programme for Research in Third Level Institutions). Full details of the PRTLI Cycle 3, which runs from 2002 to 2006 and other HEA research programmes, may be found at www.hea.ie.

Enterprise Ireland (EI).
Enterprise Ireland administers and promotes a number of industry support measures that are grant aided under the industry RTDI Measure and the NDP Productive Sector Operational Programme. A list of support measures is available at http://www.enterprise-ireland.com/industry-support.asp

Sea Change
A Marine Knowledge, Research and Innovation Strategy for Ireland 2007 to 2013, emerged from the National Marine Foresight Exercise (2005) and was completed in 2006. The document sets out strategies and goals for developing the maritime knowledge base and is described in the “Status of Irish Aquaculture 2006”.

This section of the report gives an overview of some of the third level institutes in Ireland undertaking aquaculture related work and the wide range of funded aquaculture related research that has been carried out or approved in the year 2007. The reader should note that the number of researchers shown in the tables below may not indicate that they are dedicated full time to a project. Also, many of the projects shown may have multiple partners involved and these may not be shown on the tables.

University College Cork's (UCC), Aquaculture and Fisheries Development Centre (AFDC) supports and coordinates aquaculture research at undergraduate and postgraduate levels. Its objectives are "To support, stimulate and promote the development of aquaculture and fisheries, thereby enabling these sectors to achieve their full socio-economic potential by utilising sustainable natural resources" (Table 8:8).

Table 8:8. UCC and AFDC Aquaculture Research.

UNIVERSITY COLLEGE, CORK / AFDC	Short abstract.	Funding type, contact and number of researchers associated with the project.
(ST/05/25) An investigation into the ability of pacific oysters, scallops and abalone to act as carriers of the protozoan *Bonamia ostreae.*	The protistan *Bonamia ostreae* is a serious pathogen of the native oyster *Ostrea edulis*. Questions still exist in relation to the life cycle and modes of transmission of this pathogen. This study investigated the role of other molluscs of commercial significance in Ireland to act as hosts or incidental carriers for this parasite.	Marine Institute NDP 2000-2006 €197,05 21 December 2005-31 May 2008 s.culloty@ucc.ie 3 persons
UrchinFarm: Development of Commercial Sea Urchin Aquaculture in Ireland Using the UrchinPlatter™ System	The UrchinPlatter™ System is a novel, land-based method for farming sea urchins. The aim of this project was to develop and commercially validate this technology by performing a pilot-scale assessment under commercial farm conditions.	Government, Enterprise Ireland €340,000 May 2005, 3 years g.mouzakitis@ucc.ie
Commercial Validation of the RediBind™	The RediBind™ System is a novel method for production of feeds for marine animals. The aim of this project was to demonstrate pilot-scale production of marine feeds and validate the resulting feeds in commercial aquaculture farms.	Government, Enterprise Ireland €94,000 Dec 2007, 12 months g.mouzakitis@ucc.ie 3 persons
Development of Novel Diet Formulations for Marine Animals using the RediBind™ Technology	This project developed the basic techniques and methods for producing marine feeds using the RediBind™ System.	Government, Enterprise Ireland €90,000 May 2006, 12 months g.mouzakitis@ucc.ie 3 persons
Development and Assessment of the First Hatchery-Stage Artificial Diets for Sea Urchins (HatchFeeds)	The aim of this project was to develop a series of feeds for juvenile sea urchins using the RediBind™ System.	Government, Marine Institute €89,000 Dec 2005, 18 months g.mouzakitis@ucc.ie 5 persons

The **Daithi O'Murchu Marine Research Station (DOMMRS**) has been in operation since 1991 as part of the Aquaculture and Fisheries Development Centre (ADC), University College Cork. In 2005 it was established as an independent commercial research station and experimental hatchery. A scallop hatchery has been in operation at the Station for the last few years. Research work at the station has grown steadily and has included consultancy, commercial trials and participation in EC Projects (Table 8:9).

Table 8:9. Daithi O'Murchu Marine Research Station (DOMMRS) Aquaculture Research.

Daithi O'Murchu Marine Research Station	Short abstract.	Funding type, contact and number of researchers associated with the project.
Bivalves from farm to fork (BIFF).	The objective of the project will be to develop an economically viable and environmentally sustainable genetic breeding programme for scallops. The project will also optimise ongrowing, harvesting (effects of size of animal and seasonal harvesting) and processing (effects of different handling, storage and packaging) of the shellfish.	Marie Curie IAPP €579,085 1st October 2006 (four years) Julie.maguire@dommrc.com 9 (5 partners)
Organic fish production through sustainable and environmental friendly fish farming in Northern areas.	The aim of this study is to examine the rearing of ballan wrasse *Labrus bergylta* and the application of this species in sea lice control.	INTERREG Northern Periphery Programme €1,594,966 1st Jan 2008 (three years) Julie.maguire@dommrc.com 6 (5 partners)

The **University of Limerick (UL)** is heavily involved in industry-led research (Table 8:10). This has resulted in significant research commercialisation activities and collaboration between our leading researchers and industry. Some key areas of interest are:

Materials & Surface Science,
Information & Communication Technologies,
Biosciences, Environment and Bioengineering.

Table 8:10. University of Limerick (UL) Aquaculture Research.

Mobile & Marine Robotics Research Centre / University of Limerick	Short abstract.	Funding type, contact and number of researchers associated with the project.
Advanced technologies for aquaculture Title of final report: aquaculture technologies for high energy marine sites	Detailed study of fish farming technologies employed in aquaculture globally with reference to suitability for use in exposed offshore sites off Ireland. Appraisal of the state-of-the-art in farming systems and technologies in Shellfish and Finfish aquaculture. Critical biological and technical aspects of offshore shellfish and finfish cultivation are examined. Identifies niche areas in aquaculture technology development / exploitation in Ireland and areas requiring research.	NDP Marine - Post Doctoral Fellowship Award 2005 (REF: PDOC/05/001) €120,000 Dec 2005 – Mar 2008 Sean.nolan@ul.ie; Daniel.toal@ul.ie Marine Robotics Research Centre 4 persons

Letterkenny Institute of Technology (LIT) is a third level institution serving Donegal and the north west of Ireland. The **Centre of Applied Marine Biotechnology (CAMBio)** at LIT undertakes applied marine biotechnology research in collaboration with industry in aquaculture, marine biodiscovery, marine food processing and waste remediation (Table 8:11).

Table 8:11. Letterkenny Institute of Technology (LIT) and the Centre of Applied Marine Biotechnology (CAMBio) Aquaculture Research.

CAMBio Centre of Applied Marine Biotechnology	Short abstract.	Funding type, contact and number of researchers associated with the project.
The identification of bivalve larvae using fluorescence in-situ hybridisation (FISH) techniques.	Development of a technique for the identification of mussel and scallop larvae in the wild to support determination of where, when and at what intensity larvae of these commercial species settle in nature to become shellfish seed.	Enterprise Ireland and IRCSET October 2005 (Three year) € 417,000 www.cambio.ie 4 persons
Adding value to crab-shell waste.	Disposal of crab shell waste to landfill sites is an increasingly expensive option. Internationally crustacean shell waste is used for the production of chitin and chitosan. This project is targeting the identification of high value added products which can be extracted or produced from the waste by microbial fermentation.	Enterprise Ireland August 2007 (Two and half years) € 450,000 www.cambio.ie 3 persons
Bacterial pathogens in the salmon and fish processing industry.	The presence of the pathogens *Salmonella* spp., *Campylobacter*, *Listeria monocytogenes*, *E. coli* 157:H7 in food is a major issue in food safety. The aim of this project is to develop a reliable and sensitive multiplex real-time PCR technique for the simultaneous detection of three food-borne pathogens of concern to the salmon and fish processing industry.	Enterprise Ireland January 2005 (Four years) € 450,000 www.cambio.ie 4 persons
Development of an immobilised molecular beacon E-DNA biosensor.	The objective of this project is development of an electrochemical DNA biosensor platform assembled on a disposable gold electrode. By changing the DNA probe attached to the electrode the sensor may be tailored for applications in shellfish larval identification, toxic algal monitoring and the detection of bacterial pathogens in fish and shellfish.	IRCSET / Enterprise Ireland / Tyndall NAP September 2002 (Six years) € 150,200 www.cambio.ie 4 persons
Molecular-based dietary analysis of marine bivalve larvae.	Molecular fingerprinting techniques are being used to identify the composition of adult and larval shellfish diets in nature. Such information can be applied to the tailoring of larval diets in shellfish hatcheries and may also help to identify the phytoplankton species responsible for AZP toxicity.	Higher Education Authority August 2007 (Three years) € 298,365 www.cambio.ie 4 persons
Machine vision for the identification of bivalve larvae.	Computational pattern recognition methods for the automated identification and size analysis of shellfish larvae with a view to supporting the development of a tool for spatfall prediction are being developed in this project.	Higher Education Authority September 2005 (Four years) € 34,000 www.cambio.ie 3 persons
Validation characteristics for ASP toxin measurement.	The procedure for the extraction of domoic acid from shellfish tissue prior to analysis involves the use of 50% aqueous methanol followed by measurement using HPLC. The efficiency of toxin extraction from a range of shellfish tissues is being determined. Extraction efficiency is being investigated over a range of concentrations, both above and below the 20µg/g concentration in EU Directive 2002/226/EC.	LYIT Res. Fund and Higher Education Authority 2002 to 2008 € 56,500 www.cambio.ie 3 persons

NUI Galway has a long tradition of marine science research and the **Martin Ryan Institute (MRI)** is the home of marine science research at NUI Galway. The MRI now serves as a regional, national and international Centre of Excellence for the study of marine and freshwater resources. The MRI has outreach research facilities at Carna, Co. Galway. The MRI Carna is engaged in the many challenges now facing the Irish aquaculture and inshore fisheries sectors (Table 8:12).

Table 8:12. NUI Galway and the Martin Ryan Institute (MRI) Aquaculture Research.

National University of Ireland, Galway / Ollscoil na hÉireann, Gaillimh / MRI CARNA / Martin Ryan Institute, Carna / Institiúid Mháirtín Uí Riain, Carna	**Short abstract**	**Funding type, contact and number of researchers associated with the project.**
Development and demonstration of viable hatchery and ongrowing methodologies for seaweed species with identified commercial potential.	Developing a seaweed hatchery and on-growing techniques for *Palmaria palmata, Laminaria digitata*, and *Porphyra* sp with technology transfer to industry and development of marketing strategies for products.	Marine Institute Sea Change NDP (three years) Lucy Watson, BIM Watson@bim.ie 7 persons
Marine functional foods research initiative.	Studies have shown that marine resources are unrivalled sources of compounds with the potential to maintain and improve health through inclusion in other foods or as whole foods. This initiative aims to provide seed capital to develop the neglected area of marine origin functional foods and create a sustainable network of researchers dedicated to world-class innovative research in this area.	Marine Institute, Sea Change NDP & Dept of Agriculture FF. 1/3/08 (five years) Dr Declan Troy, Head Ashtown Food Research Centre 14 new researchers recruited and 30+ involved from eight Universities and research centres.
Establishment of high-value seaweed culture - Porphyra biomass production.	Porphyra is one of the most highly prized seaweed species growing naturally along the Irish coastline. In this project funded by BIM, researchers at MRI Carna are seeking to develop a sustainable method of intensively cultivating this high-value product for niche local and international markets.	Bord Iascaigh Mhara June 2007 (one year) Dr Stefan Kraan Stefan.Kraan@nuigalway.ie 1 person
Long-term cold water storage of high valuable crustacean species.	Most Crustacean harvesting occurs during the summer months. Long-term storage would allow summer production to be transferred to a winter market when value is at its highest. This project is defining the protocols for cost effective cold-water storage and transport of live lobster to the European market.	Bord Iascaigh Mhara June 2007 (one year) Dr Mark Harvey mark.harvey@nuigalway.ie 1 person
Investigations into the general biology and Breeding of Ballan wrasse, *Labrus bergylta* (Ascanius, 1767), for the provision of an alternative, ecological and effective sea lice treatment in Irish Salmonid aquaculture.	International trends in the regulatory environment and increasingly consumer preferences are highlighting the opportunities for organic produce and this applies particularly to farmed salmon. The use of wrasse as biological cleaner fish offers the aquaculture sector with a number of advantages, not least of which is the reduction/removal of chemical treatment and their impacts on the environment. One of the primary objectives is to develop a protocol for the sustainable production of wrasse as a cleaner fish.	BIM and Marine Harvest Ireland May 2007 (two years) Dr Richard FitzGerald / Dr Ashie Norris Richard.fitzgerald@nuigalway.ie 1 person
U.I.S.C.E. - Understanding Irish Shellfish Culture Environments.	This shellfish carrying-capacity and water quality modelling project seeks to understand the environment in which Irish shellfish are cultivated. Researchers are seeking to establish the optimum culture practices within three reference bays around the coast. At MRI Carna scientists are examining the growth rates of mussels at selected sites to inform the overarching modelling project.	Bord Iascaigh Mhara May 2007 (one year) Dr Richard FitzGerald / Dr Terence O'Carroll ocarroll@bim.ie 1 person

Summaries of three selected aquaculture research projects.
It is not possible in this report to provide detailed information on each research project being undertaken. However for the readers benefit three selected research project summaries have been included below. These are as follows:

1. EIRCOD (Cod Broodstock and Breeding Programme for Ireland).
2. Total Energy Solutions for Sustainable Aquaculture (TESSA).
3. Development and demonstration of viable hatchery and ongrowing methodologies for seaweed species with identified commercial potential.

EIRCOD (Cod Broodstock and Breeding Programme for Ireland).

EIRCOD is the Cod Broodstock and Breeding Programme for Ireland funded under the Sea Change Initiative with the support of the Marine Institute and the Marine Research Sub-programme of the National Development Plan 2007 to 2013.

National University of Ireland, Galway
Ollscoil na hÉireann, Gaillimh

MRI CARNA
Martin Ryan Institute, Carna
Institiúid Mháirtín Uí Riain, Carna

Background: Across Europe and the World, there is a broad movement, fuelled by strategic National R & D programmes toward further commercial development in the Marine Sector, to expand the range of seafood products available to a growing and more demanding consumer market. With declining wild catches and caution over exploitation and depletion of stocks, there has been an ever-growing pressure on aquaculture to service and supply these market needs and, in turn, this is reflected in diverse initiatives to expand production volumes and to increase the variety of species farmed including cod. These issues are clearly evidenced and highlighted in recent preparatory actions and in the specific work programmes under the National Development Programme of the relevant State Agencies, notably, the Marine Institute with Sea Change (2006). An intrinsic part of this process is the establishment of Broodstock programmes to exploit the inherent genetic 'Biodiversity' embodied in wild populations and allowing continued selected breeding and possible improved performance in farmed stocks. Indeed, these trends were recognised and acted upon as early as 2001-2 with the establishment of the New Species Development Group and, subsequent work led to the initiation of cod farming, with the active support of the various State Agencies, including, Údarás na Gaeltachta, BIM and the Marine Institute. This has now led to the completion of the life cycle in Ireland from larval production to onrearing at sea and, finally, this spring the harvesting of cod for market from a commercial production unit.

Project: The overall objective of the EIRCOD project is to design, establish and operate a Cod Broodstock and Breeding programme, customized for the Irish environment and underpinning the native fish farming industry, which will draw on the potential genetic reservoir of local cod populations and utilize the best available technologies, with necessary and appropriate International links, such that the emerging industry can gain maximum competitive advantage from using a customized Cod farming Stock that has enhanced performance capacity, including:

- Higher growth rates to increase production and yield.
- Shorter life span at sea/to market reducing production costs.
- Improved Conversion Efficiencies giving more efficient use of feeds.
- Lowered stress, fewer health issues and less mortality.
- Improved flesh quality.

The overall Work Programme for the seven year period has a number of integrated work packages including Characterization & Profiling of native Irish Cod Stocks, Enhanced Technical Performance for Eggs & Larvae and, critically, Broodstock Production & Selection. Other allied tasks include an Economic Assessment of Cod Production in Ireland and technology transfer and dissemination activities to local industry.

A strategic consortium of Irish partners are to undertake this work including, MRI Carna, UCC, Irish Seafood Producers Group, BIM, Trosc Teo and Dr Ashie Norris, consultant.

Marine Institute
Foras na Mara

SeaChange
Casadh na Taoide

NDP
National Development Plan 2007 - 2013

Total Energy Solutions for Sustainable Aquaculture (TESSA), Galway Mayo Institute of Technology (GMIT).

Increased oil price and consequently increased petrol and diesel fuel prices put pressure on electricity and gas prices in the short and medium term. These developments are of particular interest to industries such as power generation and transportation which depend heavily on energy. However, they are of equal interest to other sectors, none more so than the Irish aquaculture industry, where energy cost ranks alongside labour and feed.

Researchers from GMIT's Research for Alternative Culture Enterprises (RACE) Group recognised that energy cost has long been a key constraint to growth in the aquaculture sector and they teamed up with colleagues from the Centre for the Integration of Sustainable Energy Technologies (CiSET) in 2006 to help address this issue. Both groups were awarded funding for "Total Energy Solutions for Sustainable Aquaculture" (TESSA), a three year long project funded by the Department of Education and Science's STRAND III Program that commenced in June 2007.

The key aims are to:

- establish a profile for the year around energy consumption in Irish based aquaculture farms
- use this information to investigate alternative means of meeting energy requirements using a combination of:
    - sustainable energy technologies (energy supply)
    - energy efficiency measures (energy reduction)

The research combines desk study, energy audits through site visits nationally and internationally, construction and operation of a demonstrator facility at GMIT and system simulation.

The project is co-ordinated by Dr. John Lohan (CiSET), Brendan Allen and Dr. Ian O'Connor (RACE). Laurentiu Dimache has been recruited as project manager and Michael Greene as PhD researcher. The project has also received support from BIM Aquaculture for development of the demonstrator facility at GMIT.

For further information on the development of this project contact Laurentiu Dimache or Michael Greene by email: tessa@aquaculture.ie or by phone: +353 (0)91 74 2370 or +353 (0)91 74 2379.

Development and demonstration of viable hatchery and ongrowing methodologies for seaweed species with identified commercial potential.

This three year project is funded under the Sea Change Initiative with the support of the Marine Institute and the Marine Research Sub-programme of the National Development Plan 2007 – 2013.

Background: Identifying a global, increasing interest in aquatic plant aquaculture, the project aims to develop trial industry – scale hatchery and ongrowing methodologies for identified seaweed species (*Palmaria palmata*, *Laminaria digitata* and *Porphyra*) and to provide a platform for transferring the technology to create new business opportunities in seaweed aquaculture in Ireland.

Project Objectives: The project research objectives are two fold. Culture techniques have been demonstrated by vegetative propagation for red algae which are the higher value species, such as *Palmaria*. However hatchery protocols have not yet been perfected. In the first instance, the project aims to develop viable, industry scale hatchery and grow-out techniques including harvesting methods. These protocols will be trialled, improved on and written up in a manual. Workshops and on-site demonstrations will be used to disseminate the information. An economic model will be developed. Secondly, pilot scale hatchery methodologies and on-growing trials will be established for *Laminaria digitata* and *Porphyra*. Likewise the trials will be written up in a user friendly manual with information dissemination via workshops and on site demonstrations. An economic model will be worked up for industrial scale production. The project also aims to develop a species specific, desk based assessment of the criteria for optimum site selection for Irish seaweed ongrowing operations.

Project Partnership: There are three partners; BIM, the Centre for Marine Resources and Mariculture (C-Mar) of Queen's University Belfast (QUB) and the Irish Seaweed Centre (ISC) of National University of Ireland Galway (NUIG). The industry associates include Dolphin Sea Vegetable Company, Cartron Point Shellfish Ltd., Cleggan Seaweed Ltd., G & B Barge Operators Ltd., Tower Shellfish Ltd. and Roaring Water Bay Seaweed Co-operative Society Ltd. Taighde Mara Teo was also a non-funded project associate. BIM is responsible for the overall co-ordination and management of the project. The three year work programme is ambitious in its aims and brings together all the main academic and industry players in the seaweed sector in Ireland.

Northern Ireland C-MAR Research.

Queens University's "Centre for Marine Resources and Mariculture (C-Mar)" is a marine research and outreach centre within the School of Biological Sciences. Located at the Marine Laboratories in Portaferry, the Centre is focused and applied research in sustainable marine aquaculture (Table 8:13), inshore fisheries and marine resource management.

Table 8:13. Aquaculture-related Research in the Third-level Sector Northern Ireland (2007) (CMAR).

C-Mar	Short abstract	Funding type, contact and number of researchers associated with the project.
Native oysters in Carlingford Lough.	To develop a stock enhancement strategy and conduct growth trials for *Ostrea edulis* in Carlingford Lough.	INTERREG IIIA February 2007; one year 105,000 euros d.roberts@qub.ac.uk; http://www.c-mar.eu 3 persons Partners - Mourne Shellfish, Cloughmore Shellfish
Modelling tool for shellfisheries management.	To develop modelling software that will facilitate the sustainable development and management of shellfish aquaculture in coastal environments.	InterTrade Ireland – FUSION 2006; two years 40,000 euros d.roberts@qub.ac.uk; http://www.c-mar.eu 5 persons Partners - Marcon Computations International Ltd.
SHARE (Sustainable HARvesting of Ensis).	To develop recommendations for the sustainable production of razor clams in Europe.	INTERREG IIIB March 2004; 36 months; Completed 1.5 million euros d.roberts@qub.ac.uk; http://www.razorclam.eu 15 persons Partners - CIMA; University of La Coruna; IPIMAR; BIM
TIMES – Toward Integrated Management of Ensis Stocks.	To develop recommendations for integrated management of Ensis stocks in the Atlantic Area.	INTERREG IIIB March 2007; 16 months 750,000 euros d.roberts@qub.ac.uk; http://www.razorclam.eu 10 persons Partners - CIMA; University of La Coruna; IPIMAR
Marine Aquaculture Training Course 2007.	The course is targeted towards those interested in diversifying into aquaculture and those in aquaculture who wish to broaden their knowledge.	DARD Task Force for South Down – Fishing Villages Initiative; Interreg IIIA, Seafish 2007; 2 Years 150,000 euros d.roberts@qub.ac.uk; http://www.c-mar.eu 10 persons Partners - C-Mar, BIM, SFITA (Seafish)
Microsatellite DNA profiling in the European Lobster.	To develop molecular tools to support and monitor efficacy of female lobster V-notching programmes.	NI/EU BSP Programme 2006; 2 years 210,000 euros p.prodohl@qub.ac.uk 4 persons Partners - North East Lobster Fishermen's Co-op

AquaTT 2007

AquaTT is an international foundation based in Dublin which provides project management and training services to support the sustainable development of Europe's maritime sector. AquaTT supports the Education, Industry and Research sectors through the provision of services and through participation in, and coordination of EU projects and initiatives in the areas of education, training and technology transfer.

AquaTT collaborates with the Research Sector through involvement in EC research projects where AquaTT provides specialist training, dissemination and technology transfer services. AquaTT's main services to Producers and Industry are dissemination and communication initiatives, technology transfer and employment and mobility services. Educational institutions at all levels, from young people at primary level, thorough vocational and higher education level, in the European maritime sector are supported by AquaTT's services and initiatives including training courses and resources, networking, education policy development and pilot education projects.

PISCES TT Jobs (www.piscesttjobs.com) is a free online recruitment service for employers and potential employees in aquaculture and related science sectors. Using a secure and innovative site format, employers and job searchers can post job vacancies and CV's, respectively, thus facilitating human resource development in the industry.

AquaTT also produces a free news service "**TRAINING NEWS**" specifically for the aquaculture industry. The e-newsletter is sent out once a month and is intended to keep over 3,500 subscribers informed of developments in Education & Training and related areas. Previous Training News issues are archived on the AquaTT website.

In 2007 AquaTT participated in 7 EC projects* under a variety of programmes;
*(*AquaTT led projects are in **Bold**).*

- **AQUA-RET** – Marine Renewables E-Learning Project (www.aquaret.com).
- **AQUA-TNET** – Thematic Network in Aquaculture, Fisheries and Aquatic Resource Management (www.aquatnet.com).
- PESCALEX – Develop of Language modules for Aquaculture (www.pescalex.org).
- BLUE SEED – Provision of high quality hatchery Mussel spat (www.blueseedproject.com).
- PROFET POLICY – Communicating industry needs for EU Research (www.profetpolicy.info).
- CONSENSUS – Defining Sustainable Aquaculture (www.euraquaculture.info).
- CRAB – Collective Research project on Aquaculture Biofouling (www.crabproject.com).

Figure 8:1. CONSENSUS group (a project with AquaTT involvement).

An overview of Aquaculture related projects undertaken by AQUATT during the year 2007 is shown in Appendix VII and for further information go to: www.aquatt.ie

9. IRISH FARMERS ASSOCIATION (IFA)

IFA Aquaculture Activities 2007

IFA Aquaculture

IFA Aquaculture is the representative body for all Irish aquaculture producers (marine and freshwater, shellfish and finfish). The constituent bodies within IFA Aquaculture are:

- The Irish Salmon Growers Association (ISGA).
- The Irish Shellfish Association (ISA).
- The Irish Trout Producers Group (ITPG).

The organisation is also supported by service companies, processors of farmed seafood and equipment supply businesses.

IFA Aquaculture is the Irish representative on the Federation of European Aquaculture Producers, the European Mollusc Producers Association and the International Salmon Farmers' Association. IFA Aquaculture has been elected by the European finfish and shellfish sectors to chair the European Commission's Aquaculture Working Group since the year 2001.

Overview 2007

January 2007 saw the launch of the Cawley report, a detailed, widely supported document which offered the first realistic development plan for the seafood sector in many years. The Cawley report distilled very succinctly and directly the main issues and aims for aquaculture, as agreed with IFA Aquaculture and its members at the detailed discussions held around the country in 2006. The carefully argued proposals for a communications plan and a reform of the licensing system for aquaculture were widely welcomed by industry. The development plan envisaged an ambitious joint public and private investment of over €200 million to grow, modernise and make the shellfish and finfish sectors more efficient and profitable.

Shellfish

The shellfish sector enjoyed a buoyant market throughout most of 2007. The number of closures on account of biotoxins was lower and this relatively benign environmental situation reduced the number of Management Cell decisions. This allowed the ISA and the industry to concentrate on water quality issues and specifically on the Shellfish Waters Directive. The final ruling in the ISA case came though in the summer, leading the Government to announce in August 54 proposed new designations of bays and inlets for protection under the Directive.

The bottom mussel sector looked to try and capitalise on its relatively rapid success with a review of the sector and the management of the seed resource initiated at ISA's request.

Meetings were held with ISA members in six different locations around the coast with the SFPA to discuss the Good Practice Guide for microbiological monitoring of shellfish which now included for the first time a response element to spikes and ongoing *E.coli* occurrences.

Finfish

The salmon sector recovered from the discovery in late 2006 of IPN. Action by ISGA in association with State bodies and farmers ensured that financial implications were minimised and eggs sourced from new hatcheries which would improve both our health status and our genetic base. The Marine Institute in detailing the problem estimated that the potential loss of up to €31 million (the potential value of the fish which died, if they had gone to full harvest weight and without any production overheads being deducted) to the industry had been averted and that actual losses amounted to €1.2million. Far more importantly the 2008/09 harvest had been saved.

Organic certification of Irish salmon farms continued and the incidence of Pancreas Disease decreased markedly in most areas. The MIP on imports of Norwegian salmon was fixed and markets remained very buoyant throughout the year.

ISGA's priority in 2007 along with colleagues in shellfish production was to ensure the introduction of a new licensing regime which would reward farmers for good environmental practice, allow for the best possible preventative sea lice and PD control plan via fallowing and single generation sites and level the playing field between Ireland and our competitors in terms of red tape and efficiency. A number of bilateral meetings were held between IFA and the Coastal Zone Administration Division but lack of progress culminated in a meeting with Ministers Coughlan and Browne in October 2007 where full resources for the aquaculture division were promised with a swift reduction in the backlog of licence applications which stood at 250 at the end of the year.

International
The successful conclusion of negotiations in Brussels also saw the final version of the new Fish Health Directive after five years of dialogue between the European Commission and FEAP. At EU level as well, IFA Aquaculture was instrumental in persuading Commissioner Borg to begin putting a new EU Aquaculture Strategy in place, through detailed consultation which culminated in a successful two day conference in Brussels in November. IFA Aquaculture also represented the industry at a special inter-party group meeting in the European Parliament on the future of Aquaculture in October. ISGA also participated in a special workshop in Trondheim on sea lice control as part of the International Salmon Farmers Association and AquaNor 2007.

Other Activities
In April there was the “Aqua 20-20” event where IFA Aquaculture organised its most successful combined conference ever with two days of events and a high profile display of aquaculture products in Enfield. IFA Aquaculture ran a very well-attended and successful national Oyster Workshop in Sligo in October 2007 which included the first of 5 regional meetings with producers on the new Microbiological Good Practice Guide. Following the June General Election, IFA Aquaculture was active in lobbying and promoting the sector with all parties and especially the new marine spokespersons across all parties in the Dáil and Seanad since the General Election.

IFA Aquaculture is a partner in three projects submitted under the Marine Institute’s Sea Change programme – Aquaplan (developing procedures and identifying control zones for the new fish health directive), Gill Pathology (R&D into an economically important problem for marine farmers) AZA (Toxicology into the most economically significant toxin affecting shellfish growers).

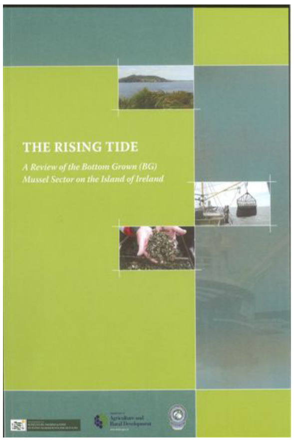
During the year, IFA Aquaculture handled a very wide range of individual issues for members – 67 in total (Not counting 37 Management Cell Decisions on biotoxins) – during 2007 ranging from individual licensing problems; local authorities’ development proposals; water quality-threatening developments including sewage schemes; airport runway development over shellfish beds; ro-ro facilities near oyster production; egg imports; grant aid for vessels; shellfish seed imports; shellfish classification problems; shellfish recalls; mussel seed issues; local development groups; developments of local piers for landing shellfish; shellfish gatherers documents; planning permission for freshwater finfish, etc.

During 2007 IFA Aquaculture represented Industry at meetings with or participated in committees of the following organisations:

- The Marine Institute
- BIM
- Údarás na Gaeltachta
- Sea Fisheries Protection Agency
- Ministerial Aquaculture Forum
- Seafood Strategy Implementation Group
- Molluscan Shellfish Safety Committee
- Shellfish Microbiological Monitoring sub group
- Irish Fish and Shellfish Health Committee and Code of Practice subgroup
- Technical Committees of the Salmon, Mussel and Oyster Quality Marks
- National Salmon Commission
- Regional Fishery Boards (through appointed members)
- EU Advisory Committee on Fisheries and Aquaculture
- Federation of European Aquaculture Producers
- European Mollusc Producers Association
- International Salmon Farmers Association
- Dept of Agriculture and Environmental Heritage Services Northern Ireland
- CRAB (Antifouling project with EU partners)
- Water Framework Project

Figure 9:1. Meeting Ministers in the new Department of Agriculture Fisheries and Food: Pictured at a meeting to discuss aquaculture licensing in September 2007 are (left to right) ISA Chairman, Flor Harrington; Minister of State John Browne TD; Minister Mary Coughlan TD; IFA Aquaculture Exec Secretary, Richie Flynn; ISGA Chairman, Damian Ó Ceallacháin.

10. "THE RISING TIDE"-A Review of the Bottom Grown (BG) Mussel Sector on the Island of Ireland



The bottom growing (BG) mussel industry has undergone many significant and predominantly successful changes over the last decade. There has been strong demand for the mussels produced and considerable financial investment by national and international sources. Arising from these and other developments it was decided to undertake a review to ensure that the potential of the sector is "unlocked in a way that is economical, socially and environmentally sustainable". The all Ireland evaluation of the industry was chaired by Donal Maguire (BIM) and was undertaken by a working group drawn from DARD, DAFF and the Loughs Agency under terms of reference set out by Ministers from both jurisdictions and supported by the Aquaculture Initiative EEIG. The report examined the BG mussel sector under the broad headings of marketing, environment, administration and implementation.

Marketing

A cornerstone for the progression of the bottom grown mussel industry is effective marketing. Demand for seafood supplies is increasing worldwide and this represents an opportunity for the BG mussel industry, the majority of whose production is exported in an undifferentiated bulk form. The key recommendations set out in the report are as follows:

1. Development agencies to actively work with BG mussel operators on the promotion of labeled IQM quality assured mussels into the Dutch-supplied marketplace.
2. Development agencies to engage in an awareness campaign and market development programme for BG mussels in the French market place.
3. Further investment to be made in market research and intelligence.
4. Improved services for commercially focused Research and Development/ New Product Development (NPD) to be provided by the relevant agencies.

Environment

An all Ireland environmental assessment was undertaken, the text of which is included in the report. Overall it was reported that the sector had a low impact in the areas of noise, visual, odour, water, landscape and material assets. It was reported that resource use (seed allocation) and ecological impacts (benthic impacts) required a greater level of understanding, these issues are being addressed by research initiatives. The recommendations arising from the report are:

1. Competent authorities to continue the assessment process where aquaculture sites for BG cultivation lie within or adjacent to NATURA 2000 sites.
2. 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 have 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 growing areas be addressed through the work of the proposed BGMCF.

Administrative arrangements

The "Rising Tide" report found that the administrative arrangements employed to support the BG mussel industry required restructuring. A general agreement of the report was that "an all-island management regime" must be developed (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. In summary it was recommended that:

1. The formation of an *All-island BG Mussel Consultative Forum (BGMCF).*
2. A dedicated Secretariat is formed to service the sector and the BGMCF.
3. The examination of issuing seed mussel fishing permits and that potentially any revenue generated would be used to fund the activities of the BGMCF and its secretariat.
4. That the Aquaculture Initiative EEIG be tasked with providing the Secretariat function negotiated with both Departments and the Loughs Agency.
5. The Secretariat commission an appropriate and mandatory stock tracking system which should be developed, introduced and administered under the aegis of the BGMCF.

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 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 are 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 licenced 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 BGMCF 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

To ensure the timely implementation of the complex recommendations set out in the "Rising Tide", it was deemed necessary to have an appropriate plan, assigning responsibility for each task together with the necessary timeframe for completion. It was envisaged that the BGMCF once established would become the main implementation body, however in the short term it was recommended that an interim implementation group (IIG) be formed. The IIG was to 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.

For further information on the "The Rising Tide" the reader should go to the main BIM webpage.

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APPENDICES

Appendix I: Irish Aquaculture Production (Volume - tonnes) 1990 to 2007 (BIM).

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Shellfish																		
Rope Mussel	3,380	4,700	5,091	4,773	3,707	5,500	7,000	6,694	7,790	6,467	4,045	7,580	7,699	9,313	8,755	8,755	9,660	11,200
Relaid Rope Seed	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2,788	4,300	-
Bottom Mussel	15,000	11,200	8,731	8,884	9,260	5,500	7,500	11,458	11,306	9,644	21,615	22,793	24,000	29,976	28,560	29,510	23,583	18,270
Gigas Oyster	361	1,278	1,750	2,014	1,862	2,539	4,000	3,135	5,369	6,555	5,031	4,909	5,444	4,830	5,103	5,811	6,511	7,032
Native Oyster	420	366	334	450	590	400	400	400	516	696	266	431	280	325	390	342	360	382
Clam	60	50	79	84	110	103	125	218	233	121	92	91	214	154	181	161	245	170
Scallop	-	-	-	-	-	-	-	24	25	33	61	49	67	80	103	87	37	58
Others	-	-	-	-	-	28	-	-	-	-	-	-	-	-	-	-	-	-
Total Shellfish	*19,221*	*17,594*	*15,985*	*16,205*	*15,529*	*14,070*	*19,025*	*21,929*	*25,239*	*23,516*	*31,110*	*35,853*	*37,704*	*44,678*	*43,092*	*47,454*	*44,696*	*37,112*
Finfish																		
Salmon ova/smolt	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Salmon	6,323	9,300	9,696	12,366	11,616	11,811	14,025	15,422	14,860	18,076	17,681	23,312	21,423	16,347	14,067	13,764	11,174	9,923
Sea reared Trout	324	560	432	677	613	470	690	1,020	1,046	1,077	1,360	977	888	370	282	717	546	507
Freshwater Trout	705	845	965	906	854	1,003	1,160	1,161	1,155	1,098	1,053	730	915	1,081	889	897	970	760
Others**	0	0	0	0	0	15	30	0	24	89	76	63	54	40	25	6	36	48
Total Finfish	*7,352*	*10,705*	*11,093*	*13,949*	*13,083*	*13,299*	*15,905*	*17,603*	*17,085*	*20,340*	*20,170*	*25,082*	*23,280*	*17,838*	*15,263*	*15,384*	*12,726*	*11,238*
Total Aquaculture	**26,573**	**28,299**	**27,078**	**30,154**	**28,612**	**27,369**	**34,930**	**39,532**	**42,324**	**43,856**	**51,280**	**60,935**	**60,984**	**62,516**	**58,355**	**62,838**	**57,422**	**48,350**

Appendix I: Irish Aquaculture Production (Value - €'000) 1990 to 2007 (BIM).

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Shellfish																		
Rope Mussel	1,717	2,343	2,974	2,727	2,118	3,143	4,000	4,252	5,094	4,298	2,358	4,205	5,489	7,568	6,871	6,579	7,177	7,784
Relaid Rope Seed	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	930	1,935	-
Bottom Mussel	2,286	1,715	1,816	1,850	2,703	1,864	2,542	4,431	5,028	4,115	10,562	12,691	16,896	21,653	21,014	25,718	35,789	20,906
Gigas Oyster	646	1,379	3,000	3,197	2,837	2,095	4,571	4,020	7,025	9,231	6,813	7,993	11,912	9,920	12,204	12,089	14,623	15,390
Native Oyster	2,108	1,859	994	1,524	1,847	1,412	1,524	1,270	1,971	2,913	1,027	2,060	1,157	1,324	1,636	1,708	1,941	1,630
Clam	305	180	251	245	321	131	516	705	827	424	361	589	1,421	795	711	849	1,382	1,038
Scallop	-	-	-	-	-	-	-	216	93	127	338	339	333	380	437	425	200	339
Others	-	-	-	-	-	61	-		104	531	53	65	684	142	727	380	201	204
Total Shellfish	*7,061*	*7,476*	*9,035*	*9,543*	*9,827*	*8,706*	*13,153*	*14,894*	*20,142*	*21,639*	*21,512*	*27,942*	*37,892*	*41,782*	*43,600*	*48,678*	*63,248*	*47,291*
Finfish																		
Salmon ova/smolt	-	-	-	-	-	-	-	-	-	2,616	4,401	2,905	4,848	2,000	2,337	2,500	3,378	2,869
Salmon	26,736	38,413	38,609	49,618	47,493	46,790	47,333	47,638	51,412	55,463	62,772	70,869	77,731	54,198	51,289	55,042	52,711	51,294
Sea reared Trout	1,131	1,671	2,150	1,371	1,947	2,598	1,927	2,720	2,980	3,525	4,831	2,837	2,108	1,200	860	1,568	2,444	1,932
Freshwater Trout	2,286	2,360	2,576	2,576	2,331	1,401	2,856	2,929	3,320	3,106	2,734	1,997	2,557	2,318	2,116	2,379	2,658	2,027
Others**	-	-	-	-	-	95	211	-	217	301	429	556	82	350	300	62	221	317
Total Finfish	*30,152*	*42,445*	*43,335*	*53,565*	*51,771*	*50,884*	*52,327*	*53,287*	*57,929*	*65,011*	*75,167*	*79,164*	*87,326*	*60,066*	*56,902*	*61,551*	*61,412*	*58,439*
Total Aquaculture	**37,213**	**49,921**	**52,370**	**63,109**	**61,598**	**59,590**	**65,480**	**68,181**	**78,071**	**86,650**	**96,679**	**107,107**	**125,218**	**101,848**	**100,502**	**110,229**	**124,660**	**105,730**

Appendix II:

Box 1. **Aquaculture Licence Appeals Board (ALAB).**
Following the decision by the Minister for Communications, Marine and Natural Resources to grant, refuse, revoke or amend an aquaculture licence, an appeal can be lodged to the Aquaculture Licences Appeals Board (ALAB). ALAB was established in 1998 under Section 22 of the Fisheries (Amendment) Act, 1997. Its function is to provide an independent authority for the determination of appeals against decisions of the Minister for Communications, Marine and Natural Resources on aquaculture licence applications. A person aggrieved by a decision of the Minister on an aquaculture licence application, or by the revocation or amendment of an aquaculture licence, may make an appeal within one month of publication (in the case of a decision) or notification (in the case of revocation/amendment).

The Board, in determining appeals, has the option of:

a) Confirming the decision of the Minister to grant or refuse a licence; or
Determining and issuing its own aquaculture licence as if the application for the licence had been made to the Board in the first instance.

Additionally, the Board may alter the terms or conditions of a licence decision granted by the Minister by issuing its own licence with additional or altered terms and conditions.

Box 2. **National Marine Biotoxin Monitoring Programme.**
Ireland is obliged under European legislation (Council Directive 853/2004 – a new food regulation which came into force in 2006) to have a National Marine Biotoxin Monitoring Programme to monitor shellfish harvesting areas for the presence of toxins produced by several different species of phytoplankton. The objectives of the programme are:

a) To protect consumers of Irish shellfish by promoting food safety in the sector;
b) To work with industry partners in the development of the industry; and
c) To develop a harmonious biotoxin management system that provides for industry requirements in line with consumer safety.

Details of the Biotoxin Monitoring Programme are outlined in a Code of Practice produced by the Food Safety Authority of Ireland (FSAI) - available at http://www.fsai.ie/sfma/about_cop.asp. It includes information on how shellfish samples are to be collected and analysed; reporting procedures and the procedures for opening and closing shellfish production areas. The Department of Communications Marine and Natural Resources (DCMNR), under a Service Contract with the FSAI, implements aspects of the Biotoxin Monitoring Programme in Ireland. The Marine Institute carries out marine biotoxin testing, also under a Service Contract with the FSAI. The four main toxin groups (and their causative agents) covered under the monitoring programme are:

1.	Diarrhetic Shellfish Poisoning (DSP)	*Dinophysis* species / *Prorocentrum lima*
2.	Paralytic Shellfish Poisoning (PSP)	*Alexandrium* species
3.	Azaspiracid Poisoning (AZP)	*Protoperidinium* species (suspected causative organism)
4.	Amnesic Shellfish Poisoning (ASP)	*Pseudo-nitzschia* species

If toxins are detected at levels that are unsafe for human consumption, the harvesting and sale of shellfish from the production area in question is prohibited. The ban on harvesting and sale is lifted only after thorough scientific analysis of samples shows that the product is safe for human consumption. Before harvesting from any production area, two samples, taken a minimum of 48 hours apart, must have levels of biotoxins below the regulatory limit. With the first of these two clear samples the area is assigned a “Closed Pending” status and with the second the area is assigned an “Open” status. If a result is positive for biotoxins then the area in question is assigned a “Closed” status and the area will need two clear results, from samples taken a minimum of 48 hours apart, to return to an “Open” status. The minimum frequency of testing is laid down for each species and this may have a seasonal variation. If samples are not provided for testing at the minimum frequency the area can lose its “Open” status.

The results for the biotoxin monitoring programme are available on the websites of the Marine Institute (www.marine.ie/habs) and the FSAI (www.fsai.ie/sfma/default.asp).

Appendix II (Contd.)

Box 3. **Classification of Designated Production Areas (EU Regulations 853 and 854 of 2004).**

(1) (a) Subject to paragraph (b), live bivalve molluscs of a species referred to in Column IV of the Annex to this Designation may be collected for direct human consumption from a bed specified in Column III of the said Annex where the classification specified in respect of that bed in Column VI of the said Annex is "A".

(b)Live bivalve molluscs to which this paragraph applies must meet the requirements set out in Annex I, Chapter 1 of Regulation (EC) No. 2073/2005 of 15th November 2005 (OJ No. L338 of 22.12.2005, p.9) and in Annex III, Section VII Chapter V of Regulation (EC) No. 853/2004) of 29th April, 2004 (OJ No. L139 of 30.04.04, p.60).

(2)(a) Subject to paragraph (b), live bivalve molluscs of a species referred to in Column IV of the Annex to this Designation which are collected from a bed specified in Column III of the said Annex may, where the classification specified in respect of that bed in Column VI of the said Annex is "B", be placed on the market for human consumption only after treatment in a purification centre or after relaying which ensures that the requirements specified in paragraph (1) (b) are met.

(b) Live bivalve molluscs from areas referred to in paragraph (a) must not exceed the limits of a five-tube, three-dilution MPN-test of 4,600 *E.coli* per 100g of flesh and intravalvular liquid.

(3)(a) Subject to paragraph (b), live bivalve molluscs of a species referred to in Column IV of the Annex to this Designation which are collected from a bed specified in Column III of the said Annex may, where the classification specified in respect of that bed in Column VI of the said Annex is "C", be placed on the market for human consumption only after relaying over a long period as specified in Annex III, Section VII, Chapter II of Regulation (EC) No. 853/2004) of 29th April, 2004 (OJ No. L139 of 30.04.04, p.57) which ensures that the requirements of paragraph (1) (b) are met.

(b) Live bivalve molluscs from areas referred to in paragraph (a) must not exceed the limits of a five-tube, three-dilution MPN-test of 46,000 E. coli per 100g of flesh and intravalvular liquid.

Box 4. **Irish National Reference Laboratory.**

The Marine Institute is the National Reference Laboratory (NRL) for monitoring microbiological and virological contamination of bivalve shellfish for Ireland. During 2006 the MI introduced standardised methods for enumeration of *E. coli* and detection of *Salmonella* spp. in shellfish into its new laboratory in Oranmore. In addition state of the art real-time PCR methods for detecting human pathogenic viruses in shellfish were introduced. The NRL undertakes virus testing for surveillance purposes and in specific response from the newly formed Sea Fisheries Protection Authority or the Food Safety Authority of Ireland.

The NRL is responsible for co-ordinating the activity of national laboratories carrying out testing for shellfish waters classification purposes (see main text). In 2006 five testing laboratories were contracted by the Marine Institute to undertake *E. coli* testing for this purpose. The contracts set down strict quality assurance criteria and ensure reliability of the test results.

Finally, the NRL assists the SFPA in the organisation of the national monitoring programme for viral and bacteriological contamination of bivalve molluscs. This includes the provision of scientific advice, selection of appropriate sampling points, sample storage, and analysis and interpretation of monitoring data.

Appendix II (Contd.)

Box 5. **Contaminants in Shellfish.**

Trace metals exist naturally in the environment and many, including, copper, iron and zinc are essential elements for living organisms. However, some trace metals such as mercury, lead and cadmium are not required for metabolic activity and can be toxic at quite low concentrations. These three elements occur naturally in the earth's crust, but they can also be introduced into the aquatic environment from activities such as mining, industry and transport. Once in the aquatic environment these metals can be bio-accumulated in shellfish tissues. Chromium contamination results mainly from human activities.

Polychlorinated biphenyls (PCBs) and organochlorine pesticides (OCPs) are man-made compounds that are ubiquitous air and water-borne contaminants. They are persistent pollutants with a tendency to bio-accumulate in shellfish tissues and bio-magnify through the food chain.

The determination of trace metal and chlorinated hydrocarbon concentrations in shellfish growing areas is carried out by the Marine Institute in part fulfilment of the monitoring requirements of various EU legislation, including:

- EU Directive 79/923/EEC on the quality required of shellfish growing waters (as implemented in Ireland by Statutory Instrument No. 200 of 1994).
- EU Directive 91/492/EEC laying down the health conditions for the production and placing on the market of live bivalve molluscs.

EU Commission Regulation 466/2001/EC (as amended by Regulation 221/2002/EC and Regulation 78/2005/EC) sets maximum levels for mercury, cadmium and lead in bivalve molluscs of 0.5, 1.0 and 1.5 mg kg-1 wet weight, respectively. The UK is the only country at present to set down a guideline value of 50 mg kg-1 for zinc in food; however this excludes shellfish. There are no published guidelines for acceptable concentrations of chromium, silver and nickel in shellfish. Therefore, results are compared against other areas to assess for any obviously elevated results. Oysters accumulate silver to a higher concentration than mussels and this is evident from the results obtained. Oysters are also known to accumulate high levels of zinc, particularly in the digestive glands.

Box 6. **Listed Diseases of Finfish and Shellfish.**

The Fish Health Directive- Health of Aquaculture Animals and Products Regulations 2008

The new Fish Health Directive (Council Directive 2006/88/EC) will come into effect on 1st August 2008 and introduces new animal health requirements for aquaculture animals and products and the prevention and control of certain diseases in aquatic animals. It updates and consolidates existing legislation and introduces new measures to reflect the significant growth and development in the aquaculture industry in Ireland over the past 15 years.

The new legislation requires the following operators to apply for fish health authorisation:

- finfish farmers;
- shellfish farmers;
- put and take fisheries;
- commercial aquaria;
- purification or dispatch centres
- aquaculture processing business which carry out sanitary slaughter following an outbreak;
- premises where aquaculture animals are kept without being sold or supplied
- premised where ornamental fish are kept in contact with natural water where effluent is not discharged

These operators are also required to put in place appropriate "biosecurity" measures; to participate in a fish health surveillance scheme; and to keep records of mortalities, movements and results of the risk based surveillance scheme, to ensure that disease outbreaks can be quickly detected and controlled adequately. Ireland remains free of many fish and shellfish diseases that occur in other countries and the aim of the Fish Health Directive is to keep those diseases out, thereby helping aquaculture in Ireland to be more competitive and profitable.

Key new features of this legislation include the establishment of a public register of authorised production businesses, and registration of transporters of aquaculture animals. There will be a lead in time to establish the *Aquaculture Animal Transport Register* and, once in place, only registered transporters may be used to transport certain aquaculture animals under the conditions of the authorisation. The public register of aquaculture production businesses will be in place by 1st August 2009.

The Directive also keeps in place a number of the successful elements of the previous legislation; including compulsory notification of certain diseases, compulsory eradication of exotic diseases (diseases which are exotic to the EU), freedom, eradication or containment for certain non-exotic diseases (disease which occur in parts of Europe), a trade regime within the EU which is based on health status; third country import rules and the ability for a member state to control diseases which are important to them subject (in certain cases) to EU scrutiny. Notifiable diseases which were not previously listed under EU legislation include exotic diseases: Epizootic Haematopoietic Necrosis, Epizootic Ulcerative Syndrome, Taura Syndrome, Yellowhead Disease; and non-exotic Koi Herpes Virus (KHV) and White Spot Disease. Ireland has disease free status in relation to finfish deaseases: Infectious Salmon Anaemia, Infectious Haematopoietic Necrosis, and Viral Haemorrhagic Septicaemia which are now listed as non-exotic diseases. Ireland also has disease free status in relation to non-exotic shellfish diseases *Marteilia refringens* and, in certain bays, *Bonamia Ostrea*[1]. Gyrodactylus salaris is one of the diseases no longer listed at EU level but under Ireland's 'Additional Guarantees' we will continue to be recognised as free of Gyrodactylus salaries, Spring Viraemia of Carp, and Bacterial Kidney Disease and outbreaks of these disease must be eradicated in order to maintain this disease-free status.

Authorisation

Authorisations granted under the new legislation will be granted separately to any aquaculture licence but will run concurrently with it. A Fish Health Authorisation will only deal with issues relating to animal health, while licenses will continue to regulate all other aspects of the aquaculture operation. Where any conflict arises between fish health aspects of current licences and the Fish Health Authorisation, the authorisation will take precedence. The Marine Institute is the Competent Authority for the implementation of the new regulations, and held seven information seminars at venues throughout the country from October to December 2008, to inform fish and shellfish farmers on the scope of the new legislation. Information on the new legislation has also been sent to every aquaculture production business in the country. Application forms and guidelines on how to prepare a Fish Health Management Plan as well as a summary document covering the main points of the legislation for both fish and shellfish producers are available to download from the Marine Institute website www.marine.ie/fishhealth.

Each application for an Authorisation must be accompanied by a Fish Health Management Plan indicating how the business intends to comply with the regulations. The plan should outline a risk-based fish health surveillance scheme; maintenance of appropriate records; good hygiene practices; action to be taken if there are increased mortalities; and action to be taken if an outbreak of a listed disease is suspected. Once authorisation is obtained, the Marine Institute will carry out regular inspections. The frequency of site surveillance will depend on the type of trade that business is involved in.

The new regulations place an obligation on aquaculture operators to report any suspicion or confirmation of diseases specified in the Directive or any increased mortality occurring in aquaculture animals to the Marine Institute. All operators can contact the Institute by fax to 091 387201 or by emailing notification@marine.ie . The Fish Health Unit (FHU) of the Marine Institute is the Irish National Reference Laboratory for fish and shellfish diseases and is the Competent Authority for the implementation of aquatic animal health legislation. You can call Fish Health Unit on 091 387200 with any legislation queries.

The draft Code of Practice for Finfish Aquaculture in Ireland and the supporting Fish Health Handbook may also assist those businesses holding finfish, in preparing biosecurity plans. These documents are available by contacting The Irish Salmon Growers Association, Irish Farm Centre, Bluebell, Dublin 12.

Box 7. **The National Sea Lice Management Plan.**

In 1991, in response to concerns about the possible impacts of sea lice from salmon farms on wild populations of sea trout, a sea lice monitoring programme was initiated by the Department of the Marine. In 1992/1993 the programme was expanded and culminated in the publishing in May 2000 of the '*Offshore Finfish Farms - Sea Lice Monitoring and Control Protocol* (Department of the Marine and Natural Resources, 2000).

The purpose of the National Sea Lice Monitoring Plan is to:

Provide an objective measurement of infestation levels on farms.
Investigate the nature of the infestations.
Provide management information to drive the implementation of the control and management strategy.
Facilitate further development and refinement of control and management strategies.

The management strategy for sea lice control has five principal components:

Separation of generations.
Annual fallowing of production sites.
Early harvest of two sea-winter fish.
Targeted treatment regimes, including synchronous treatments.
Agreed husbandry practices (including fish health, quality and environmental issues).

Together, these components work to reduce the development of infestations and to ensure the most effective treatment of developing infestations. They minimise lice levels whilst controlling reliance on, and reducing use of, veterinary medicines. The separation of generations and annual fallowing prevent the vertical transmission of infestations from one generation to the next, thus retarding their development. The early harvest of two-sea-winter fish removes a potential reservoir of lice infestation and the agreed practices and targeted treatments enhance the efficacy of treatment regimes. One important aspect of targeted treatments is the carrying out of autumn / winter treatments to reduce lice burdens to as close to zero as practicable on all fish which are to be over-wintered. This is fundamental to achieving near zero egg-bearing lice in spring. The agreed husbandry practises cover a range of related fish health, quality and environmental issues in addition to those specifically related to lice control.

When lice levels exceed pre-set treatment figures (the **treatment trigger level**), advice is given to treat the affected stock. These are designed to minimise any risk of transmission of sea lice from fish farms to wild sea trout stocks. The current treatment trigger level is 0.3 – 0.5 egg-bearing (ovigerous) female lice per fish during spring. Outside the critical spring period, the treatment trigger level is set at 2.0 egg-bearing female lice per fish. Where numbers of mobile lice are high, treatments are triggered even in the absence of egg-bearing females.

Box 8. **Benthic Monitoring at Finfish Sites.**

Finfish farming results in inputs to the marine environment in the form of uneaten feed and faecal material. This oxygen-consuming organic 'rain' falls to the seafloor and can result in stress on the benthic environment, i.e. de-oxygenated sediments. This, in turn, can lead to changes in the benthic community structure, including a decrease in faunal diversity and increases in the abundance of so-called 'opportunistic' species associated with deteriorated conditions (e.g. the polychaete worms *Capitella capitata* and *Malacoceros fuliginosa*). The hydrodynamics of cage sites dictate the potential for organic build-up and associated impacts on benthic communities. Stratified, semi-enclosed water bodies with poor water exchange are most at risk from such inputs.

Adherence to the benthic monitoring protocols are now included as a condition in all new (and renewed) marine finfish aquaculture licences. The sea bed under and adjacent to finfish aquaculture sites is monitored annually with a view to minimising the impact and ensuring environmental quality is within acceptable limits.

All finfish farms that are subject to the monitoring protocols must carry out an annual survey at each site (production and smolt) included in the relevant licence. The level of detail required in the benthic survey is dependent on the biomass held at the site and the local hydrographical conditions.

The monitoring protocols allow for a certain degree of impact on the seabed beneath and adjacent to the fish cages, with the acceptable level of impact decreasing with distance from the cages. In the event of a breach of the allowable impact levels, the licencee must submit a Benthic Amelioration Plan to the Department of Agriculture Fisheries and Food, with the aim of achieving an acceptable benthic standard in the licenced area as soon as possible. The plan may include actions such as a feed waste control plan; a reduction in the documented volumes of fish feed into the licenced area in question; movement of all production cages; and a reduction in production tonnage. A subsequent survey of the impacted area determines if the amelioration plan has been successful.

Appendix II (Contd.)

Box 9. **National Residue-Monitoring Plan.**

European Union (EU) Directive 96/23 of the 29th April 1996 requires member States to monitor certain "substances and residues thereof in live animals and animal products". The Department of Agriculture, Fisheries and Food (DAFF) are responsible for implementing the Directive in Ireland, where the Sea Fisheries Protection Authority (SFPA) with support from the Marine Institute (MI) are responsible for the implementation of this directive with respect to finfish. The Food Safety Authority of Ireland (FSAI) co-ordinate the activities of the various departments and agencies involved in delivering this programme.

Any species of farmed finfish that is produced in greater quantity than 100 tonnes annually is subject to analysis under the Residue programme. Based on this production level requirement, three farmed species (salmon, fresh-water trout and sea-reared trout) are currently monitored. The National Residues Control Plan for aquaculture is submitted annually to DAFF for inclusion in the overall national plan and onward transmission to the European Commission. It outlines the sampling frequency and analysis that will be undertaken. For aquaculture, a wide range of substances are tested. These are specified in the National Residues Control Plan (NRCP) and are reviewed annually.

Samples of farmed finfish are collected at the time of harvest and at other stages of production by an officer authorised under the Animal Remedies Act, 1993. Samples are maintained under a strict chain of custody. Archive sub-samples are retained at the Marine Institute and are available for testing by reference laboratories in the event of a disputed result.

Directive 96/23 requires that following initial "screening" tests on samples, positive test results are confirmed using appropriate test methodology and according to EU guidelines. The Marine Institute reports all positive results to DAFF, SFPA and FSAI. Decisions in relation to the positive result(s) and follow-up action are made by the Case Management Group (CMG). The CMG is made up of representatives from SFPA, FSAI and the Marine Institute. Follow-up action may involve further sampling, investigations and criminal proceedings.

The results of this programme are submitted annually to DAFF, SFPA and FSAI. It is the responsibility of DAFF to coordinate the results for all farmed animals and products and to submit the results to the EU. This report is also released into the public domain. The individual test results for specific aquaculture sites are also reported to the companies who supplied samples.

Appendix III: Weight Conversion Rates for Salmon.

Salmon production is given as Round Weight Equivalent (RWE). This is the mass of a fish after it has been starved and bled, also known as the harvest weight.

In calculating the salmon harvest it may be appropriate to work backwards using the following conversion rates:

Harvest weight (RWE)	- 100%
Gutted fish	- 90%
Head-off and gutted	- 83%
Fillet, with skin on	- 68%
Fillet, with skin off	- 60%

e.g. The RWE (Harvest weight) of 100 tonnes of head-off, gutted salmon is
100/0.83 = 120 tonnes.

Appendix IV: Designated Bivalve Mollusc Production Areas around Ireland 2007 (as per 2006 SFPA).

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	B
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	A B	B B
Gweedore	Carrick Point to Carrickacuskeame and Torglass Island to Dunmore Point	All Beds	Oysters	B	B
Dungloe	Wyon Point to Burtonport Pier	Dungloe	Oysters	B	B
Traweenagh	Dooey Point to Crohy Point	All Beds	Mussels Oysters	A	B 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 to Pound Point	Bruckless	Mussels	A	A
Inver Bay	St. John's Point to Doorin Point	All Beds	Mussels	A	B
Donegal Harbour	Doorin Point to Rossnowlagh Point.	All Beds	Oysters Mussels	B	B
Drumcliff Bay	Raghly Point to Deadman's Point	All Beds	Oysters Clams Mussels Cockles	A B B B	B B B B
Sligo Harbour	Deadman's Point to Killaspug Point	All Beds	Oysters Clams	B	B
Ballysodare Bay	Killaspug Point to Derkmore Point	All Beds	Mussels	B	B
Killala Bay	Ross Point to Iniscrone Point	All licenced Beds All Beds	Oysters Mussels	A -	A B
Blacksod Bay (Belmullet)	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 A
Clew Bay	Area bounded to the south by 53° 52.60' N and to the west by 9° 37'. W and to the east by 9° 35.15'W	Newport Bay	Oysters Mussels	B	A -
	Area within a one nautical mile (1,852 M) radius of Roskeen Point (53° 53.46'N, 09° 40.10' W)	Tieranaur Bay	Oysters	B	A
	Area bounded to the west by a line from Mulranny Pier to Old Head and to the south east by 09° 35.37' W	Corrie Channel and Rosslaher Beds	Mussels Oysters	B	B
		All other Beds	Mussels Oysters	A	A
Killary Harbour	Rusheen Point to Rossroe Quay	All Beds	Mussels	B	B
Ballinakill	Renvyle Point to Cleggan Point	All Beds	Oysters Mussels	A -	A B
Streamstown Bay	Gubarusheen Point to Omey House ruins to Ardoe	All Beds	Oysters	A	A

I **Production Area**	II **Boundaries**	III **Bed Name**	IV **Species**	V **Previous Classification**	VI **Current Classification**
Clifden Bay Inner	Errislanan Pier to Dooghbeg Quay (ruins)	All Beds	Mussels	B	B
Clifden Bay Outer	Errislanan Pt 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	Cloghmore Point to a point at 53°11’ 00” N, 9° 30’ 00” W to a point at 53°11’ 00” N, 9° 24’ 00” W. to Loughaunbeg Point.	Inverin	Mussels	-	B
	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 Clarenbridge and Killeenaran Beds	Oysters Mussels Oysters Mussels Clams	B A B A	B A B A
	Knockapreaghaun Point to Goragh Island to Traught Point (8° 59.1’ W and 53° 10.4’ N.)	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 A
Carrigaholt	Kiloher Head to Leck Point and Corlis Point to Beal Point	All Beds	Oysters	A	A
Poulnasharry	Corlis Point to Baurnahard Point	All Beds	Oysters	A	A
Kilrush	Ferry point (9° 32.55’ W and 52° 38.53’ N.) to Crusheen Point to and from Aylevaroo Point to Courtbrown Point	All Beds	Oysters	B	A
Ballylongford	Beal Point to Knockfinglas 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	Lamb’s Head to Cod’s Head	Ardgroom Cleandra Kilmakilloge Sneem/Tahilla Coosmore All other Beds	Mussels Mussels Mussels Mussels Mussels Oysters	A A B B B B	A A B B A 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° 37.5’N, 09° 42’W to Whiddy Point west to Relane Point. Sheep’s Head to Black Ball Head	Castletownbere South Shore All other Beds	Mussels Mussels Sea Urchins Mussels	A A B	A A B
Dunmanus Bay	Sheep’s Head to Three Castle Head	All Beds	Mussels Sea Urchins	B A	B A

I	II	III	IV	V	VI
Production Area	**Boundaries**	**Bed Name**	**Species**	**Previous Classification**	**Current Classification**
Roaringwater Bay	Cousnaganniv Point to Frolic Point	All beds	Mussels	B	B
Baltimore Harbour	Barrack Point to Beacon Point and Lettuce Point to Spanish Point to Grig's Point	All beds	Oysters	B	B
Sherkin North	Licensed sites	All licenced Beds	Oysters	A	A
Sherkin Kinish	Drawlaun Point to Long Point	All licenced Beds	Oysters	A	A
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°16.4' W and 8° 15.6' W. Between 8°14.6'W and 8°13.2'W. Ahada Pier to Gold Point	North Channel West North Channel East Rostellan	Oysters Oysters Oysters	B B B	B 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	Cockles Mussels Oysters	- B	B
Bannow Bay	Ingard Point to Clammer's 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 All other Beds	Mussels Mussels	C B	C B
Malahide	Between 53° 25.4' N and 53° 29.4' N	All Beds	Razor Clams	B	B
Skerries	Area bounded by a line from Hampton Cove to a point at 06° W, 53°36.3' N to a point at 06° W, 53°34.5'N to Shenick Island	All Beds	Razor Clams	B	B
Gormanston / Laytown	Between 53° 38' N and 53° 40'N and Between 53° 41' N and 53° 42' N	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
Dundalk Bay	Area bounded to the East by 6 ° W, to the S by 53° 49' N and to the North by 54° N.	All Beds	Razor Clams Cockles	B	B
Carlingford Lough (Irish Waters)	Ballagan Point to Cranfield Point	Ballagan Carlingford	Razor Clams Oysters Oysters Mussels	A B A B	A A A B

Appendix V. Conservation Sites in Ireland.

The main conservation sites in Ireland comprise SAC's (Special Areas of Conservation) SPA's Special Protection Areas, collectively known as Natura 2000 and NHA's (Natural Heritage Areas). Natura 2000 sites are designated under European Legislation while NHA's are a national designation. Under the European Habitats and Birds Directives, any activities that take place in or adjacent to a Natura 2000 site and which are not part of the management of that site, must undergo an appropriate assessment of its implications for the integrity of that site. In the case of aquaculture, the minister cannot grant a licence until satisfied that the aquaculture activity will not adversely affect the integrity of the Natura 2000 site concerned. To address this obligation, DAFF together with BIM and MI continue to address the challenge to develop an appropriate assessment methodology that will satisfy the requirements of the Habitats Directive while enabling licensing to proceed in a timely and cost efficient manner. This is a two stage process. Licences must first be screened to assess potential significant impacts associated with the culture type and the features of the designation. If the screening concludes that there are no potential significant impacts, licensing may proceed. If, however, it concludes that there are likely significant impacts, further study must be carried out in the form of a full Appropriate Assessment. In late 2007 and early 2008 DAFF and NPWS officials met with representatives of the European Commission. At the direction of the Commission and in light of infraction proceedings against Ireland for failure to address the requirements of the Birds directive, the Appropriate Assessment screening protocol is now at the final stages of development.

Figure V:1. Special Areas of Conservation.

The Department of the Environment, Heritage and Local Government is responsible, through the National Parks and Wildlife Service, for the designation of conservation sites in Ireland. The three main types of designation are: Natural Heritage Areas (NHA), Special Areas of Conservation (SAC's) and Special Protection Areas (SPA's). A recent publication, "The Status of EU Protected Habitats and Species in Ireland" [2]reports that Coastal habitats were found to have declined in quality, often as a result of recreation and development pressure over the past 20 years. Many habitats associated with water were considered to be in bad condition. Even moderate declines in water quality make rivers and lakes unsuitable for many fish and invertebrate species.

Figure V:2. Special Protection Areas.

NHA's are the basic designation for wildlife sites. Many of these NHA's have overlapping designations with SAC's and/or SPA's. At the time of publication of this report there were 802 proposed NHA's which are not SAC/SPA. These cover an area of about 113,000 hectares.

SAC's are prime wildlife conservation areas in the country, considered to be important on a European as well as Irish level (Figure V:1). The legal basis on which SAC's are selected and designated is the EU Habitats Directive (92/43/EEC), transposed into Irish law in the European Communities (Natural Habitats) Regulations, 1997. Some habitats are deemed "priority" and have greater requirements for designation of sites and protection. Sites that meet criteria laid down by the EU Directive are identified by the Department and proposed for designation. Once transmitted to the European Commission and prior to final designation the candidate SAC's become Sites of Community Importance (SCI's). There are currently 413 SCI's of which 92 have a marine component.

[2]http://www.npws.ie/en/PublicationsLiterature/HabitatsDirectivereport07/

SPA's sites are primarily areas of importance for wild birds and their habitats and are designated under the EU Birds Directive (79/409/EEC) (Figure V:2). Only certain species require protection, and some of the listed species conveniently occur in high numbers and densities. However, others such as breeding waders and birds of prey occur at very low density where designation of sites is a more difficult, although necessary, exercise. To date 131 SPA's have been designated, of which 66 have a marine component.

Site Designation Process.
A number of Natura 2000 sites across Ireland are currently being reviewed and expanded. Information on these programmes is available on the websites of DEHLG and NPWS and will also be in local press. At a national level, the Department of the Environment, Heritage and Local Government consults regularly with stakeholders including the major Non-Government farming and conservation groups and other government departments. For consultation at a local level, owners of land and/or rights in designated areas are identified and notified of proposals that may affect them and are invited to attend public consultation meetings to develop conservation plans for the sites. The Department also places advertisements locally in press and on radio to maximise awareness of any new statutory proposals.

The process of establishing a nature conservation site follows five steps:
1. Identify, document and select a boundary for a site.
2. Advertise and notify intention to designate site.
3. Assess any objection to proposed site.
4. Designate site.
5. Draft conservation plan for site.

The implications of site designation.
The EU Habitats Directive requires Member States to maintain or restore the favourable conservation status of the habitats and species listed in its annexes in the SAC's. Thus designation of a site as an SAC or SPA has wide ranging implications. Practices that may be affected include:
- Farming.
- Aquaculture.
- Planning Applications.
- Grazing, Sporting and Turf-cutting rights.

Certain activities restricted within NHA's, SAC's and SPA's can only be carried out with the consent of the Minister for the Environment, Heritage and Local Government, and these 'Notifiable Actions' vary depending on the type of habitat that is present on the site. Many other activities can only be undertaken with permits or licences.

The Government is committed, as part of the social partnership process, to the payment of a fair and proper level of compensation to landowners and users for actual losses suffered due to restrictions imposed as a result of their lands being included in formal proposals for designation as NHA, SAC or SPA.

For more information contact:
National Parks & Wildlife Service
7 Ely Place,
Dublin 2,

e-mail: natureconservation@environ.ie
web: http://www.npws.ie/ & http://www.environ.ie/

Appendix VI: Irish Conferences and Workshops 2007.

April 3-4: Aqua 20/20, Enfield, Co. Meath. Hosted by IFA Aquaculture

June 5: Abalone Workshop, Ennis, Co. Clare. Hosted by BIM and Taighde Mara Teo

September 25-28: World Seafood Congress 07, Dublin, Ireland. Hosted by Bord Iascaigh Mhara, Enterprise Ireland and the Food Safety Authority of Ireland for the International Association of Fish Inspectors. Details: www.worldseafoodcongress07.com

September 18; Oyster Workshop, Rosses Point, Sligo. Hosted by BIM and IFA Aquaculture.

Appendix VII: Aquaculture Related Projects Undertaken by AQUATT in 2007.

NB: AquaTT is not a Research Institution, and doesn't employ researchers, but is involved in projects working together with research institutions. The Number of Researchers listed is an estimate of all the staff working on the project, not just AquaTT staff.

	PROFET POLICY
Number of researchers involved in project.	5 FTE (Full Time Equivalents)
Funding (type).	EC FP6 (- Research for Policy Support)
Total amount of funding.	€728,070
Start date and duration of project.	12/2005 to 12/2008
Short abstract describing the project (2 to 3 lines at most)	The objective of the Profet Policy project is to build a platform for the communication and dissemination of the results of EU-funded research projects, in fisheries and aquaculture, of the 5th and 6th Framework Research Programmes
Contact details for project (email address or web page)	http://www.profetpolicy.info
	BLUE SEED
Number of researchers involved in project	10 FTE
Funding (type)	EC FP6 (- Specific Research Activities for SME's)
Total amount of funding	€805,377
Start date and duration of project	11/2005 – 11/2007
Short abstract describing the project (2 to 3 lines at most)	The BLUE SEED project is a co-operative research project for the development of new technologies to ensure a reliable supply of high quality seed in blue mussel farming
Contact details for project (email address or web page)	http://www.blueseedproject.com/
	CRAB
Number of researchers involved in project	8 FTE
Funding (type)	EC FP6 (- Specific Research Activities for SMEs)
Total amount of funding	€1,584,733
Start date and duration of project	06/2004 – 06/2007
Short abstract describing the project (2 to 3 lines at most)	The objective was to develop effective biofouling management strategies for the aquaculture industry. The project reviewed current fouling control techniques and selected and optimised suitable strategies to combat biofouling in aquaculture.
Contact details for project (email address or web page)	http://www.crabproject.com/
	CONSENSUS
Number of researchers involved in project	6 FTE
Funding (type)	EC FP6 (- Food Quality & Safety)
Total amount of funding	€1,447,627
Start date and duration of project	03/2005 – 03/2008
Short abstract describing the project (2 to 3 lines at most)	The objective of the Consensus project is to provide and demonstrate to consumers the benefits of high quality, safe and nutritious farmed fish and shellfish grown in sustainable conditions.
Contact details for project (email address or web page)	http://www.euraquaculture.info/

Non-research projects:

	AQUA-TNET
Number	2 FTE
Funding (type)	EC Socrates Programme
Total amount of funding	€401,199
Start date and duration of project	10/2005 – 10/2008
Short abstract describing the project (2 to 3 lines at most)	AQUA-TNET is a multidisciplinary Thematic Network that unites the academic and vocational aspects of the Bologna reforms and the establishment of the European Higher Education Area in the field of aquaculture, fisheries and aquatic resources management
Contact details for project (email address or web page)	http://www.aquatnet.com/
	AQUA-RET
Number	5 FTE
Funding (type)	EC, Leonardo da Vinci Programme
Total amount of funding	297,383
Start date and duration of project	10/2006 – 10/2008
Short abstract describing the project (2 to 3 lines at most)	Aqua-RET is a pan-European project that will provide an online e-learning resource promoting & clarifying the technological and practical considerations when planning and selecting sites for renewable energy generation.
Contact details for project (email address or web page)	http://www.aquaret.com/index.php/1/home/
	PESCALEX
Number	5 FTE
Funding (type)	EC, Leonardo da Vinci Programme
Total amount of funding	340,438
Start date and duration of project	10/2005 – 10/2007
Short abstract describing the project (2 to 3 lines at most)	PESCALEX aims to create content and language integrated learning (CLIL) courses in fish health/disease for the benefit of specific areas of Europe where the aquaculture industry is vital to the economy.
Contact details for project (email address or web page)	http://www.pescalex.org/pescalex/index.php

For further information go to: www.aquatt.ie
AQUATNET Annual Event, Crete, June 2007.

Appendix VIII: Role of State Agencies.

Department of Agriculture Fisheries and Food (DAFF) established in 2007.

The new Department retains all of the former functions of the Department of Agriculture and Food and, in addition, took responsibility for sea fisheries, aquaculture, marine research, marine engineering and pier and harbour development for all piers and harbours other than those commercial harbours which are under the responsibility of the Department of Transport or the island harbours under the responsibility of Department of Community, Rural and Gaeltacht Affairs.

In addition, DAFF is responsible for all aquaculture licensing. DAFF is also responsible for all foreshore licensing, other than foreshore licences in Department of Transport commercial harbours and foreshore licences in respect of all energy and aggregate and mineral extraction projects on the foreshore. Those responsibilities transfer to the Department of Environment, Heritage and Local Government.

As a consequence of the new responsibilities moving to DAFF, it also took responsibility for Bord Iascaigh Mhara, the Marine Institute and the Sea Fisheries Protection Agency.

The Sea-Fisheries Protection Authority.

The Sea-Fisheries Protection Authority (SFPA) is an independent statutory agency established on 1st January 2007 under the provisions of the Sea-Fisheries and Maritime Jurisdiction Act 2006. The SFPA's mission is:

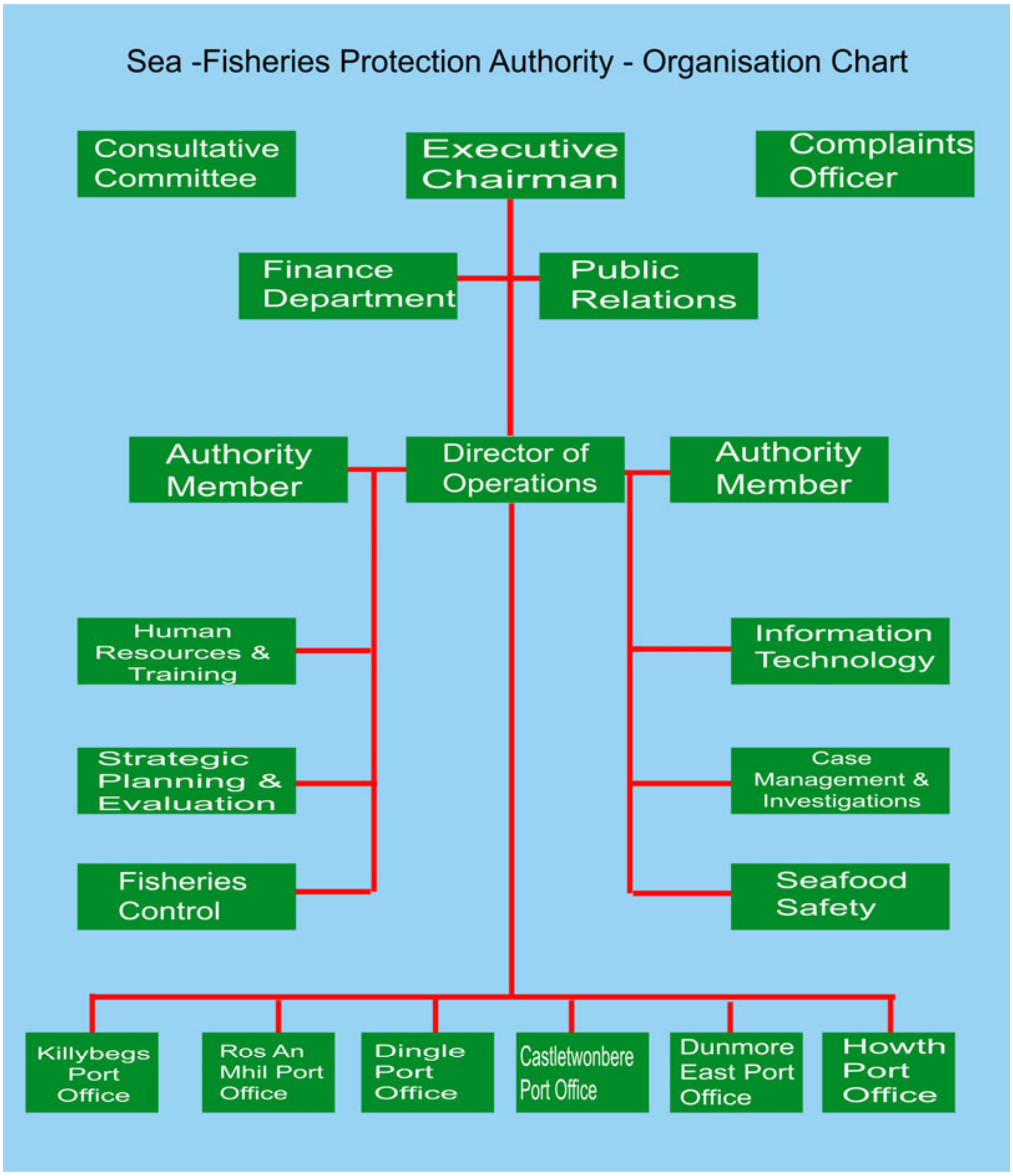
"To implement Sea-Fisheries Conservation legislation and Seafood Safety legislation fairly and consistently to meet the functions laid down in the Act, and to promote compliance with these laws, with the overall objective of ensuring that the marine fish and shellfish resources from the waters around Ireland are exploited legally and consumed safely for the long-term benefit of all".

The SFPA is based in Clonakilty, County Cork, with offices at Killybegs, Ros a Mhíl, An Daingean, Castletownbere, Dunmore East and Howth. The SFPA is the lead agency for the enforcement of sea-fisheries protection legislation and is an official agency in respect of the enforcement of seafood safety law for the purposes of the Food Safety Authority of Ireland Act 1998.

A principle role for SFPA is securing compliance with sea-fisheries conservation and seafood safety legislation. The bulk of this function involves verification of the compliance by food business operators with the relevant safety requirements, through a programme of Official Controls including inspections, audits, monitoring, sampling and analysis. Conservation controls include the rational management of mussel seed harvesting and ensuring compliance with minimum size requirements for certain species. The SFPA official controls also entail direct involvement in specific monitoring programmes in shellfish production areas. In addition to protection of consumer health, SFPA ensures consumers' interests through verification of accurate labelling of seafood produced and marketed in Ireland.

Just as in fisheries control, SFPA is committed to promoting compliance with seafood legislation through the provision of information and guidance. The impetus towards enhanced addition of value to Irish seafood through further processing will be significantly underpinned by SFPA's role in the seafood area.

Within SFPA, seafood safety functions are managed nationally by the Director of Food Safety, with the assistance of a Seafood Safety Manager and input from Sea Fisheries Protection Officers, Senior Port Officers and other SFPA Personnel throughout the organisation. The development of this structure has greatly enhanced the seafood services provided by the SFPA.



The SFPA's primary goals in relation to food safety include:

- Protecting Public Health through the fair and consistent application of food safety legislation across the seafood sector.
- Promoting consumer interests through the enforcement of food labelling and traceability requirements to ensure provision of accurate information regarding the provenance of fish produced and marketed in Ireland.
- Engaging constructively with industry all stakeholders to ensure an effective, efficient and co-ordinated approach to the management of seafood safety.

The principal functions of the SFPA in respect of aquaculture products are focused on the implementation of shellfish safety programmes including the microbiological monitoring of live bi-valve mollusc production areas and the biotoxin monitoring programme. With respect to finfish the SFPA in conjunction with the Marine Institute implement a residues monitoring programme as required by national and EU legislation

The implementation of shellfish safety programmes is guided by the Molluscan Shellfish Safety Committee (MSSC), which comprises members of the Food Safety Authority of Ireland, the SFPA, the Marine Institute, the Irish Shellfish Association, BIM, the Health

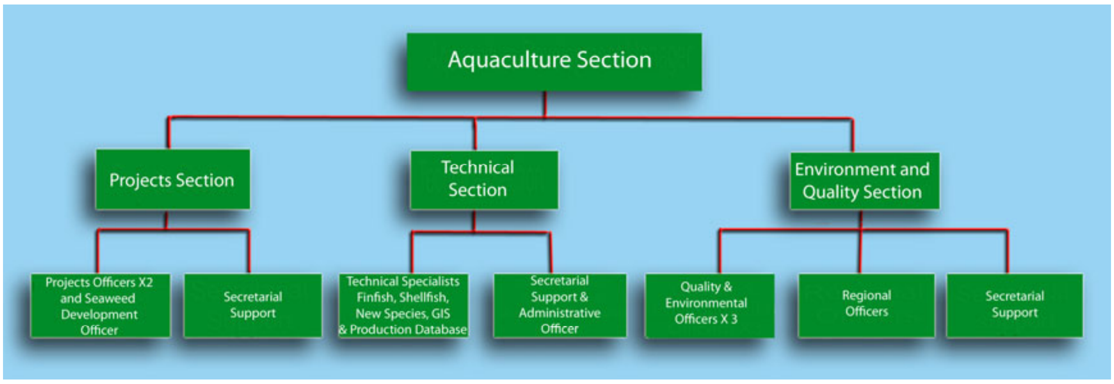
Services Executive and industry representatives. In 2007 a sub-group of the MSSC devised a Code of Practice for the microbiological monitoring of bivalve mollusc production areas. As part of the consultation process in developing this management tool a series of six regional consultation meetings were held around the country and an online consultation process was also undertaken. The procedures outlined in this document with regard to the classification of bivalve production areas will be implemented from 2008 onwards.

Other work in this area undertaken by the SFPA in 2007 included the provision of Health Certification for aquaculture products being exported to third countries and participation in the Shellfish Waters Management Committee, which was established by government to oversee the implementation of the Shellfish Waters Directive.

Bord Iascaigh Mhara (BIM)

Bord Iascaigh Mhara
Irish Sea Fisheries Board

www.bim.ie **info@bim.ie**



BIM's mission is '*to promote the sustainable development of the Irish seafood industry at sea and ashore and support its diversification in the coastal regions so as to enhance the contribution of the sector to employment, income and welfare both regionally and nationally*'. BIM's role in aquaculture development is three tiered, with support being given by the Aquaculture Development Division, the Market Development Division and the Marine Services Division.

The *Aquaculture Development Division* is charged with promoting the sustainable development of the Irish aquaculture industry in terms of volume and value of output. It has three sections. The Technical Section provides a specialist technical support service to the aquaculture industry. The Project Development Section evaluates and prioritises investment proposals for grant assistance and assesses payment claims for draw-down of approved grants. The Environment and Quality Section promotes quality and environmental best practice in the aquaculture industry by providing specialist advice and guidelines and developing codes of practice and quality assurance schemes for the sectors.

The role of the *Market Development Division* is to promote Irish seafood at home and abroad and provide a range of market supports to assist clients capitalise on market opportunities. The Division provides a range of services to the sector. The Market Research and Intelligence Section provides market intelligence and targeted market research on products. BIM Overseas Officers located in Paris, Madrid and Dusseldorf provide support in business development including facilitating buyer and customer contact, providing market information and undertaking promotional activities. The Product Quality and Process Development Section provide a technical advisory service to clients through the Seafood Development Centre including the Laboratory facility. The Trade and Market Development Section operates two support programmes which help develop marketing expertise and skills in seafood companies and support market development efforts namely the Irish Seafood Business Programme and the Market Investment Programme. The Consumer Support Section focuses on encouraging consumer demand for Irish seafood. It manages a number of promotional initiatives at retail and food service level including consumer educational programmes to enhance the status of Irish seafood products.

The *Marine Services Division* is charged with developing the industry's human resources through the provision of training and educational programmes and to raise the quality of fish supplies through increased use of ice and improved fish handling practices. Training for the seafood industry is provided through a coastal service that includes the National Fisheries College, the Regional Fisheries Centre, and two mobile coastal training units. Courses for the aquaculture sector have been developed in consultation with industry and are accredited by statutory bodies. The Engineering Services Section manages BIM's ice plant network which provides a supply of ice to fish farms and fish processors to help ensure that fish and shellfish are maintained in top quality from time of harvest to market.

Cross-Border Aquaculture Initiative (CBAIT) EEIG
http://www.bim.ie

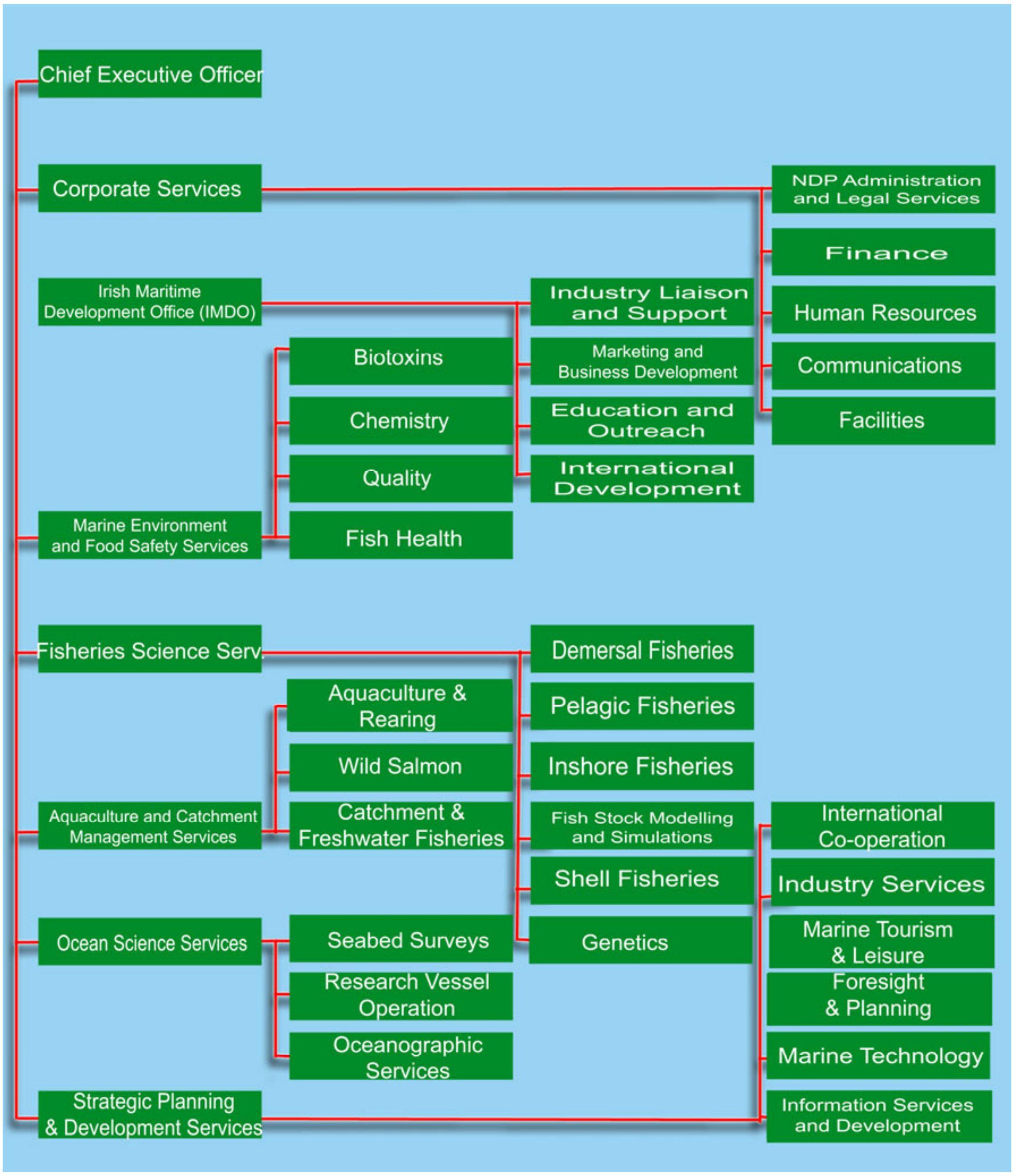
Cross-Border Aquaculture Initiative EEIG 2006. The Aquaculture Initiative is a European Economic Interest Grouping (EEIG) administered by Board Iascaigh Mhara (BIM), whose mission is *"To provide a range of support services for the sustainable development of the aquaculture sector, increasing volume, value and employment in the six counties of Northern Ireland and the six Border counties of the Republic of Ireland."* This group is currently funded through the Peace II extension programme with match funding from DCMNR, BIM and DARD (Department of Agriculture and Rural Development Northern Ireland).

Resource Development. The Aquaculture Initiative team is involved in developing the considerable potential for expansion of the aquaculture industry within the remit area, through the full development of the natural resources available, contributing significantly to the economy of the area as a whole, and to rural areas in particular. The Team advises the aquaculture industry on financial, technical and strategic issues, in order to provide effective support to new and existing aquaculture ventures.

Quality and Environment. The Aquaculture Initiative provides advice and support to enable producers to meet increasingly rigorous environmental and quality standards. The Team also works to raise awareness concerning environmental responsibilities with respect to the sustainable use of natural resources.

Marine Institute
www.marine.ie institute.mail@marine.ie

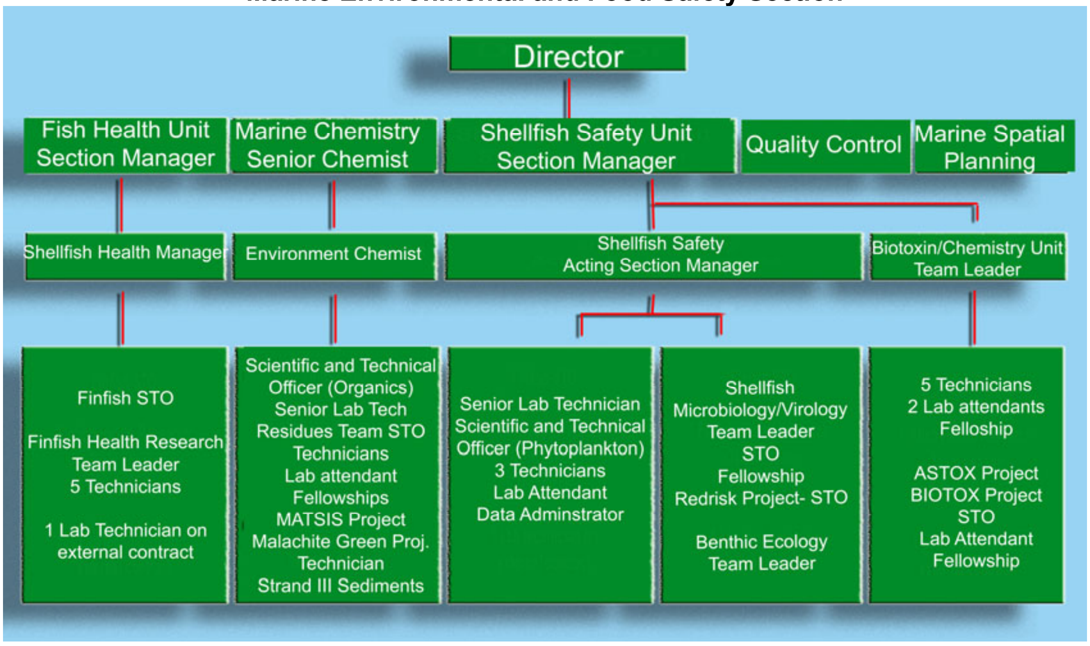
The Marine Institute is Ireland's national marine R&D agency with the following general functions:
"to undertake, to co-ordinate, to promote and to assist in marine research and development and to provide such services related to marine research and development, that in the opinion of the Institute will promote economic development and create employment and protect the environment." - Marine Institute Act, 1991.



The Marine Institute is an agency of the Department of Agriculture Fisheries and Food. It was established under statute in 1992. In 2005, the Institute had a staff of 180 people, located in Galway, Newport, Dublin and in ports around the country.

The Marine Institute carries out a number of specific roles in relation to Aquaculture:

Marine Environmental and Food Safety Section



1 – **Monitoring and Advice**. MI provides a range of key scientific services and advice to marine businesses and other State agencies that safeguard the quality of aquaculture products and the marine environment. These include statutory monitoring programs in fish health, sealice, benthos, residues in finfish, shellfish toxins and shellfish microbiology.

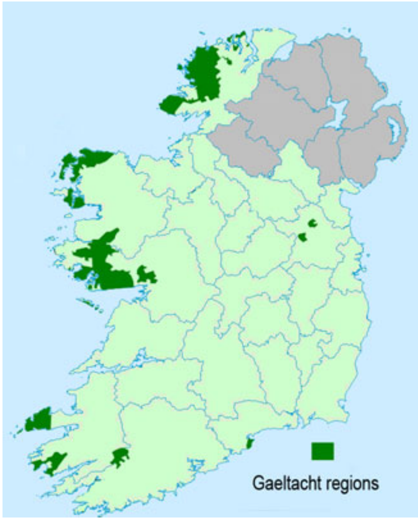
MI personnel provide statutory advice to the Department of Agriculture Fisheries and Food in relation to the granting of aquaculture licences. MI personnel provide keys inputs to the Molluscan Shellfish Safety Committee and FSAI. It provides data and advice to the Management Cell which ensures a risk management approach to shellfish safety. MI participates in the Aquaculture Forum and a number of working groups with industry.

2 – **Research.** The Institute carries out research and supports RTDI (research, technology, development and innovation) activity in the Aquaculture sector projects under the Marine Research Measure of the National Development Plan. These research projects in the areas of cod, mussels, scallops, sealice and shellfish toxins are designed to support employment, provide for sound management decisions to guide the on-going sustainable development of the resource and thereby to underpin future innovation, growth and wealth creation in aquaculture.

MI collaborates with BIM and Taighde Mara in many areas of aquaculture including the planning of research programmes, quality schemes and the work of the Co-ordinated Local Aquaculture Management Systems (CLAMS) processes in selected bays nationwide.

Údarás na Gaeltachta
www.udaras.ie

An Ghaeltacht.



As a regional development agency, Údarás na Gaeltachta brings an integrated approach to the development of aquaculture within the Gaeltacht. The range of activities engaged in by An tÚdarás to date has involved the development of novel species and new techniques while aiding business entities from the research phase, through innovation and pilot scale trials to commercialisation.

Údarás na Gaeltachta has offices and staff in each Gaeltacht area and provides support to new entrants and to expanding or diversifying aquaculturists. A broad range of support measures are available depending on the client's needs. Financial support is usually by way of grant aid for capital, training and research and development and may also include investment by means of preference or redeemable shares depending on a project's financing requirements.

Appendix IX: Commonly used Abbreviations.

Commonly used abbreviations	
Amnesic Shellfish Poisoning	(ASP)
Aquaculture Licence Appeals Board	(ALAB)
Aquaculture License Production System	(ALPS)
Azaspiracid Poisoning	(AZP)
Bacterial Kidney Disease	(BKD)
Bord Iascaigh Mhara	(BIM)
Bottom Grown	(BG)
Cadmium	(Cd)
Case Management Group	(CMG)
Chromium	(Cr)
Coastal Zone Management	(CZM)
Co-ordinated Local Aquaculture Management Systems	(CLAMS)
Copper	(Cu)
Department of Agriculture, Fisheries and Food	(DAFF)
Department of Communications, Marine and Natural Resources	(DCMNR)
Diarrhetic Shellfish Poisoning	(DSP)
Enteric Redmouth Disease	(ERM)
Environmental Code of Practice for Aquaculture Companies and Traders	(ECOPACT)
EU 6th Framework Programme	(FP6)
European Commission	(EC)
European Economic Community	(EEC)
European Mollusc Producers Association	(EMPA)
Federation of European Aquaculture Producers	(FEAP)
Fish Health Unit	(FHU)
Food Safety Authority of Ireland	(FSAI)
Hepatitis A Virus	(HAV)
High Performance Liquid Chromatography	(HPLC)
Higher Education Authority	(HEA)
Infectious Haematopoetic Necrosis	(IHN)
Infectious Pancreatic Necrosis	(IPN - IPNV)
Infectious Salmon Anaemia	(ISA)
Integrated Coastal Zone Management	(ICZM)
Irish Farmers Association	(IFA)
Irish Salmon Growers Association	(ISGA)
Irish Salmon Producers Group	(ISPG)
Irish Shellfish Association	(ISA)
Lead	(Pb)
Limit Of Detection	(LOD)
Limit Of Quantification	(LOQ)
Liquid Chromatography Mass Spec.	(LCMS)
Marine Institute	(MI)
Maximum Residue Limit	(MRL)
Mercury	(Hg)
Minimum Import Price	(MIP)
National Development Plan	(NDP)
National Reference Laboratory	(NRL)
National Residues Control Plan	(NRCP)
Nickel	(Ni)
Noroviruses	(NV's)
Okadaic Acid	(OA)
Organochlorine pesticides	(OCP's)
Pancreas Disease	(PD)
Paralytic Shellfish Poisoning	(PSP)
Polychlorinated biphenyls	(PCB's)
Part Time	(PT)
Price Waterhouse Coopers	(PWC)
Regional Fisheries Boards	(RFB)
Round Weight Equivalents	(RWE)
Sea Fisheries Protection Authority	(SFPA)
Silver	(Ag)
Single Bay Management	(SBM)
Spring Viraemia of Carp	(SVC)
Taighde Mara Teo	(TMT)
Viral Haemorrhagic Septicaemia	(VHS)

Appendix X: Common and Scientific Names of some Aquaculture Species.

Common name	Scientific	Alternative name
Abalone	*Haliotis discus hannai*	Ezo awabi
	Haliotis tuberculata	European abalone
Charr	*Salvelinis alpinus*	
Clams	*Ruditapes philippinarum*	
	(Tapes philipinarium)	
Cod	*Gadus morhua*	
Gigas oyster	*Crassostrea gigas*	Pacific oyster
Mussel	*Mytilus edulis*	Rope, bottom, seed
Native oyster	*Ostrea edulis*	Flat oyster
Lobster	*Homarus gammarus*	
Perch	*Perca fluviatilis*	
Salmon	*Salmo salar*	Atlantic salmon
Scallops	*Pecten maximus*	
Trout (rainbow)	*Oncorhynchus mykiss (=Salmo gairdneri)*	
Trout (brown)	*Salmo trutta*	

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MARINE INSTITUTE
Headquarters
Rinville
Oranmore
Galway
Tel: +353 (0)91 387200
Fax: +353 (0)91 387519
institute.mail@marine.ie
www.marine.ie

BIM
Head Office
P.O. Box 12
Crofton Road
Dun Laoghaire
Co. Dublin
Tel: +353 (0)1 2144100
Fax: +353 (0)1 2841123
info@bim.ie
www.bim.ie

ÚDARÁS NA GAELTACHTA
Na Forbacha
Co. na Gaillimhe
Tel: +353 (0)91 503100
Fax: +353 (0)91 503101
eolas@udaras.ie
www.udaras.ie

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