Status of Irish Aquaculture 2006

A compilation report of information on Irish Aquaculture
(With a review of key programs during the years 2000 to 2006)

Marine Institute, Bord Iascaigh Mhara and Taighde Mara Teo.

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Cover image of cage in Bertrabui Bay, Connemara and oyster farm, Kinvarra (Ronan Browne).

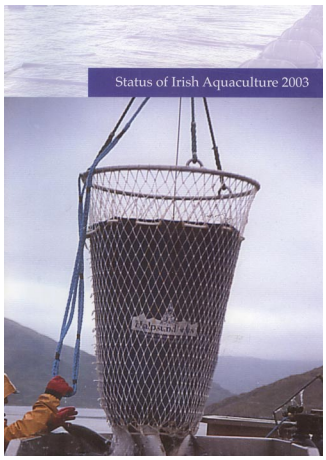
CONTENTS

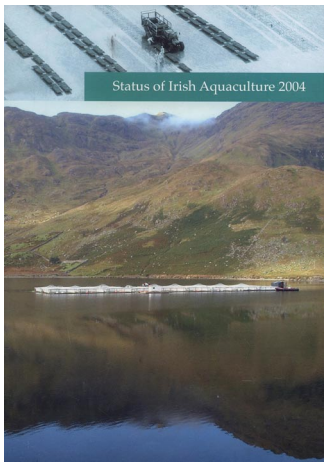
List of Figures

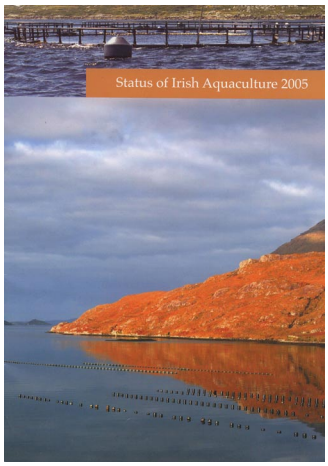
List of Tables

1. INTRODUCTION / RÉAMHFHOCAL

Aim and Scope of Report







This is the fourth annual report reviewing the status of Irish aquaculture (see Parsons *et al*. 2004, Parsons *et al*. 2005, and Browne *et al*. 2006). As with the previous reports 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/ Taighde Mara Teoranta (TMT).

The objectives of this report are:

- To provide an objective and comprehensive source of information on the status of Irish aquaculture in 2006.
- To show trends in the production, employment, export and market statistics for the Irish industry in 2006.
- To summarise the current licensing activity, which is the responsibility of the Department of Communications, Marine and Natural Resources.
- 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 research and development initiatives in the area of aquaculture that are underway in the various State agencies and third-level institutions.
- To collate information about Irish aquaculture training.
- To report on issues/events/initiatives that occurred during the year 2006.
- To review the impact of the National Development Plan (2000 to 2006) on Irish Aquaculture.
- To present summaries of pertinent aquaculture reports published during 2006.
- To provide an introduction to Aquaculture in Northern Ireland.

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 growing world's population demand for fish has increased pressures on many wild stocks to their maximum sustainable yield. This inherently strong market for aquatic products has also been heightened by consumer appreciation for the health benefits of consuming fish rich in omega III fatty acids. Despite this, strong and growing demand for aquatic products it is expected that world capture fisheries will remain relatively static at 95 million tonnes annually while requirement is expected to increase to 180 million tonnes by 2030 (FAO, 2006). For this reason it is anticipated that world-wide aquaculture production will have to increase substantially.

On a world scale the Irish aquaculture industry currently has a relatively modest production. Nevertheless, it has progressed from being a fledgling industry in the 1970's and 1980's to becoming an important economic contributor in rural areas. As an indigenous industry it is therefore relatively young and has over the last few years faced a number of production difficulties and species specific marketing challenges. Despite these issues, there have been significant efforts and advances made to improve cultivation strategies and overcome the vagaries of markets, ensuring that Irish Aquaculture production meets the highest standards set for consumption.

The total value of Irish aquaculture production has increased by 13% in the last year, from €110.2 million in the year 2005 to €124.6 million in 2006. Despite this increase in value, the cumulative total production volume of both the finfish and shellfish sectors fell by 8% from 62,838 tonnes in 2005 to 57,422 tonnes in 2006. This drop in production and increase in sales value can largely be explained by the following:

- Total shellfish production volume decreased from 47,454 tonnes in 2005 to 44,696 tonnes in 2006. However, the market value of the shellfish produced increased by over €15million (+29.9%) compared with 2005 figures.
- The national finfish harvest volume decreased from 15,384 tonnes in 2005 to 12,726 tonnes in 2006, which was a drop of 17%. Although production levels declined, the total harvest value of €61.4 million remained relatively the same as the previous year, dropping by only 0.2%. This production trend has continued since the year 2001 and is associated with the decline in salmon production.

Main shellfish species.
Bottom mussel culture generated the highest volume (52.7%) of shellfish production and the highest total value (56.5%) of all shellfish species produced. The average price for bottom mussel increased from €871 per tonne in 2005 to €1,517 per tonne in 2006. However, as a result of a reduction in the volume of mussels relaid in 2005, the amount of bottom mussels harvested decreased by 20% to 23,583 tonnes in 2006. There was a total of 13,960 tonnes of rope mussel harvested in 2006. Of the total rope mussel harvest 9,660 tonnes went to market and 4,300 tonnes were re-laid as bottom mussel seed. Gigas oyster production increased by 12% to 6,511 tonnes in 2006. While the market value for Gigas oysters also increased by 20.9% to €2.5 million. The harvested volume of native oyster remained relatively static with only a moderate increase from 342 tonnes in 2005 to 360 tonnes in 2006 (+5.2%). Clam production increased from 161 tonnes in 2005 to 245 tonnes in 2006, a rise of 52%. The value of the clam harvest also increased significantly from €850,000 in 2005 to €1.38 million in 2006 (+62.7%). The lack of scallop spat in the years 2000 and 2001 had a consequential effect on returns in 2006 with only 37 tonnes being harvested. This was a significant decrease (-57%) from the 87 tonnes harvested in 2005.

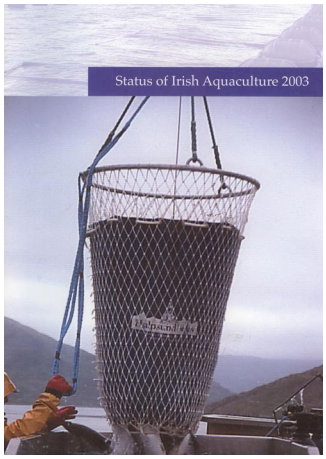
Main finfish species.
Despite early optimism in 2006 that salmon production was on the increase, mortalities during the summer period prevented this from occurring. These mortalities were primarily attributed to IPN and gill disease. As a result, total production decreased by 18% to 11,174 tonnes. However, the exceptional price per tonne achieved in 2006 lessened the impact of the decline in volume production, yielding a total value for salmon produced of €52.7 million, 4% less than that achieved in 2005. The total number of smolts put to sea during 2006 was 2,027,000. Freshwater trout production increased from 897 tonnes in 2005 to 970 tonnes in 2006 and the total value of this production also increased by 8.6%. The volume of sea-reared trout harvested declined by 23% to 546 tonnes in 2006. Although the volume dropped the total market value rose by 55.9%, due to a significant increase in the average price per tonne, which reached €4,476.

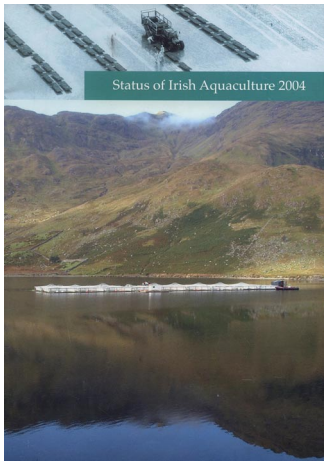
Employment.
There were a total of 2,058 people employed in the aquaculture industry in 2006, of this number 782 were in full time employment, 498 were in part time employment and 778 were employed on a casual basis. There was a rise of 12% in aquaculture employment in 2006 compared with 2005.

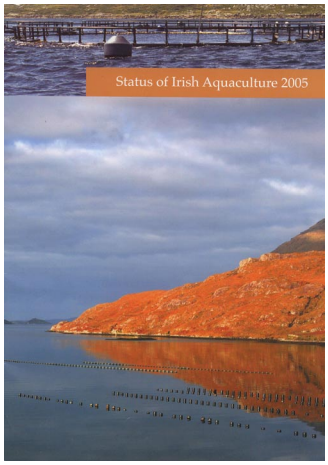
Biotoxins in shellfish.
In 2006 there was a significant reduction in toxic species observed, compared with 2005. However prolonged closures of shellfish production areas remained an issue impacting on many producers.

The locations of salmon, oyster (*C. gigas* and native/ flat *O. edulis*), blue mussel (*M. edulis*) and scallop *(P. maximus*) aquaculture licences are shown in Figure 1. The site locations of novel or new aquaculture species such as cod, perch, seahorses, urchins and abalone are shown in Figure 2.

Aidhm agus Scóip na Tuarascála







Is í seo an ceathrú tuarascáil bhliantúil a dhéanann athbhreithniú ar stádas an dobharshaothraithe in Éirinn (féach Parsons *et al*. 2004, Parsons *et al*. 2005, agus Browne *et al*. 2006). 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/ Taighde Mara Teoranta (TMT).

Is iad seo a leanas cuspóirí na tuarascála:

- Foinse oibiachtúil agus chuimsitheach eolais a chur ar fáil faoi stádas an dobharshaothraithe in Éirinn i 2006.
- Treochtaí a léiriú i dtáirgeadh, fostaíocht, onnmhairiú agus staitisticí margaidh do thionscal na hÉireann i 2006.
- Achoimre a thabhairt ar ghníomhaíocht reatha ceadúnais, as a bhfuil freagracht ar an Roinn Cumarsáide, Fuinnimh agus Acmhainní Nádúrtha.
- 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 AE.
- Chun béim a leagan ar thionscnaimh éagsúla taighde agus forbartha i réimse an dobharshaothraithe atá ar siúl i láthair na huaire sna gníomhaireachtaí éagsúla Stáit agus sna hinstitiúidí tríú leibhéal.
- Eolas faoi oiliúint dobharshaothraithe na hÉireann a chomhordú.
- Tuairisc a dhéanamh faoi cheisteanna/imeachtaí/tionscaimh a tharla le linn na bliana 2006.
- Chun athbhreithniú a dhéanamh ar thionchar an Phlean Forbartha Náisiúnta (2000-2006) ar Dhobharshaothrú na hÉireann.
- Achoimrí ar thuarascálacha ábhartha dobharshaothraithe a foilsíodh le linn 2006 a chur i láthair.
- Réamheolas a chur ar fáil faoi Dhobharshaothrú i dTuaisceart Éireann.

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

Tá éileamh méadaithe dhaonra an domhain i leith éisc ag cur níos mó brú ar stoic fhiáine go dtí a n-uastáirgeacht inbhuanaithe. Chuir tuiscint tomhaltóirí ar na leasanna sláinte a bhaineann le tomhaltas éisc ina bhfuil aigéad sailleach óimige III go mór leis an mbunmhargadh láidir do tháirgí mara. In ainneoin an éilimh láidir seo ar tháirgí mara atá ag fás, táthar ag súil go bhfanfaidh gabháil iascaigh an domhain seasta a bheag nó a mhór ag 95 milliún tona in aghaidh na bliana cé go meastar go méadóidh éileamh go 180 milliún tona faoi 2030 (FAO 2006). Dá bharr sin, meastar go mbeidh ar tháirgeadh dobharshaothraithe ar fud an domhain méadú go mór.

I láthair na huaire baineann táirgeacht sách beag le tionscal dobharshaothraithe na hÉireann i gcomparáid leis an scála domhanda. In ainneoin sin, tá dul chun cinn déanta ó bhí sé ina thionscal úr sna 1970aidí agus 80aidí go dtí an lá atá inniu nuair is gné thábhabhachtach eacnamaíoch é i gceantair thuaithe. Mar thionscal dúchasach, tá sé óg a bheag nó a mhór, agus le blianta beaga anuas bhí air aghaidh a thabhairt ar roinnt deacrachtaí táirgthe agus dúshlán margaíochta a bhain le speicis shonracha. In ainneoin sin, tá iarrachtaí agus dul chun cinn suntasach déanta chun straitéisí saothraithe

a fheabhsú agus mírialtachtaí sa mhargadh a shárú chun a chinntiú go gcomhlíonann táirgeadh Dobharshaothraithe na hÉireann na caighdeáin is airde a leagtar síos do thomhaltas.

Mhéadaigh luach iomlán tháirgeadh dobharshaothraithe na hÉireann 13% ó €110.2 milliún sa bhliain 2005 go €124.6 milliún i 2006. In ainneoin toirt iomlán táirgthe na hearnála éisc eite agus sliogéisc a bheith ag laghdú 8% ó 62,838 tona i 2005 go 57,422 tona i 2006. Is féidir an laghdú seo sa táirgeacht agus an méadú ar luach na ndíolachán a mhíniú mar seo a leanas:

- Tháinig laghdú i dtoirt táirgthe iomlán sliogéisc ó 47,454 tona i 2005 go 44,696 tona i 2006. Tháinig méadú €15milliún (+29.9%) ar luach margaidh an sliogéisc a táirgeadh i gcomparáid le figiúirí 2005, áfach.
- Tháinig laghdú ar thoirt náisiúnta buainte éisc eite ó 15,384 tona i 2005 go 12,726 tona i 2006, ar laghdú 17% é sin. Cé gur thit leibhéil táirgthe, d'fhan an luach iomlán buainte €61.4 milliún mar a bhí an bhliain roimhe a bheag nó a mhór, á laghdú (0.2%). Lean an treocht táirgthe seo ó 2001 agus baineann sé den chuid is mó le ceisteanna galair éisc eite.

Príomhspeicis sliogéisc.
Ghin saothrú diúilicíní a tógadh ar an ngrinneall an toirt is mó (52.7%) de tháirgeadh sliogéisc agus luach iomlán is airde (56.5%) de na speicis sliogéisc a táirgeadh. Mhéadaigh an meánphraghas do dhiúilicíní a tógadh ar an ngrinneall ó €871 in aghaidh an tona i 2005 go €1,517 in aghaidh an tona i 2006. Mar thoradh ar an laghdú ar an méid diúilicíní a cuireadh arís i 2005, áfach, bhí laghdú 20% go 23,583 tona ar an méid diúilicíní a tógadh ar an ngrinneall a baineadh i 2006. Baineadh 13,960 tona diúilicíní téide san iomlán i 2006. As an iomlán chuaigh 9,600 tona den bhuaint iomlán diúilicíní téide chun margaidh agus cuireadh 4,300 tona arís mar shíolta diúilicíní ar an ngrinneall. Mhéadaigh táirgeadh oisrí Gigas 12% go 6,511 tona i 2006. Tháinig méadú 20.9% ar an luach margaidh d'oisrí Gigas chomh maith go €2.5 milliún. D'fhan toirt bhuainte na n-oisrí dúchasacha seasta agus méadú beag ó 342 tona i 2005 go 360 tona i 2006 (+5.2%). Mhéadaigh táirgeadh breallach ó 161 tona i 2005 go 245 tona i 2006, méadú 52%. Tá méadú mór tagtha chomh maith ar luach buainte na mbreallach ó €850,000 i 2005 go €1.38 milliún i 2006 (+62.7%). Bhí tionchar ar an easpa speaitín muiríní sna blianta 2000 agus 2001 ar na haischuir mar níor baineadh ach 37 tona i 2006. Ba laghdú suntasach (-57%) é sin ón 87 tona a baineadh i 2005.

Príomhspeicis éisc eite.
In ainneoin go rabhthas dóchasach go luath i 2006 go raibh méadú ag teacht ar tháirgeadh bradán, chuir básmhaireachtaí le linn thréimhse an tsamhraidh cosc ar an méadú sin. Is de bharr galair IPN agus Gheolbhaigh go príomha na básmhaireachtaí sin. Mar thoradh air sin, laghdaigh táirgeacht iomlán 18% go 11,174 tona. Laghdaigh an praghas eisceachtúil a fuarthas in aghaidh an tona i 2006 an tionchar a bhí ag an laghdú i dtáirgeadh toirte, ar a raibh mar thoradh go raibh luach iomlán €52.7 milliún don Bhradán a táirgeadh, ar 4% níos lú é sin ná an méid a baineadh amach i 2005. Cuireadh 2,027,000 gealóg san iomlán chun na farraige le linn 2006. I 2006 mhéadaigh táirgeadh breac fionnuisce ó 897 tona i 2005 go 970 tona i 2006 agus tháinig méadú 8.6% chomh maith ar luach iomlán an táirgthe. Laghdaigh toirt breac mara a saothraíodh 23% go 546 tona i 2006. Cé gur laghdaigh an toirt, mhéadaigh luach iomlán margaidh 55.86%, mar gheall ar an méadú suntasach ar an meánphraghas in aghaidh an tona, a bhain €4,476 amach.

Fostaíocht.
Ba é an líon daoine a fostaíodh in earnáil an dobharshaothraithe le linn 2006 ar bhonn lánaimseartha, páirtaimseartha agus ócáideach 782, 498 agus 778, faoi seach.

Léiríonn Figúir 1 na suiomhanna dos na ceadúnais le h aghaidh feirmeacha bradáin, oisri (*C. gigas* agus *O. edulis*, an oisre dúchasach), Diuilicíní (*M. edulis*) agus muiriní. Léiríonn Figúir 2 na suíomhanna dos na ceadúnais le h aghaidh cineálacha nua éisc, cosúil le trosc, péirse, each uisce, carbhán carriage agus cluasa mara (abalone).

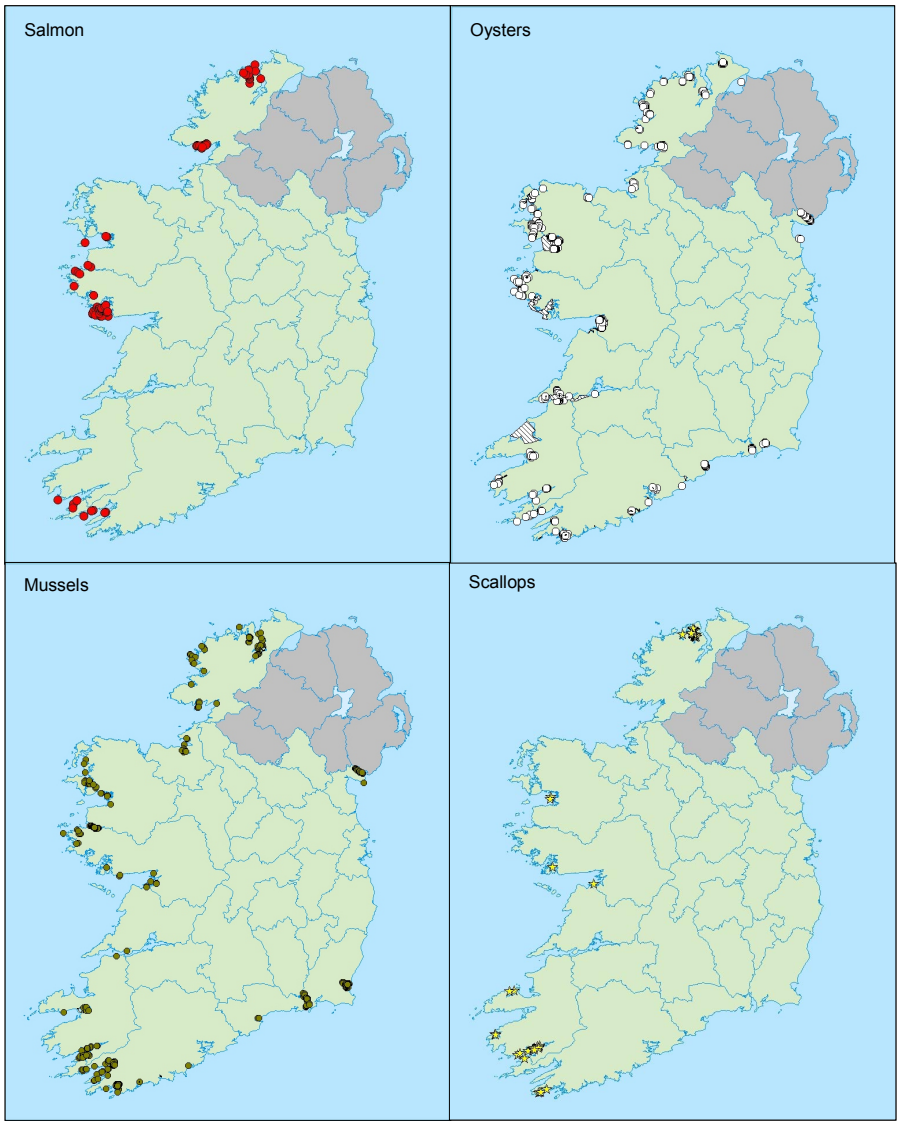


Figure 1: Location of aquaculture licences for the principal shellfish and finfish species. Hatched areas in oyster figure are areas subject to native oyster orders (e.g. Clew Bay) (BIM).

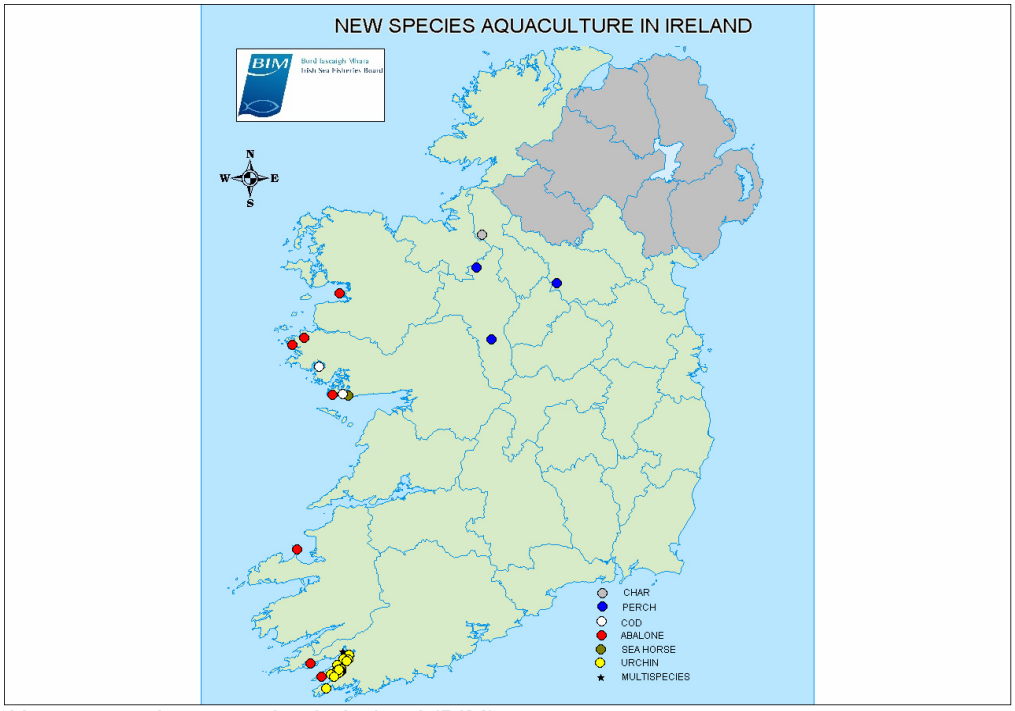


Figure 2: New aquaculture species in Ireland (BIM).

2. PRODUCTION & EMPLOYMENT SUMMARY

Overview

BIM collects aquaculture production and employment information on an annual basis. The method for gathering this information involves the distribution of a species-specific questionnaire to farmers on BIM's database. Of the 375 questionnaires sent out in 2007 (to collect 2006 data) there were 358 returns (95.5%). Farmers that did not return their questionnaire were contacted directly by BIM to gather their details. In the event of a farmer being unreachable their employment and production data was estimated based on previous year's information and their locality.

In 2006, the total production volume of both the finfish and shellfish sector was 57,422 tonnes, an 8.6% decrease in production compared with 2005 (Appendix 1 and Table 1). The most significant reductions in volume occurred in the salmon and bottom mussel industries where recorded decreases in production were 18.8% and 20.1% respectively. Despite these declines there were significant increases in the volumes of rope mussel (10.3%), relaid rope mussel seed (54.2%), Pacific/ Gigas oysters (12%), clams (52.2%) and freshwater trout (8.1%). The combined value of all shellfish harvested was €63.25 million and there was a total €61.41 million harvest for the finfish sector. In 2006, the total value of production in the aquaculture sector was €124.7 million compared with 110.2 million in 2005 a 13% increase.

Table 1. Aquaculture production (Volume and Value) in 2006 and 2005 (BIM).

	Volume (tonnes)		Value (€'000)	
Species	**2005**	**2006**	**2005**	**2006**
Rope Mussel	8,755	9,660	6,579	7,177
Relaid Rope Mussel Seed	2,788	4,300	930	1,935
Bottom Mussel	29,510	23,583	25,718	35,789
Pacific (Gigas) Oyster**	5,811	6,511	12,089	14,623
Native Oyster	342	360	1,708	1,941
Clam**	161	245	849	1,382
Scallop	87	37	425	200
Shellfish Other**			380	201
Total Shellfish	**47,454**	**44,696**	**48,678**	**63,248**
Salmon ova/smolt**			2,500	3,378
Salmon	13,764	11,174	55,042	52,711
Sea reared Trout	717	546	1,568	2,444
Freshwater Trout**	897	970	2,379	2,658
Others**	6	36	62	221
Total Finfish	**15,384**	**12,726**	**61,551**	**61,412**
Total Aquaculture	**62,838**	**57,422**	**110,229**	**124,660**

**** Includes additional value from sales of juveniles and smolts etc.**

N.B. Relaid rope mussel seed has been included in 2005 figures. Some of the seed relaid during 2006 may also have been harvested in the same year.

There were a total of 2,058 people employed in the aquaculture industry in 2006, of this number 782 were in full time employment, 498 were in part time employment and 778 were employed on a casual basis. There was a rise of 12% in aquaculture employment in 2006 compared with 2005 (Table 4).

Shellfish Production 2006

Total shellfish production volume decreased from 47,454 tonnes in 2005 to 44,696 tonnes in 2006 (Figure 3). However the market value of the shellfish produced increased by over €15million (+29.9%) compared with 2005 figures (Table 1, Figure 3 and Appendix 1).

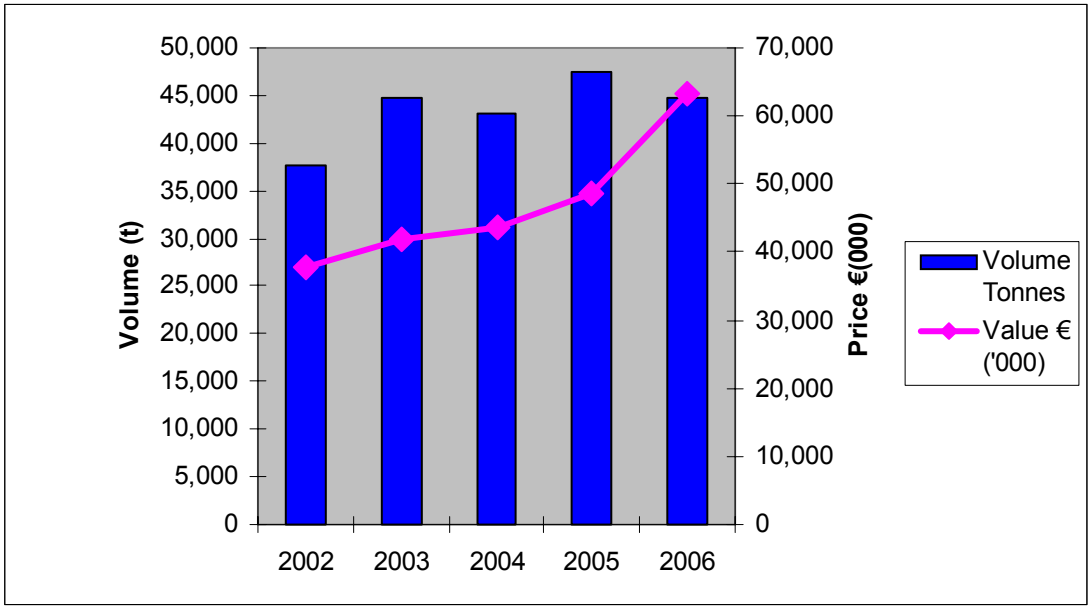


Figure 3: Total Volume (tonnes) and Value ('000) of Shellfish Aquaculture in Ireland from 2002 to 2006 (BIM).

Bottom mussel culture generated the highest volume (52.7%) of shellfish production (Figure 4a) and the highest total value (56.5%) of all shellfish species produced (Figure 4b). The average price for bottom mussel increased from €871 per tonne to €1,517 per tonne in 2006. Pacific or Gigas oyster production represents 14.5% of total shellfish tonnage produced and 23% of its overall value. The total volume of rope mussel produced made up 31% of the total shellfish production (this includes re-laid bottom mussel seed). The remainder was made up of native oyster, clam, scallop and novel shellfish. Figure 4a & b displays a breakdown of the volume of shellfish produced in Ireland and its value respectively.

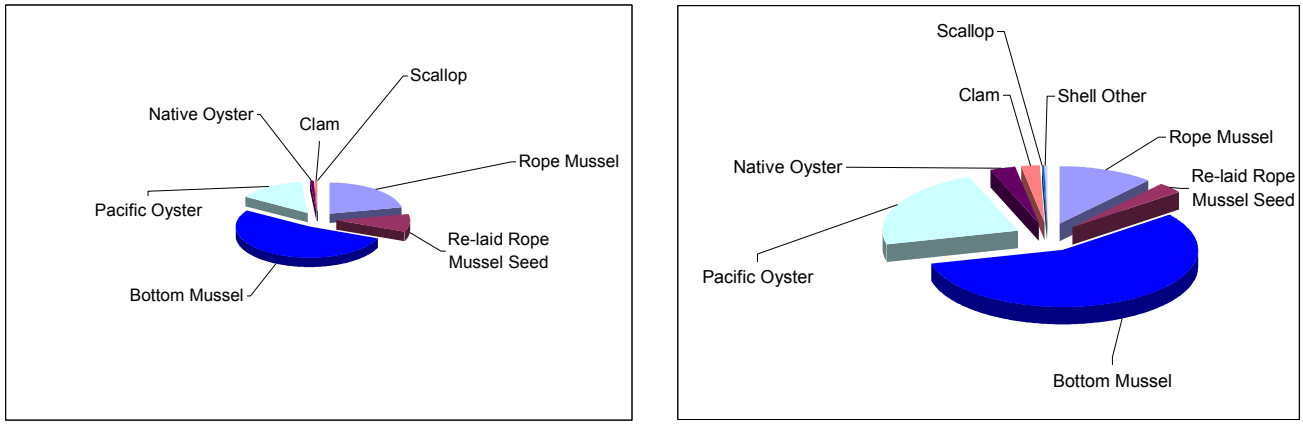


Figure 4 a & b: (a) Market Share by Volume (tonnes) and (b) Value (€'000) (BIM).

Mussels

Bottom Mussels

As a result of a reduction in the volume of mussels relaid in 2005, the amount of bottom mussels harvested decreased from 29,510 tonnes in 2005 to 23,583 tonnes in 2006 (-20%) (Figure 5). However, counteracting this production decrease was a buoyant market demand for bottom mussels which increased the total value of the harvest from €25.7 million in 2005 to €35.8 million in 2006 (Figure 5), with the average price per tonne in 2006 rising to €1,517 (Figure 6).

The amount of fished mussel seed re-laid during 2006 was less than on previous years, but this was augmented with half grown rope mussels purchased for finishing on the bottom (the majority of the product relayed was 40mm+ but there was a smaller but significant percentage of 30mm+ seed). In 2006, the returns on the amount of relaid seed harvested improved in certain areas with the adoption of better husbandry practices and predator control.

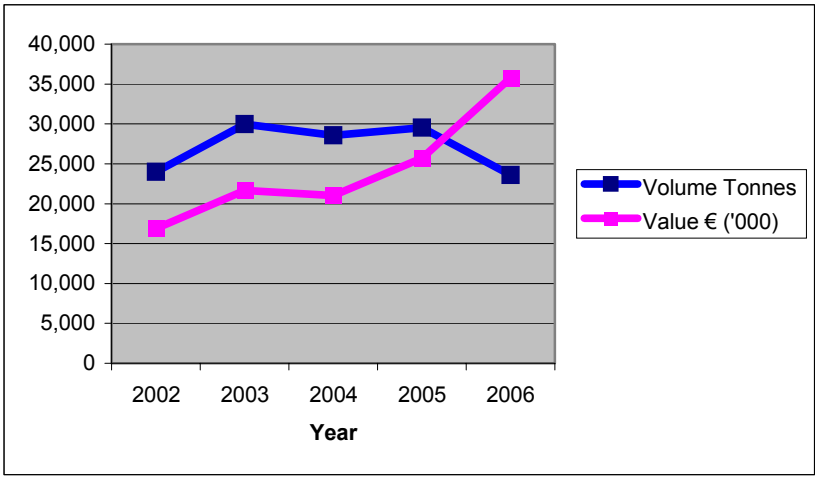


Figure 5: Total production of bottom mussels by volume (tonnes) and value (€'000) 2002 to 2006 (BIM).

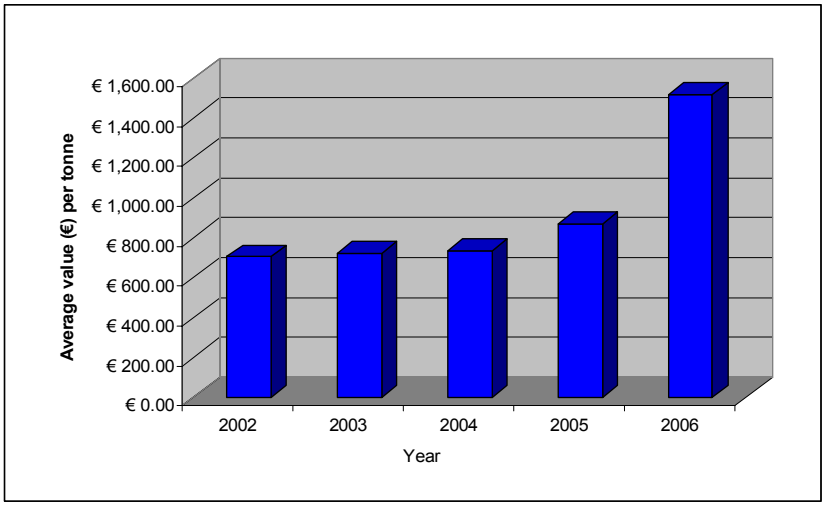


Figure 6: Average value (€) per tonne of bottom mussels 2002 to 2006 (BIM).

Rope Mussel

There was a total of 13,960 tonnes of rope mussel harvested in 2006. Of the total rope mussel harvest, 9,660 tonnes went to market (Figure 7) and 4,300 tonnes was re-laid as bottom mussel seed. The 2006 production for market increased by 905 tonnes (+10.3%) compared with the year 2005 (Figure 7). The total market value also increased from €6.5 million in 2005 to €7.1 million in 2006 (+9%), giving an average price of €742 per tonne (Figure 8).

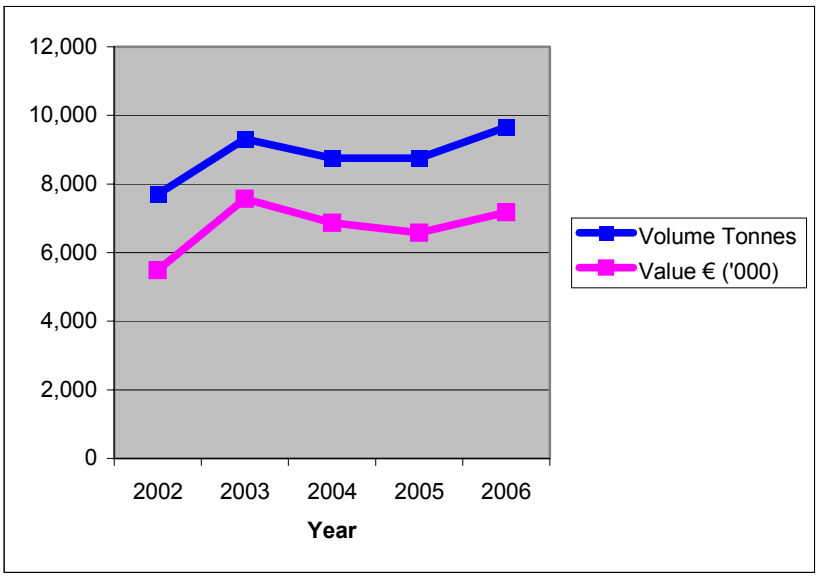


Figure 7: Production of Rope mussels by Volume (tonnes) and Value (€'000) that went to market 2002 to 2006 (BIM).

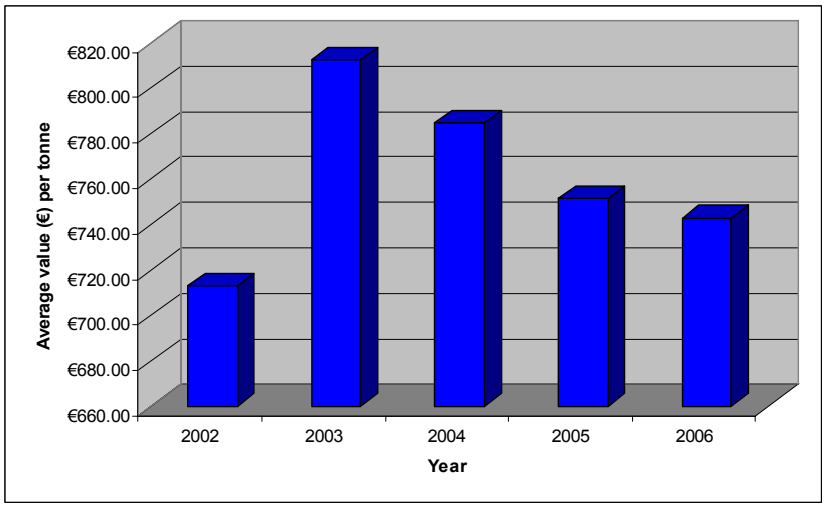


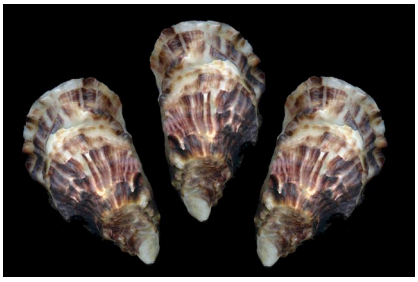
Figure 8: Average Value (€) per tonne of Rope mussels 2002 to 2006 (BIM).

The increase in rope mussel production resulted primarily for two reasons: 1. As more rope mussels affected by biotoxin closures went to bottom culture in 2006, this has meant that they were not lost as they had been in previous years (Table 2). 2. Improved husbandry techniques are yielding more harvestable crop per longline.

Table 2: Rope mussel re-laid as bottom mussel seed during 2005 and 2006 (BIM).

Rope Mussel Re-laid as Bottom Mussel seed	**2005**	**2006**
Volume Tonnes	2,788	4,300
Percentage of Marketable Rope Mussel	24.10%	30.80%
Value € ('000)	930	1,935
Percentage of Total Rope Mussel	12.38%	21.23%

Oysters



Pacific/ Crassostrea gigas (Gigas oyster)
Gigas oyster production increased from 5,811 tonnes in 2005 to 6,511 tonnes in 2006 (+12%) (Figure 9). The total market value of Gigas oysters increased by 20.9% to €2.5 million. In 2006, the average price per tonne increased to €2,245 (+7.9%) (Figure 10).

Figure 9: Total production of Gigas by Volume (tonnes) and Value (€'000) 2002 to 2006 (BIM).

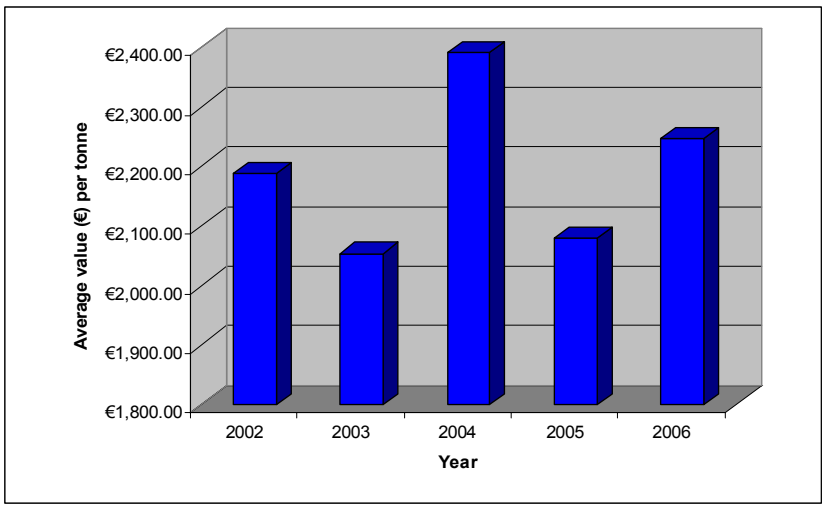


Figure 10: Average Value (€) per tonne of Gigas oysters 2002 to 2006 (BIM).

Approximately 10% of the Gigas oyster tonnage was sold as half grown, primarily to the French market. France was also the main destination for the other sizes with over 85% being sold there.

Native oyster
The harvested volume of native oyster remained relatively static with a moderate increase from 342 tonnes in 2005 to 360 tonnes in 2006 (+5.2%) (Figure 11). The market value for these oysters rose from €1.7 million in 2005 to €1.9 million in 2006 (+11%) (Figure 11). The average price of native oyster increased for the third consecutive year in with an average price of €5,387 per tonne in 2006, which was a rise of 7.8% from that recorded in the year 2005 (Figure 12).

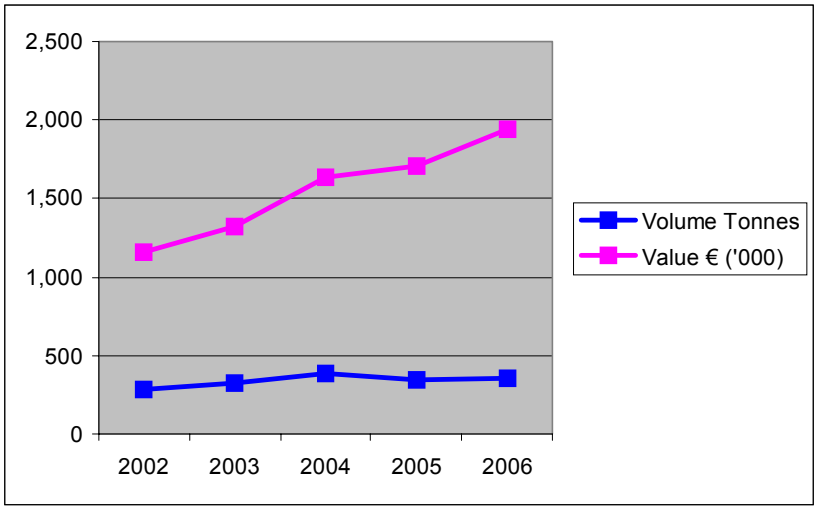


Figure 11: Total production of native oysters by volume (tonnes) and value (€'000) 2002 to 2006 (BIM).

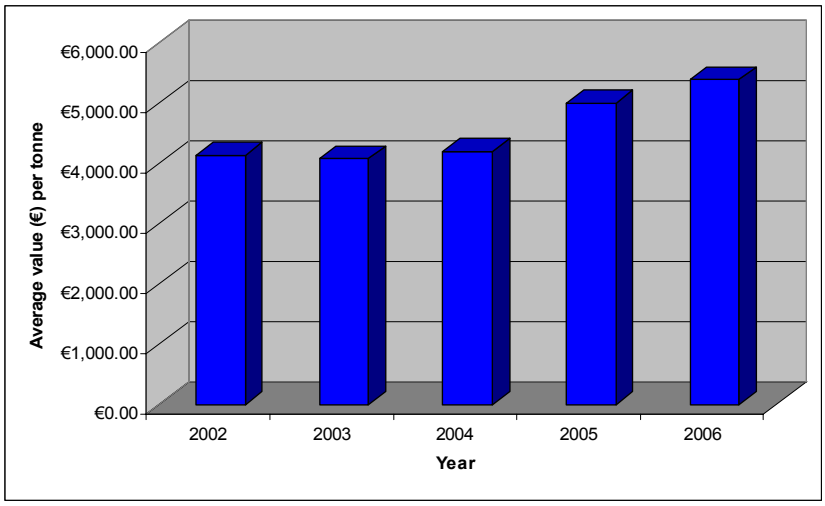


Figure 12: Average value (€) per tonne of native oysters 2002 to 2006 (BIM).

Clams

Clam production increased from 161 tonnes in 2005 to 245 tonnes in 2006, a rise of 52% (Figure 13). The value of the clam harvest also increased from €850,000 in 2005 to €1.38 million in 2006 (+62.7%) (Figure 13). The average price of clams per tonne in 2006 increased for the second year in a row to €5,640 per tonne (+6.9%) (Figure 14).

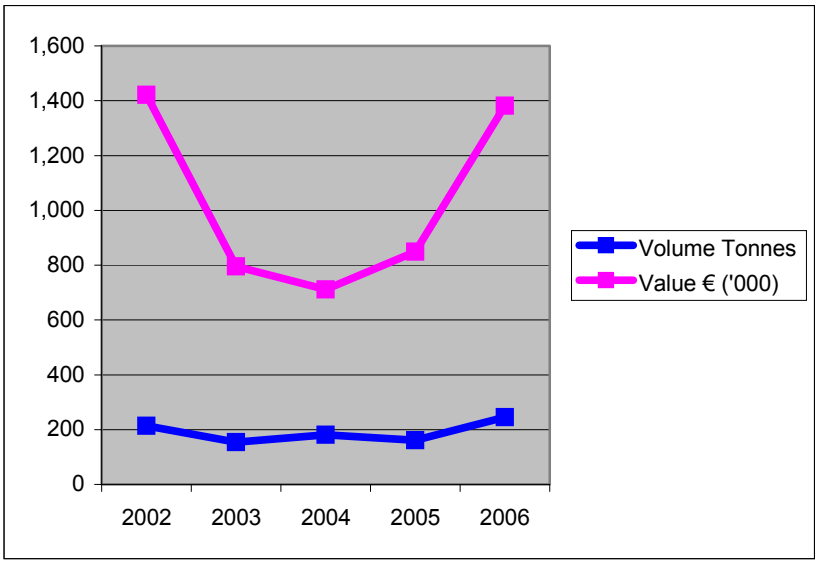


Figure 13: Total production of Clams by Volume (tonnes) and Value (€'000) 2002 to 2006 (BIM).

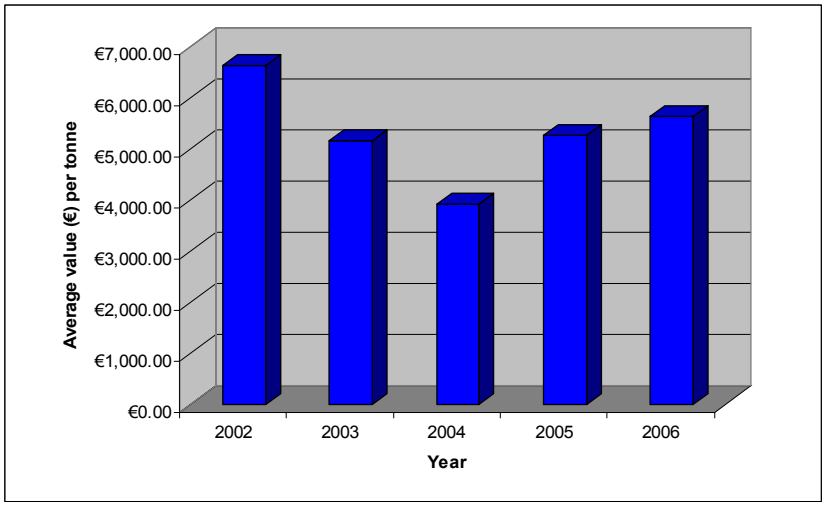


Figure 14: Average Value (€) per tonne of Clams 2002 to 2006 (BIM).

Scallop

The lack of scallop spat in the years 2000 and 2001 had an affect on the returns in 2006 with only 37 tonnes being harvested. This was a significant decrease (-57%) from the 87 tonnes reported harvested in 2005 (Figure 15). As a result the total market value for all scallops harvested also dropped from its 2005 value of €425,000 to €200,000 in 2006 (-52%). Although production volume dropped the average price per tonne of scallop increased to €5,383 per tonne (+10%) (Figure 16).

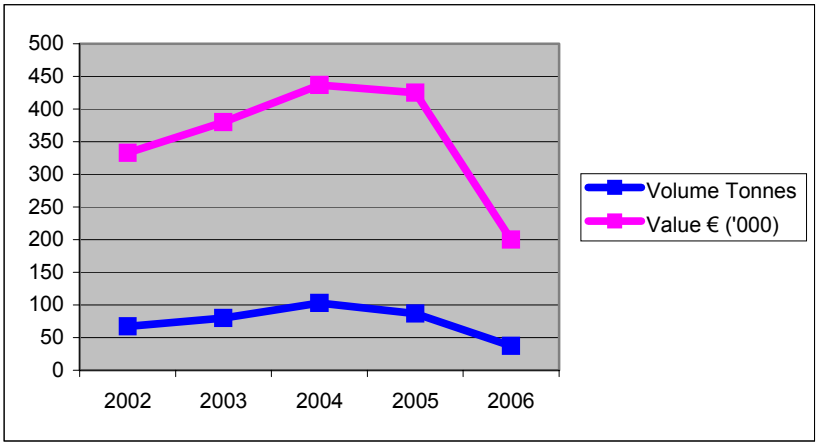


Figure 15: Total production of Scallop by Volume (tonnes) and Value (€) 2002 to 2006 (BIM).

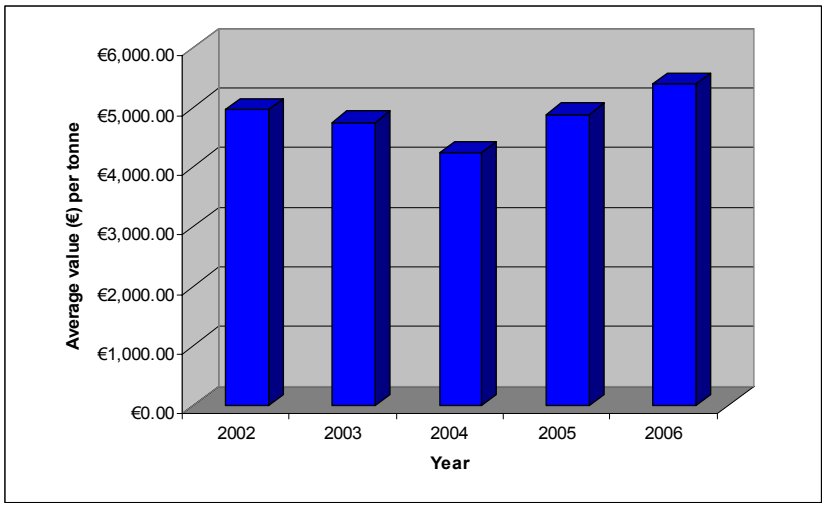
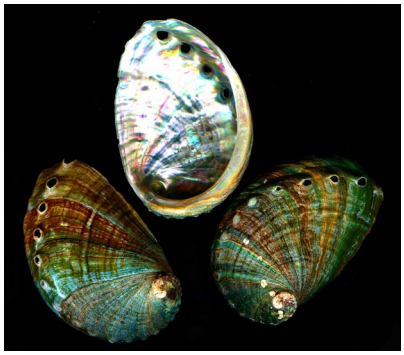


Figure 16: Average Value (€) per tonne of Scallop 2002 to 2006 (BIM).

Novel Shellfish



The category “novel shellfish” consists of abalone, urchin and farmed lobster. In 2006 the total combined value for these species decreased to €201,000 which was a fall of 47% (Figure 17).

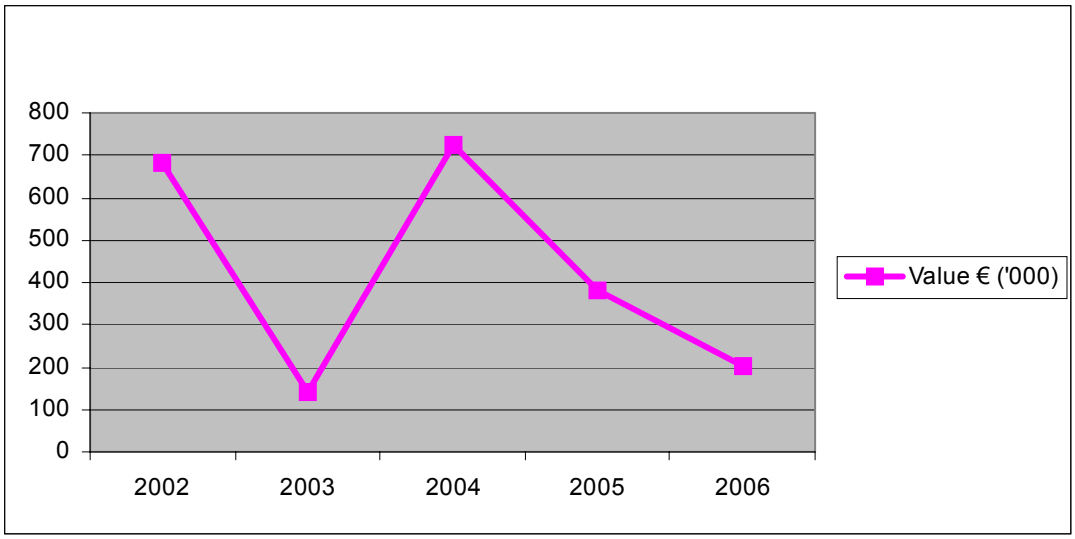


Figure 17: Value (€) of novel shellfish 2002 to 2006 (BIM).

Finfish Production 2006

The national finfish harvest volume decreased from 15,384 tonnes in 2005 to 12,726 tonnes in 2006, which was a drop of 17%. Despite this production decline, the total harvest value of €61.4 million remained relatively the same as the previous year, dropping by only 0.2% (Figure 18).

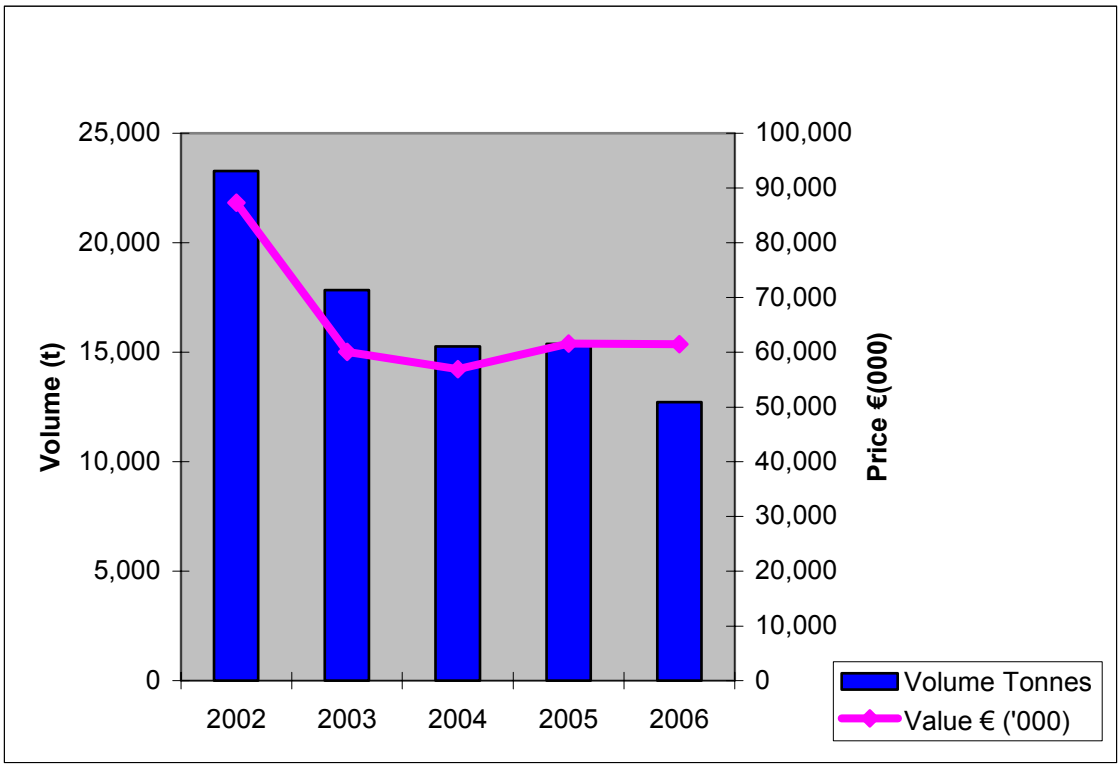


Figure 18: Total production of finfish by volume (tonnes) and value (€) 2002 to 2006 (BIM).

Figures 19a and 19b show the breakdown of the volumes and value of the finfish harvested in 2006 respectively. Salmon dominates both the total volume produced and the value of the harvest making up 88% of the volume and 86% of the value. Freshwater trout constitute 8% of the finfish total volume and 4% of its value, sea reared trout comprise 4% of the volume and value, smolts makes up 6% of the value (volumes are not specified) and novel finfish complete the remaining value.

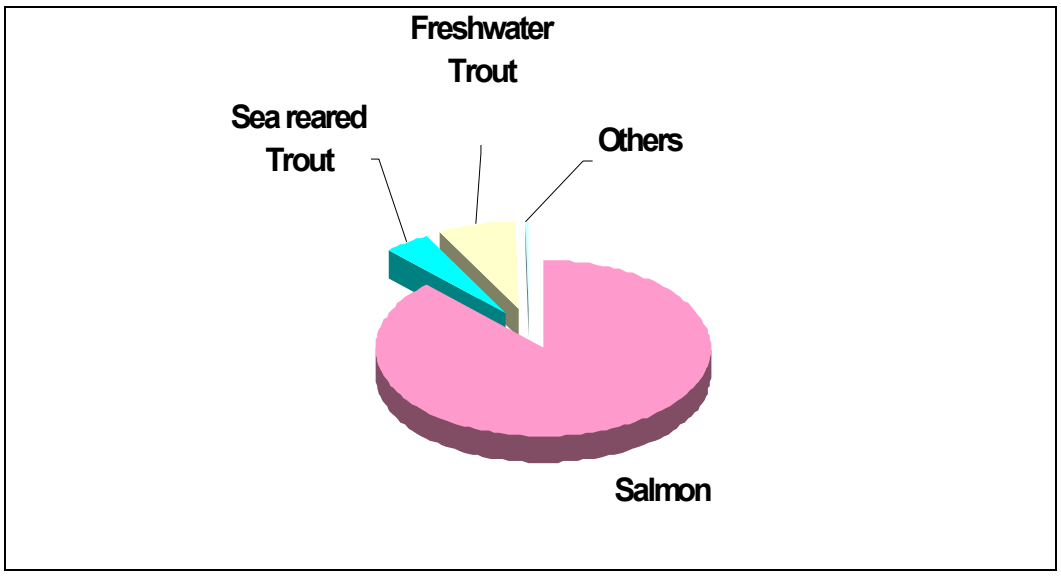


Figure 19a: Total finfish production volume (tonnes). Others include novel finfish and additional sales of juveniles etc (BIM).

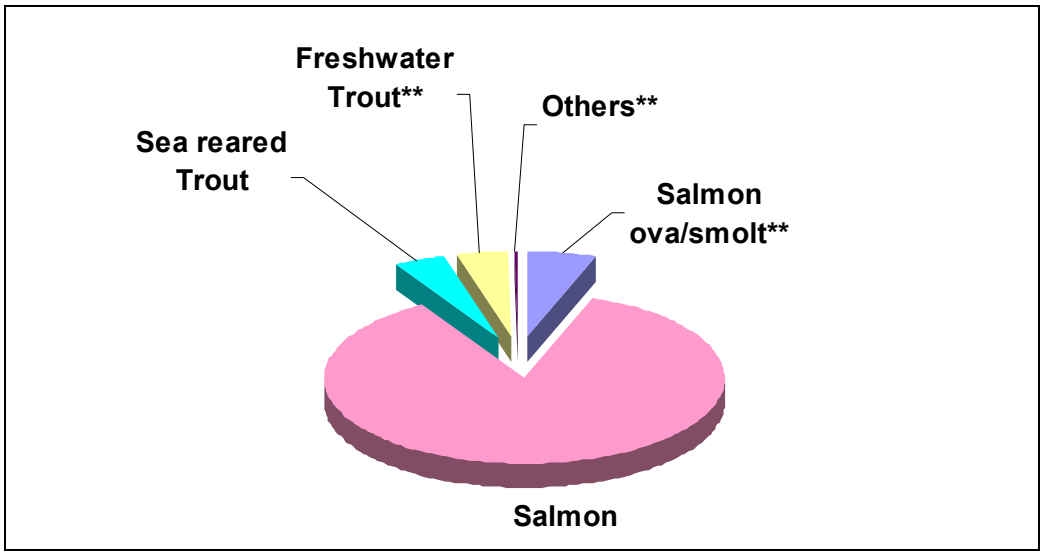


Figure 19b: Total finfish production value (€'000) (** Includes additional value for sales of juveniles etc.) (BIM).

Salmon

Despite early year optimism in 2006 that salmon production was on the increase, mortalities during the summer period prevented this from occurring. These mortalities were primarily attributed to IPN and Gill disease (see Chapter 6).Total salmon production decreased from 13,674 tonnes in 2005 to 11,174 tonnes in 2006, a drop of 18% (Figure 20). However, the exceptional price per tonne achieved in 2006 lessened the impact of the production decline, yielding a total value for the salmon produced of €52.7 million, only 4% less than that achieved in 2005 at €55 million (Figure 20).

Figure 20 depicts the total Volume (tonnage) of Salmon produced and it's Value (€'000) between the years 2000 to 2006.

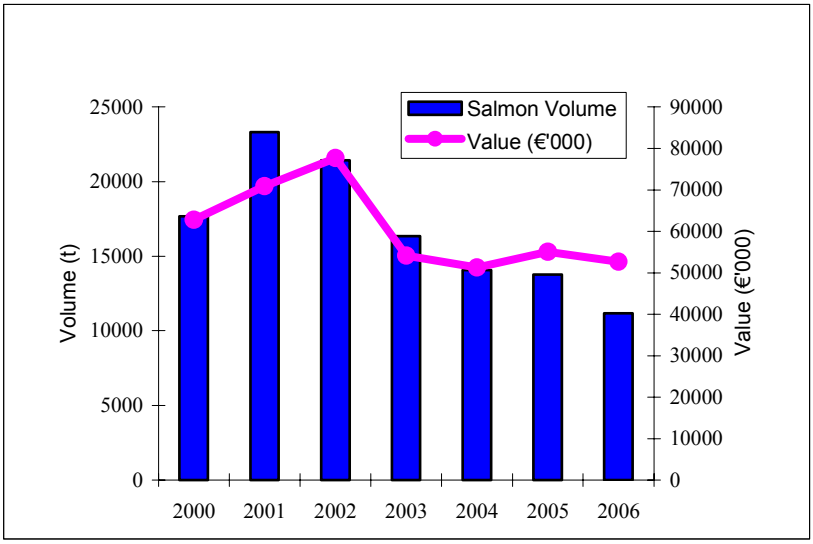


Figure 20: Irish Atlantic salmon volume (tonnes) and value (€'000) 2000-2006 (BIM).

The average price paid per tonne of salmon between the years 2002 and 2006 are shown in Figure 21. Farmed salmon value per tonne has increased steadily since the year 2003.

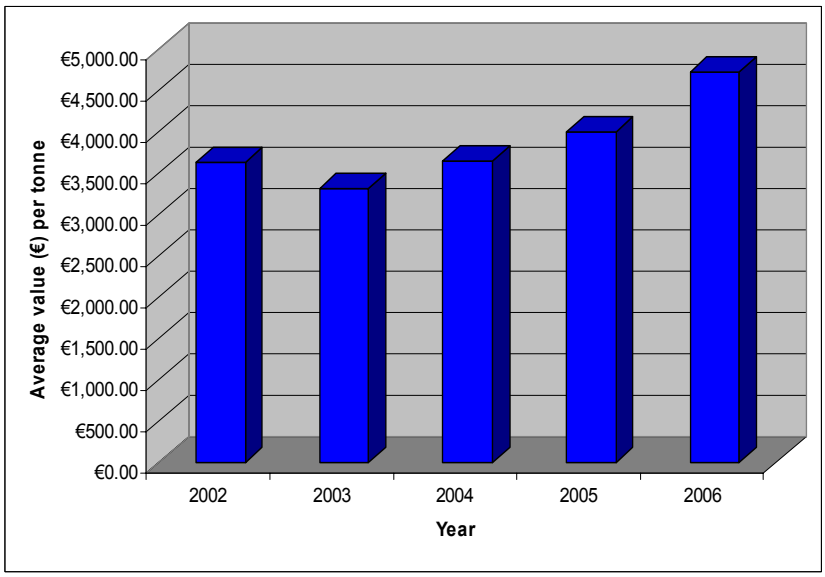


Figure 21: Average value (€) per tonne of Atlantic salmon 2002 to 2006 (BIM).

Figure 22 illustrates the mean monthly price of salmon in the years 2006 and 2005 (adjusted to round weight equivalents - RWE- see Appendix II). During 2006 prices varied from a low of €4.41/kg to a high of €5.23/kg. These prices are calculated averages of all production categories and size classes.

Figure 23 depicts average monthly salmon production volumes for all production categories and their value during the years 2005 and 2006. Production volumes were similar in the first half of each year but were significantly reduced during the autumn/ winter months of 2006. A percentage breakdown for the production categories (kg) for the years 2004 to 2006 are shown in Figure 24.

During 2006 almost 30% of harvested fish were in the 4 kg size class. Figure 24 illustrates the reduction in 5 and 6kg fish harvested in 2006 compared with 2005 and 2004. In 2006 some 25% of fish harvested were 3kg in size compared with 18% in 2005. By combining the information from Figures 24 and 25, it can be see that one quarter of harvested salmon (kg) in 2006 was sold at the lowest price (3 kg and 4 kg size categories). Figure 25 demonstrates the average price paid per kg of salmon in the various size categories during the year 2006.

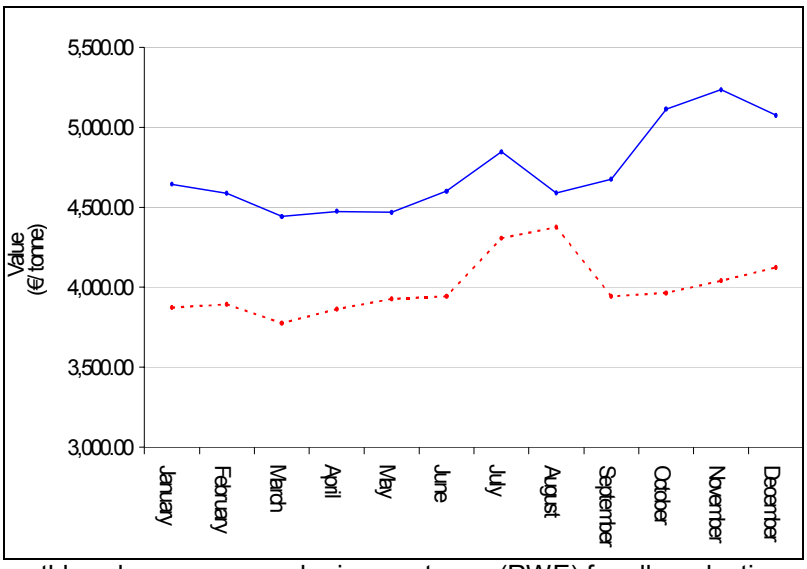


Figure 22: Mean monthly salmon processed price per tonne (RWE) for all production categories and size classes for 2006 (blue line) and 2005 (red dotted line) (BIM).

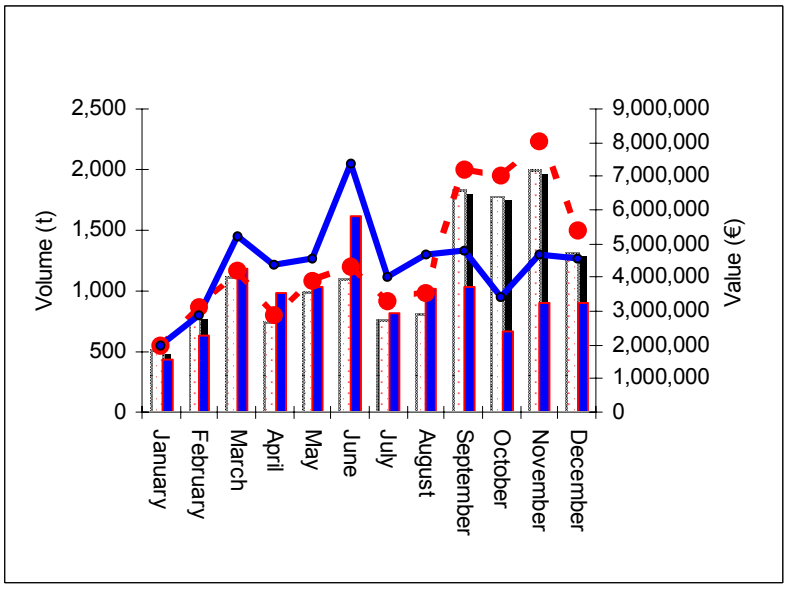


Figure 23: Mean monthly salmon volume (2006 tonnes- blue bars) (2005 tonnes- translucent bars) and value (2006 € blue line) (2005 red dotted line) for all production categories and size classes (BIM).

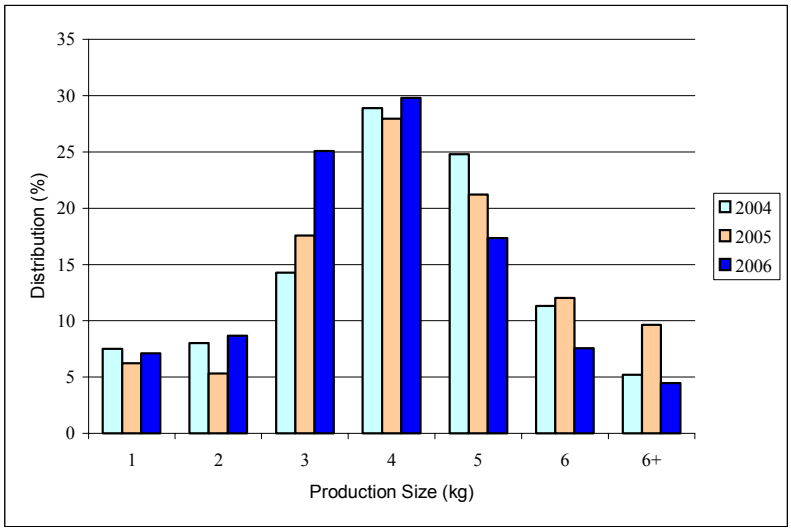


Figure 24: A comparison of size class distribution (kg) of Irish farmed Atlantic salmon during the years 2004 (turquoise), 2005 (brown) and 2006 (blue bar) (BIM).

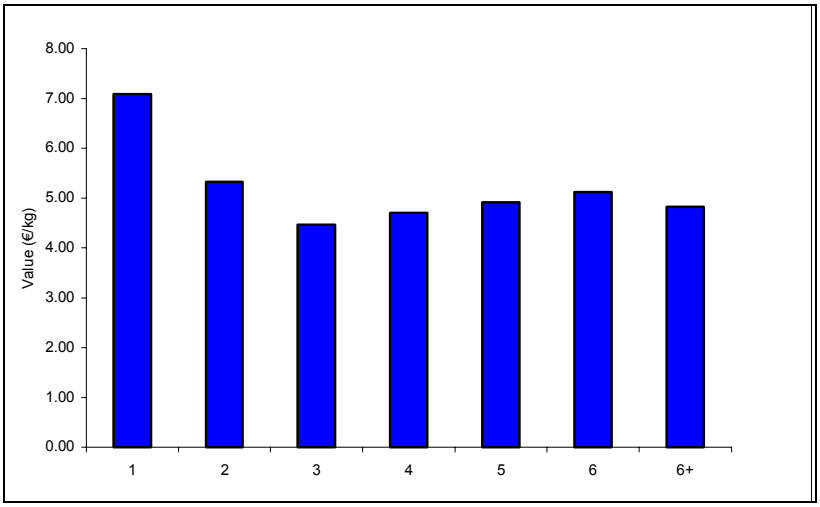


Figure 25: Price per kg of salmon for each size class (1 to 6 kg +) in 2006 (BIM).

The highest prices per kg of salmon were obtained for size classes 1kg and 2kg (Figure 25). However, the prices indicated could be misleading as it is the nature of these products that generally increases their value, i.e. many smaller fish go for value added production via filleting. The reader should also be aware that although these prices are given as round weight equivalent (RWE) allowing for direct comparison between classes, certain categories may also include large quantities of filleted organic fish which obtain premium prices.

Smolts

The national harvest value of smolts increased from a value €2.5 million in 2005 to €3.37 million in 2006, which was a rise of 34% (Figure 26).

Figure 26: Smolt production Value (€'000) from the year 2002 to 2006 (BIM).

The total number of smolts put to sea during the year 2006 was 2,027,000 (MI). The breakdown of this input of smolts is shown in Table 3.

Table 3: Breakdown in the numbers of Smolts put to sea during 2006 (MI).

S ½'s (2006 hatch)	S 1's (2005 hatch)
1,230,000 (350,000 of which were sourced from Scotland)	797,000

Trout

Freshwater trout

Freshwater trout production increased from 897 tonnes in 2005 to 970 tonnes in 2006 and the total value of production increased from €2.3 million to €2.5 million respectively (+8.6%) (Figure 27). The average price for freshwater trout fell slightly from €2,652 per tonne in 2005 to €2,648 per tonne in 2006 (Figure 28). The reader should note that these values include 65 tonnes of small trout sold to the sea rearing sector as juveniles.

Figure 27: Freshwater trout volume (tonnes) and value (€'000) 2000 to 2006 (BIM).

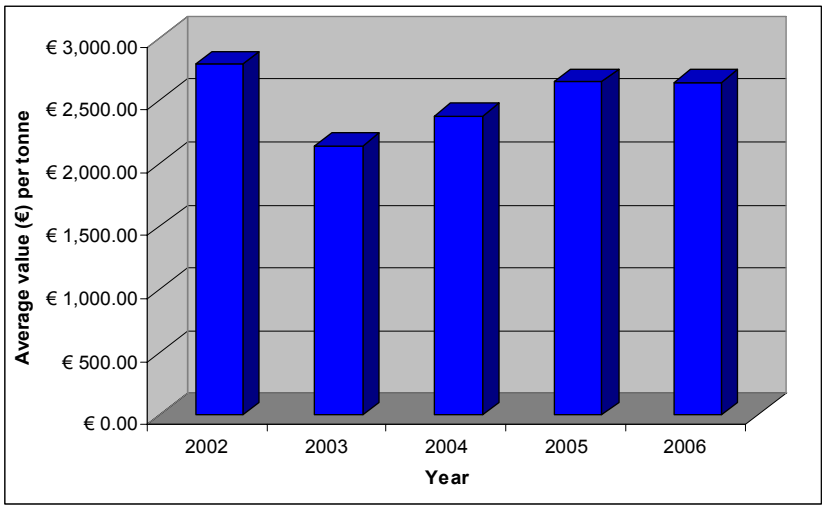


Figure 28: Average Value (€) per tonne of Freshwater Trout 2002 to 2006 (BIM).

Sea reared trout

The volume of sea-reared trout that were harvested declined from 717 tonnes in 2005 to 546 tonnes in 2006 (–23%) (Figure 29). Although the production volume of sea reared trout decreased the total market value rose by 55.9% due to a large increase of 104% in the average price per tonne, which reached €4,476 (Figure 30).

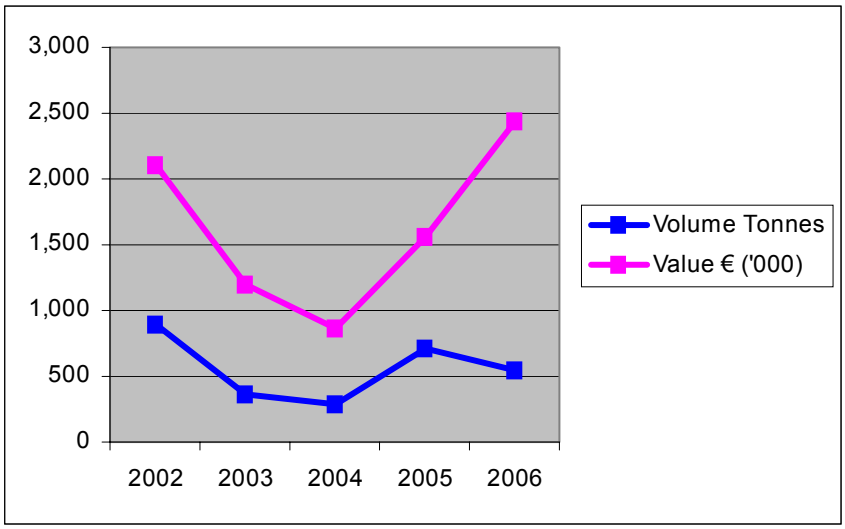


Figure 29: Sea reared trout volume (tonnes) and value (€'000) 2000 to 2006 (BIM).

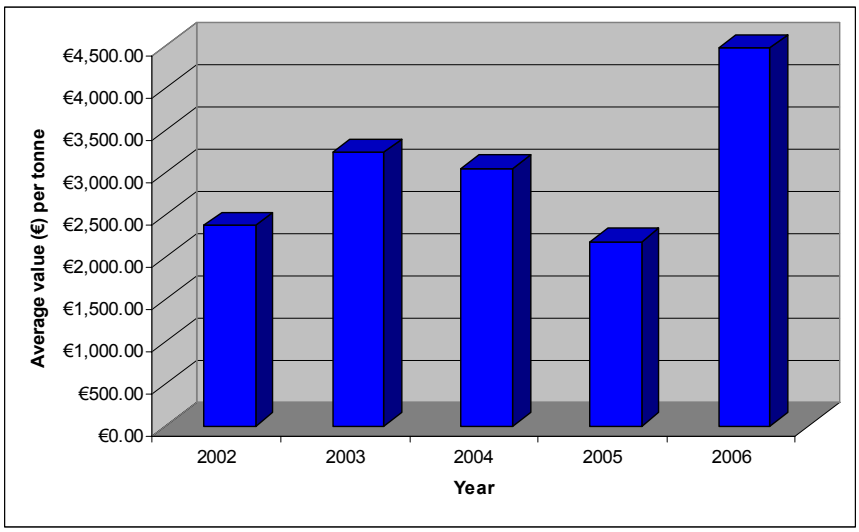


Figure 30: Average value (€) per tonne of sea reared trout during the years 2002 to 2006 (BIM).

Novel Finfish

Novel finfish includes perch, Artic char and ornamental finfish. The total value for novel finfish in 2006 was €0.2 million (Figure 31).

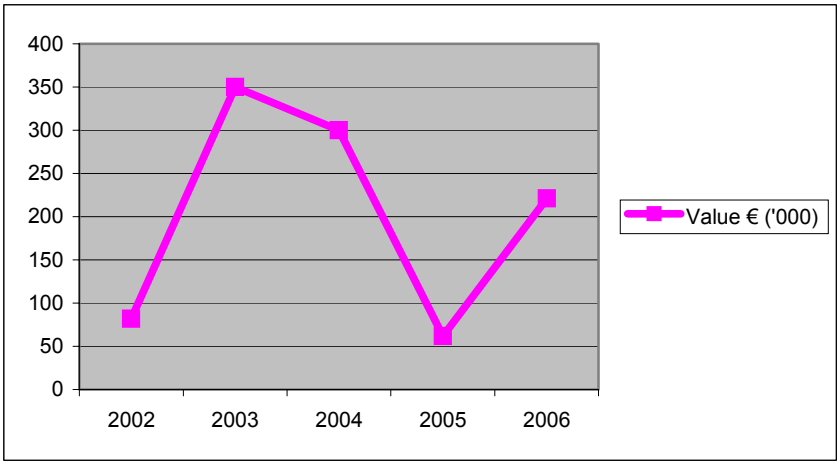


Figure 31: Novel finfish value (€'000) 2000 to 2006 (BIM).

Employment 2006

There were a total of 2,058 people employed in the aquaculture industry (Table 4) in 2006, of this number 782 were in full time employment, 498 were in part time employment and 778 were employed on a casual basis. There was a rise of 12% in aquaculture employment in 2006 compared to 2005. In 2006 the total number of people employed in the shellfish industry was 1,722, which is a rise of 20% of 2005's total or a 13% rise over 2005's FTE (see bottom of Table 4 for definition of FTE). In 2006 there were a total of 327 employed in the finfish sector.

Table 4. Employment in the aquaculture industry 2006 (BIM).

Finfish							
Species	**Full- Time**	**Part-Time**	**Casual**	**Male**	**Female**	**Total**	**FTE**
Freshwater Trout	16	5	4	18	7	25	19
Salmon	143	29	11	176	7	183	159
Sea Reared trout	9	35	3	46	1	47	27
Smolt	35	7	15	49	8	57	41
Others	6	5	4	13	2	15	9
Total Finfish	**209**	**81**	**37**	**302**	**25**	**327**	**255**
Plant							
Species	**Full- Time**	**Part-Time**	**Casual**	**Male**	**Female**	**Total**	**FTE**
Seaweed	**0**	**0**	**9**	**5**	**4**	**9**	**2**
Shellfish							
Species	**Full- Time**	**Part-Time**	**Casual**	**Male**	**Female**	**Total**	**FTE**
Abalone	12	4	2	18	0	18	14
Bottom Mussel	167	107	49	264	59	323	229
Clam	10	14	13	26	11	37	19
Gigas Oyster	171	147	151	405	64	469	270
Native Oyster (farm)	3	2	0	5	0	5	4
Native Oyster (fishery)	2	40	347	385	4	389	80
Rope Mussel	199	91	144	375	59	434	269
Scallop	7	11	24	38	4	42	17
Urchin	2	1	2	5	0	5	3
Total Shellfish	**573**	**417**	**732**	**1,521**	**201**	**1,722**	**905**
Total							
	Full- Time	**Part-Time**	**Casual**	**Male**	**Female**	**Total**	**FTE**
	782	**498**	**778**	**1,828**	**230**	**2,058**	**1,162**

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

Mussels

The total number employed in bottom mussel production in 2006, rose by 15% to 323 people compared with 281 in 2005. This was an increase of 23 FTE giving a total of 229 FTE in 2006. Rope mussel employment also increased significantly with its total increasing from 297 in 2005 to 434 in 2006 (+46%). The FTE also rose by 49.4% to 269 in 2006. This reflects the increased production of the rope mussel sector in 2006.

Crassostrea gigas

The total number of employees involved in gigas oyster production decreased from 543 people in 2005 to 469 people in 2006 (-13%), which is a reflection of the increased mechanisation of the sector.

Other Shellfish

Employment in the native oyster sector rose from 45 FTE in 2005 to 84 FTE in 2006 (+86%). The number of casual staff that operated in the area caused this significant rise with numbers increasing from 224 in 2005 to 347 in 2006.

Finfish

The number of people employed in the finfish sector decreased by 17% to 256 FTE, which was a total of 327 people employed. Salmon employment fell from 225 FTE in 2005 to 159 FTE in 2006 this was due to a reduction of 38 fulltime and 53 part time staff of the total number of persons employed. Smolt employment showed a slight increase to 45 FTE in 2006. In the freshwater trout sector, employment rose by 46% to 19 FTE. Sea reared trout also encountered an increase in employment rising by 4 FTE to 27 FTE in 2006

Using these employment figures and the total value of the species produced in Table 1 the financial turnover per FTE has been calculated in Table **5.** This table is a simple analyses of financial turnover in each aquaculture sector and does not show profit.

Table 5: The financial turnover per full time equivalent (FTE) in the Irish Aquaculture sectors.

2006 Species	Value €'000	No. F T E	Turnover per FTE
Rope Mussel (incl. Relaid Rope Seed)	9,112	269	33,873
Bottom Mussel	35,789	229	156,283
Pacific Oyster	14,623	270	54,159
Clam	1,382	19	72,736
Native oysters (Farmed and Fishery)	1,941	84	23,107
Scallop	200	17	11,764
Shellfish Other*	201	17	11,823
Total Shellfish	**63,248**	**905**	**69,887**
Salmon ova/smolt	3,378	41	82,390
Salmon	52,711	159	331,515
Sea reared Trout	2,444	27	90,518
Freshwater Trout	2,658	19	139,894
Others	221	9	24,555
Total Finfish	**61,412**	**255**	**240,831**
Total Aquaculture	**124,660**	**1,160**	**107,413**

* (Other shellfish, Abalone and Urchins).

As there are no production value figures for seaweed production this sector has not been included in Table 5.

3. EXPORT MARKET SUMMARY

Finfish

Seafood sales in France had a good start to the year with positive media reporting from a health perspective and also because of poor poultry sales resulting from concerns about bird flu.

Salmon

An increased awareness of the benefits of consuming seafood in general (e.g. Omega 3) and salmon in particular meant that retail sales of salmon in France 2006 achieved strong prices (Figure 32), resulting in the value of salmon rising steadily from Christmas 2005 up to autumn 2006. This trend was boosted by Easter demand and salmon prices matured throughout the summer as pre cuts were in demand for the barbeque season. However, retail prices began to decrease following the 'back to school' period (September) when consumer attention switched to non food budget items. October and November saw a continuation of this price decrease but the end of year sales showed signs of improved market value. Pre-cuts in general showed greater elasticity to market fluctuation than whole salmon, demonstrating the success of convenient pre packed offerings of steaks and darnes (Figure 32).

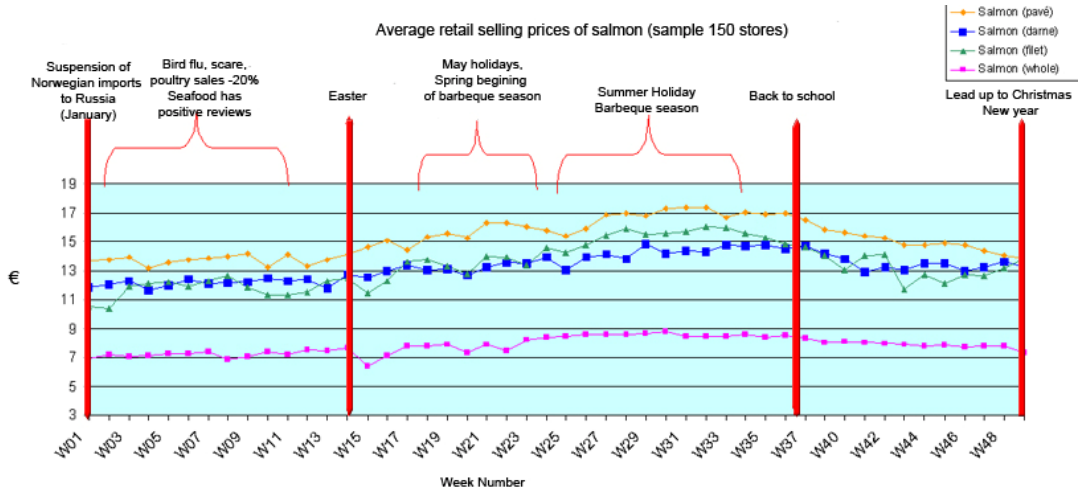


Figure 32. Average weekly retail prices for salmon in France (sample of 150 shops) (BIM).

Wholesale level prices followed a similar trend to retail stores, although the Rungis market showed a more stable curve. Nevertheless, gradual price increase could be observed up to Easter with a sudden rise in prices over the summer period due to high demand. Autumn prices dropped to pre spring levels. End of year demand was also fuelled by sales of smoked salmon. This trend appeared to favour the recipe based smoked salmon segment of the market, e.g. smoked salmon prepared with dill, basil, olive oil, peppers etc.

The most significant feature of 2006 was the rapid increase in salmon prices during the summer season. Driven primarily by restricted supply to the market coupled with increased demand. This trend was also present in the Irish industry, but analysis shows that Irish salmon prices were not as tightly coupled to the mass salmon market as in previous years. Irish export prices for salmon rose by 17% up to September 2006 compared with the same period in 2005. This increase was less that that of Scottish and Norwegian prices which improved by 23% and 30% respectively. Figure 33 shows that Irish export prices (CIF) were relatively stable in comparison to the rise and fall of the Scottish and Norwegian export prices.

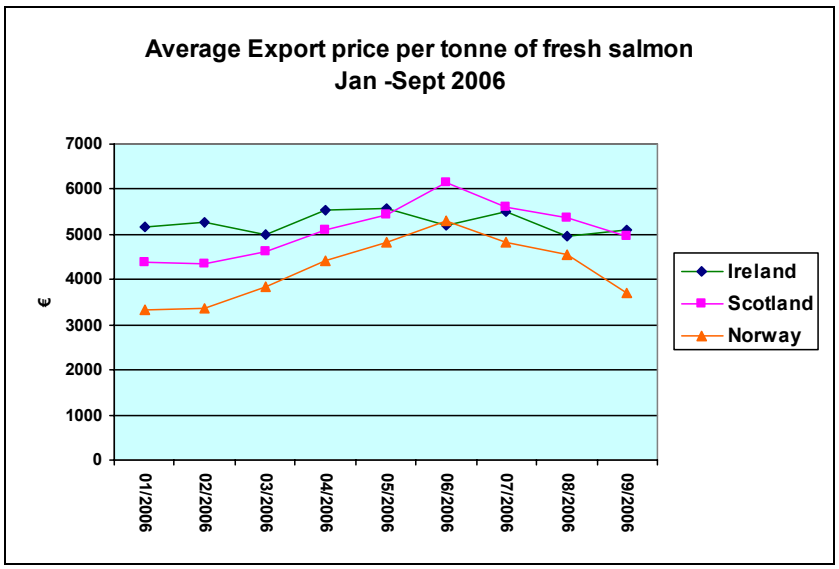


Figure 33: Average export price (€) per tonne of fresh salmon (BIM).

A number of reasons may account for this relative stability of Irish salmon price:

1. Irish salmon production was significantly lower in 2006 than in previous years and therefore was in a positive market demand situation.
2. Irish salmon appears to have achieved a degree of product differentiation in the market which has allowed Irish salmon to retain a relatively high price. The increased production of organically farmed salmon has also helped to reinforce this differentiation.
3. It would also appear that despite the rise in Scottish and Norwegian salmon prices in mid summer, Irish exporters did not exploit this situation. This seems to have allowed Irish salmon products values to stabilise while prices fell for Scottish and Norwegian salmon in the latter half of the year.

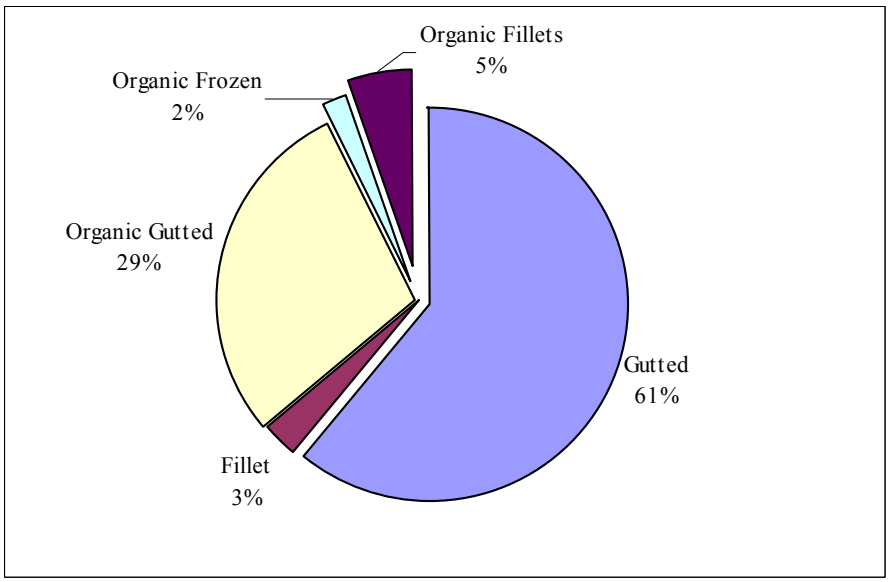


Figure 34: Production categories for Irish Atlantic salmon in 2006 (BIM**).**

The predominant production category was gutted salmon (Figure 34) composing 61% of product, down from 71% the previous year. Between 2005 and 2006 fillet supply decreased from 4% to 3%. Organic fish (all categories combined) increased from 24% in 2005 to 36% in 2006. However, it should be noted that the volume of organic salmon produced did not increase greatly. It would therefore appear that the decrease in the proportion of gutted fish produced has magnified the increase in organic salmon.

The Round Weight Equivalent (RWE – see Appendix II) price for gutted fish (Figure 35) ranged from €3.81 to €4.29 per kg. The lowest price for fillets occurred in January and was €3.51 per kg due to higher than average volumes of production grade fish. Fillets generally managed to achieve €5.67/kg and they did not drop below €5.00/kg after April. The organic salmon mean monthly value, which is composed of

several production classes, varied from €5.35 to €6.08 per kg. A further breakdown of prices for organic Salmon is shown below in Figure 36. There were no sales of frozen organic salmon in January and February (Figure 36). A peak price of €10.57 per kg occurred in October when the production was just over four tonnes as opposed to the 25 to 30 tonnes in an average month. The mean price for the year was €7.64 per kg, but with high variability. Mean prices for gutted organic salmon ranged from €5.23 to €5.69 averaging €5.47 to year-end. Fillet prices ranged from €6.52 to €7.33 per kg with a mean price for the year at €6.97 per kg. Figure 37 displays the market destination for Irish Atlantic salmon post processing. The largest market for these products is Ireland, accounting for almost 38% of production. France is the next biggest market consuming nearly 36% of production, followed by Germany and the UK at 10% and 9% respectively. Together these four markets consume in excess of 92% of processed salmon. The final 8% of markets are composed of Poland, Switzerland, US and Canada, Spain, Holland, Belgium and Hong Kong in descending order.

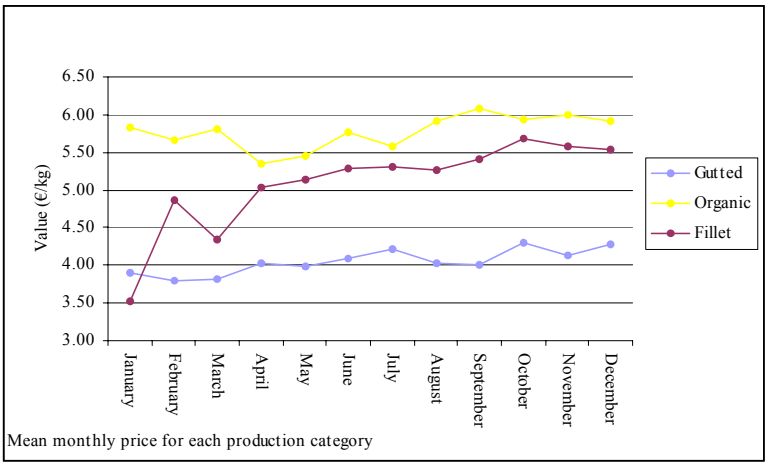


Figure 35: Mean monthly price Round Weight Equivalent (RWE – see Appendix II) for each production category (BIM).

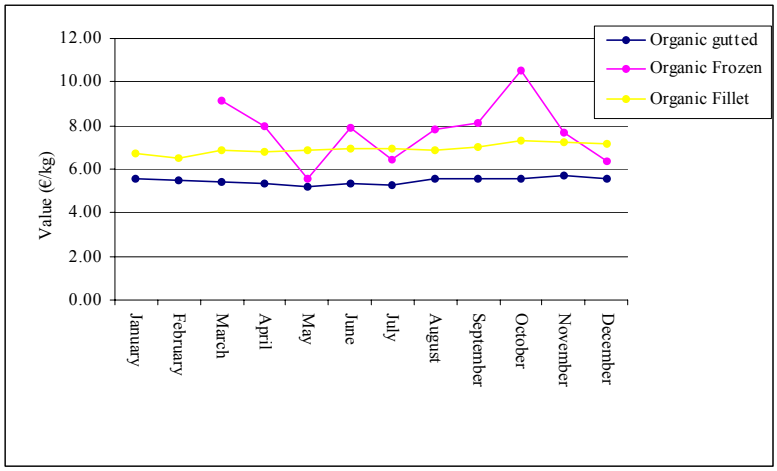


Figure 36: Organic salmon production categories (RWE –Appendix II) in 2006 (BIM).

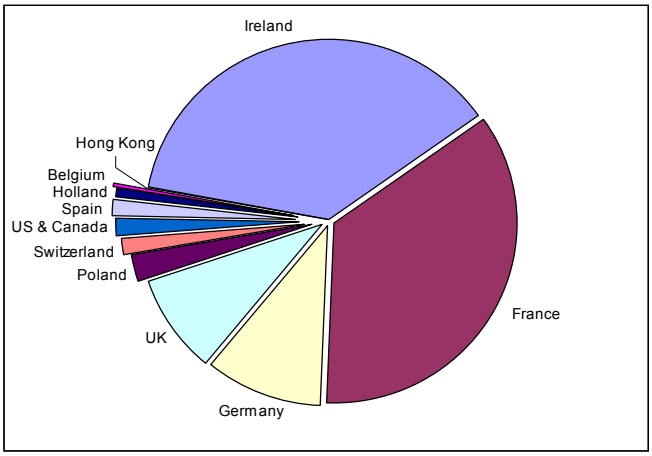


Figure 37: Market destination for processed Irish Atlantic salmon (BIM).

Trout Market

The positive market prices for salmon during 2006 impacted favourably on the freshwater trout market with the average ex-farm prices increasing from €2.65/kg in 2005 to €2.82/kg in 2006. Of the Irish freshwater trout produced for the table, 65% was sold in Ireland and the remainder was sold in the UK. There was a slight increase in the amount of trout sold (65 tonnes compared to 50 tonnes in 2005) from the freshwater sector to the sea reared trout sector for ongrowing.

The average ex-farm price of sea reared trout mirrored salmon prices with values doubling from €2.19/kg in 2005 to €4.47/kg in 2006. The main markets were France (55%) and the UK (36%). The Irish market accounted for only 6.5% of the production and an even smaller small proportion (2.5%) going to the USA.

Shellfish

Overall the market for shellfish during 2006 was positive, both in terms of volume and value traded. In response to growing consumer demand for convenience food, the range of value added shellfish products has increased in shops.

In 2006, France was the key shellfish export market for Ireland with a market share of approximately 35%, followed by Spain at nearly 20% (Table 5). A strong increase in exports during 2006 to the UK (+25%) was enhanced by value added sales. The increased exports in 2006 to the Netherlands (+122 %) were due to bottom mussels sales.

Table 6: Irish Shellfish Export Statistics (BIM).

	European Union (€)			Share %			Change %
Country	**2004**	**2005**	**2006**	**2004**	**2005**	**2006**	**2005 to 2006**
World	132,023,710	130,337,010	140,806,440	100	100	100	8.03
France	50,150,350	47,050,110	48,313,190	37.99	36.1	34.31	2.68
Spain	20,368,870	26,003,800	27,974,660	15.43	19.95	19.87	7.58
Italy	21,151,070	21,149,750	20,980,930	16.02	16.23	14.9	-0.8
United Kingdom	16,243,160	15,164,040	18,976,070	12.3	11.63	13.48	25.14
Netherlands	6,649,190	5,183,380	11,555,640	5.04	3.98	8.21	122.94
United States	2,482,240	2,452,210	3,123,380	1.88	1.88	2.22	27.37

(N.B. this table includes lobster, crab, whelk, prawns, etc.).

Oysters

In 2006, bulk Gigas oyster prices were approximately 5 to10% higher than those recorded in 2005. The average price for Irish oysters delivered to France was approximately €2.20 to €2.30 per kg and €2.70/kg for special oysters. There were also some exceptional sales reaching over €3/kg.

In 2006, the margins for French packers were reduced as a result of high bulk prices and low retail purchasing offers. Consequentially, very few packers succeeded in increasing their selling price to retail chains. The average price increase in 2006 for packed oysters was around 2 to 3 %. Despite some volatility in the retail market, the average price increased through the year. The average selling price to the consumer for all grades and quality was €5.75/kg (Figure 38).

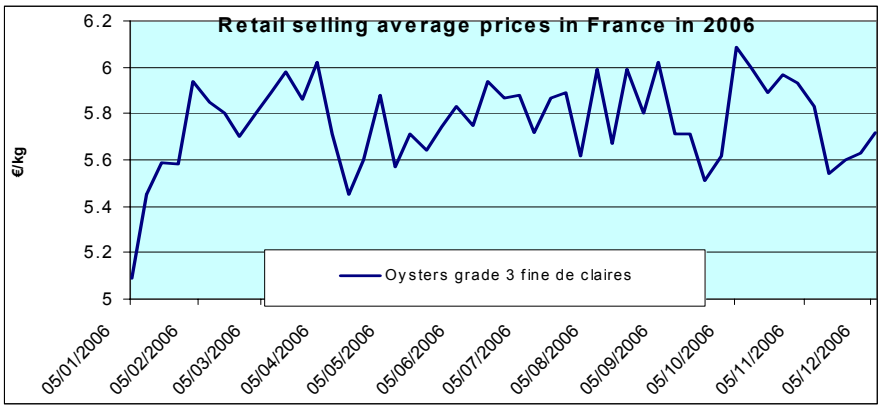


Figure 38. Gigas oyster retail prices in France 2006 (BIM).

Mussels

In 2006, mussel prices for French consumers increased by approximately 8% during the year. This increase can primarily explained by a decline in Dutch mussel supplies to the French retail chains (see section on Dutch market below) which created an upward pressure on prices (Figure 39).

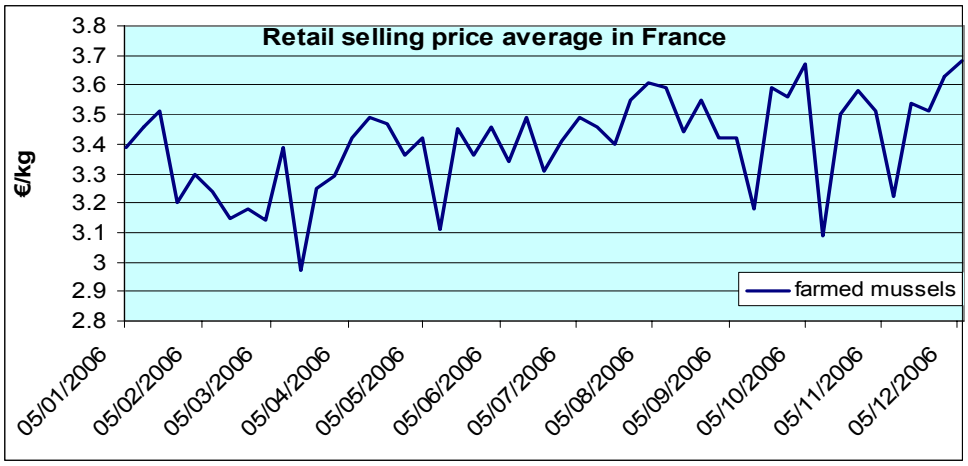


Figure 39: Retail selling price for farmed mussels in France (BIM).

In 2006 bouchot mussel ex-packer prices ranged from €1.80 to €2/kg packed in traditional 15kg jute bags. During the year 2005 similar mussels were selling at around €1.50 to 1.60/kg. Sales of Irish rope mussels delivered into France at the beginning of 2006 were achieving prices around €1.15/kg, however, strong competition led to a deterioration of these prices which resulted in a low of €0.90/kg delivered.

Sales of Irish bottom mussels in bulk benefited from the general price increase that occurred during the second half of 2006, selling at around €900/ton delivered (+10 to 15% in comparison to 2005 prices).

Dutch mussel auction prices had a record high average price of €2.30/kg in July 2006. This price was as a result of the decline in Dutch mussel production (drop in seed availability) and the commitments by Dutch packers to supply retail multiples and catering groups, which, forced them into sourcing mussels at "any cost". Sales of MAP Dutch mussels into the French market reached around €2/kg, corresponding to an increase of around 40% in comparison with 2005 (Figure 40).

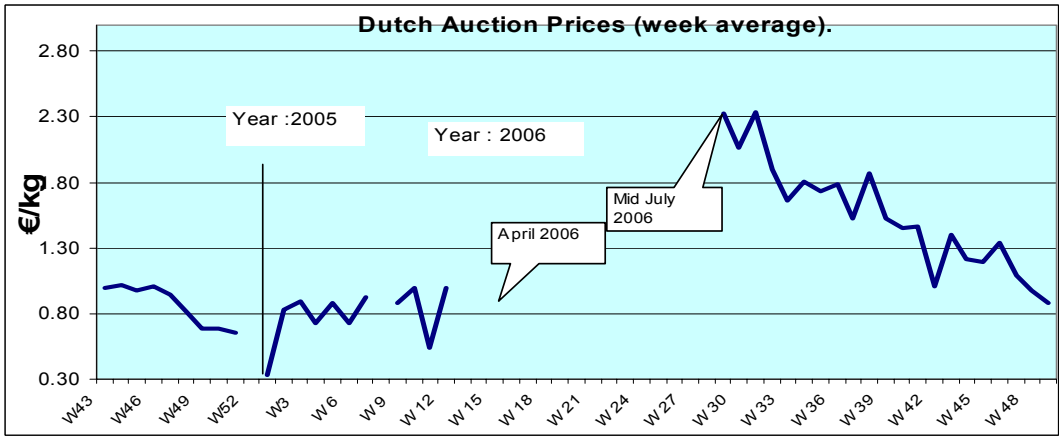


Figure 40: Dutch weekly average auction prices for mussels (BIM).

Due to good seed recruitment, Dutch mussel production is expected to increase next season.

The market for cooked, whole frozen mussels was tight during the first half of 2006, with an overall decline in price for the French market (Figure 41). It is believed that the growing supply of Chilean mussel meats (Figure 42, EU imports graph below) is affecting the global frozen mussel market and that the US$/ Euro exchange rate also favours imports from Chile.

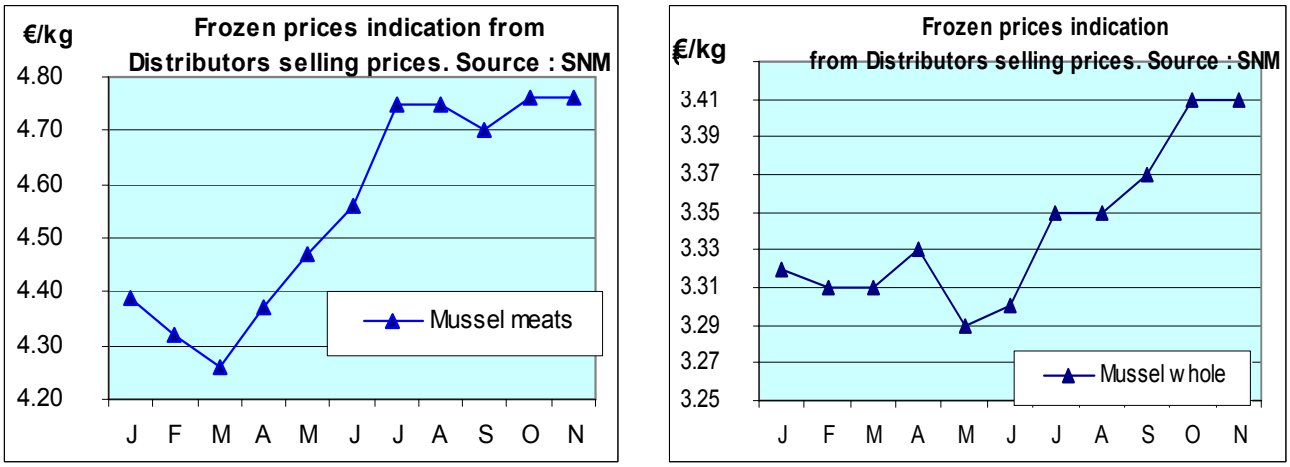


Figure 41: (a) Frozen whole mussel and (b) Frozen mussels meat prices during 2006 (BIM).

During the second half of 2006, the market improved slightly (Figure 41). This trend may be partially attributed to a lack of fresh mussel supplies in Europe, notably from Holland. This caused the catering sector to switch from live MAP mussel to frozen mussels.

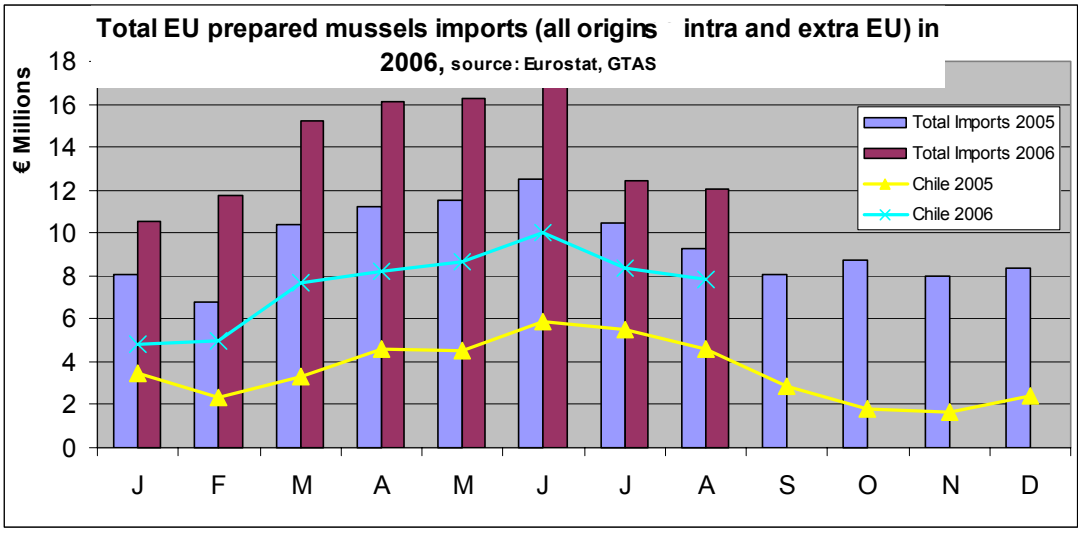


Figure 42: Total EU prepared mussel imports (BIM).

Flat Oysters (Native)

The price for Irish flat oysters was high in 2006, with a delivered price of around €6/kg (10 to 11 oysters per kg).

4. AQUACULTURE LICENCES AND APPEALS

Aquaculture Licences

From information supplied by the DCMNR there were a total of 704 aquaculture licences around Ireland in 2006 of which 181 were lapsed or due for renewal. Many of the latter may still be in operation pending decisions on renewal applications.

The distribution of the licences by species and geographic location are shown in Table 7 below. Most of the licences are for shellfish farming with a breakdown of 43% and 30% for oysters and mussels respectively. The majority of the licences are held in Galway, Donegal and Cork (cumulative total 59%). The licences are issued in eight inland and thirteen coastal counties.

Table 7: Distribution of Aquaculture Licences by County for the principal aquaculture species (Source: DCMNR). N.B. Licences that are due for renewal before the end of 2005 are indicated in (brackets).

County	Salmon	Trout (FW & Marine)	Other Finfish	Oysters	Mussels	Clams	Scallops	Other Shellfish	Algae	Total
Louth	-	1	-	10 (4)	13 (1)	-	-	-	-	24 (5)
Wexford	2	1 (1)	-	4 (3)	15	-	-	-	-	22 (4)
Waterford	(1)	-	-	7 (27)	3 (1)	-	-	-	-	10 (29)
Cork	3 (4)	1 (2)	(2)	20 (9)	49 (8)	1	3	12 (2)	1 (1)	90 (28)
Kerry	5 (1)	2	-	26 (1)	9 (14)	3 (1)	2	-	-	47 (17)
Limerick	-	-	-	1	-	-	-	-	-	1
Clare	(1)	(1)	-	15 (1)	2	1	(1)	-	-	18 (4)
Galway	19 (14)	(1)	1	48 (3)	40 (9)	3	-	5	2	118 (27)
Mayo	3 (4)	2	1	37 (25)	6	3 (1)	4	4	-	60 (30)
Sligo	-	-	1	1 (6)	2	10 (1)	-	2	-	16 (7)
Donegal	11 (8)	(1)	-	60 (6)	22 (4)	6 (1)	4 (3)	(1)	-	103 (24)
Kildare	1	-	-	-	-	-	-	-	-	1
Leitrim	1	-	-	-	-	-	-	-	-	1
Tipperary	(1)	(3)	-	-	-	-	-	-	-	(4)
Westmeath	-	2	-	-	-	-	-	-	-	2
Carlow	-	1	-	-	-	-	-	-	-	1
Cavan	-	-	1	-	-	-	-	-	-	1
Offaly	-	-	2	-	-	-	-	-	-	2
Kilkenny	-	1	-	-	-	-	-	-	-	1
Wicklow	1	2 (2)	-	-	-	-	-	-	-	3 (2)
Roscommon	-	-	2	-	-	-	-	-	-	2
Total	**46 (34)**	**13 (11)**	**8 (2)**	**229 (85)**	**161 (37)**	**27 (4)**	**13 (4)**	**23 (3)**	**3 (1)**	**523 (181)**

Notes:
i) There may be multiple sites associated with one licence.
ii) In the data analysed certain sites are shown as licensed but which have no licence duration, these appear in brackets.
iii) Other shellfish includes lobster, abalone and sea urchins.

Table 7 shows that there were 181 licences lapsed or due for renewal in the year 2006. By contrast the number of licences that lapsed or were due for renewal during the years 2004 and 2005 were 99 and 145 respectively (Parsons et al. 2004, Parsons et al. 2005 and Browne et al. 2006). Based on available data from the DCMNR it is not possible to establish how many of these are still active and may require renewing.

Aquaculture Applications and Decisions

Applications

All aquaculture operations must be licensed under the Fisheries (Amendment) Act 1997. Licences are issued by the Minister for the Department of Communications, Marine and Natural Resources (DCMNR).

In 2006 there were a total of 262 listed licence applications on the DCMR database; these are shown in Table 8.

Table 8: Distribution of Aquaculture Outstanding Licence Applications by County for the principal aquaculture species (Source: DCMNR).

County	Salmon	Trout (FW & Marine)	Other Finfish	Oysters	Mussels	Clams	Scallops	Other Shellfish	Algae	Total
Louth	-	-	-	2	5	-	-	2	-	9
Dublin	-	-	-	-	1	-	-	-	-	1
Wexford	-	-	-	4	12	-	-	-	-	16
Waterford	-	-	-	14	8	-	-	1	-	23
Cork	2	1	-	19	34	2	5	1	-	64
Kerry	1	-	-	23	18	-	-	-	2	44
Limerick	-	-	-	2	-	-	-	-	-	2
Clare	-	-	-	16	-	-	-	-	-	16
Galway	-	-	-	12	9	-	-	-	1	22
Mayo	2	-	-	11	2	1	-	-	-	16
Sligo	-	-	-	1	1	1	-	-	-	3
Donegal	-	-	-	28	15	1	2	-	-	46
Total	**5**	**1**	**0**	**132**	**105**	**5**	**7**	**4**	**3**	**262**

Notes: i) There may be multiple applications associated with one site.
ii) Certain applications may be licensed or have other decisions made about them, but the decision has not been recorded in the data analysed.
iii) Other shellfish includes cockles, abalone and sea urchins.

The majority of the licence applications are for shellfish farms (oysters or mussels) in counties Cork, Kerry and Donegal.

Decisions

Aquaculture applications and decisions on Aquaculture licences from 2003 to 2006 are summarised in Table 9 (Parsons et al. 2004 & 2005, Browne et al. 2006 – source DCMNR).

Table 9: Summary of Aquaculture Licence Applications and Decisions during 2003 to 2006.

Applications	Year 2003	Year 2004	Year 2005	Year 2006
Applications	58	70 (62+8)	73 (63+10)	NA
Licence renewal application	55	30 (24+6)	14 (8+6)	NA
Decisions				
Grant	33 (25+8)	25 (22+3)	7	15
Refusals	1	5 (4+1)	1	2
Renewals granted	12 (7+ 5)	10 (6+4)	16	28
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
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.

Table 9 shows the number of applications received by the DCMNR (new and renewals) for the years 2003, 2004 and 2005. This data shows that the number of applications (new and renewals) decreased by 26 applications (113 applications in 2003 to 87 applications in 2005). Much of this decrease is attributed to a reduction in the number of renewal applications (from 55 to 14), whereas the number of new applications increased by 15. Unfortunately at the time of publication of this report there was no data available on the number of Licence applications received by the DCMNR during the year 2006.

Between the years 2003 to 2005 the number of decisions made by the DCMNR decreased from 46 to 26. During 2006 this increased to 45 decisions.

Figure 43 illustrates that the number of new and trial Licence applications increased between the years 2003 and 2005 and that the number of decisions on new applications decreased between 2004 and 2005 but increased again during 2006. By contrast, the number of renewal application decreased sharply

between 2003 and 2005 whereas the number of decisions on renewal applications increased. It is also interesting to note that, in 2003, the number of new and renewal applications were similar but by 2005 there were 59 more new applications that there were renewal applications. The overall number of decisions made by the DCMNR between 2003 and 2006 remained constant at 46 and 45 respectively.

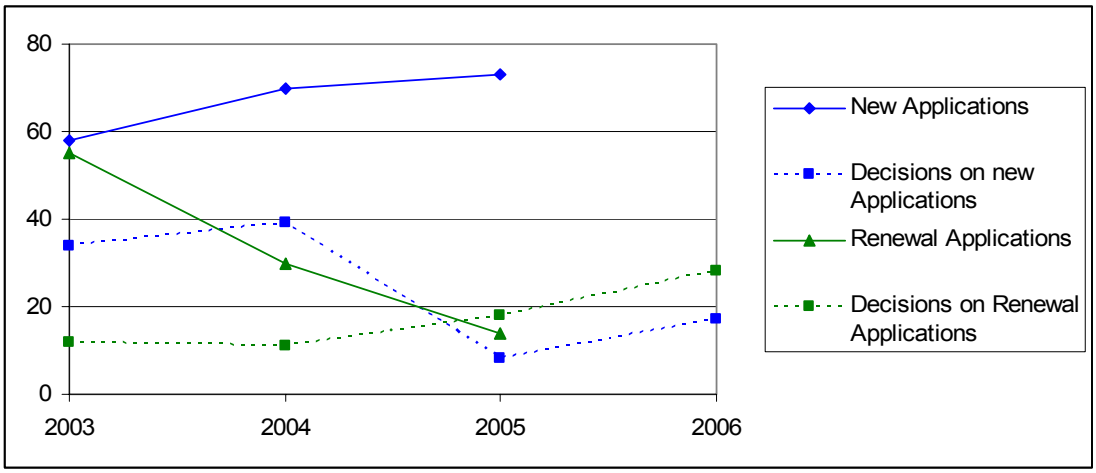


Figure 43: The number of new (including trial) and renewal aquaculture licence applications made between 2003 and 2005 and the number of decisions made by the DCMNR between the years 2003 to 2006. (NB There was no data on applications available for the year 2006).

The reason for the decrease in the number of renewal applications is unclear. Without information on the number of applications made in 2006 it is not possible to determine if there was an increase or decrease in the number of new applications for aquaculture licenses. A possible explanation for a decrease in renewal applications could be that as most aquaculture licences are granted for a period of 10 years, the decrease could reflect a high level of licensing issuing activity during the mid 1990s.

Table 7 suggests that there are 262 outstanding applications; however, this should be qualified as there may be multipliable applications associated with one site or the data analysed might not be up-to-date in terms of applications decided upon. It is thought that a more reliable indication of the extent of the backlog is the difference between the number of applications received between 2003 and 2005 and the number of decisions made during this period. Table 8 shows that there were 300 applications and only 122 decisions made.

Therefore, based on the three years (2003 to 2005) there were 178 additional outstanding applications for which no decisions were made. This represents an average yearly increase in the number of applications for which no decisions were made of 56. No data was available from the DCMNR for the number of applications received in 2006 but, as there were 45 decisions made, this backlog was not cleared and has probably increased.

The reason for this increasing backlog of licences applications over recent years is not entirely clear but obligations under the Birds and Habitats Directives are one of the influencing factors. During 2006, and in accordance the Aquaculture (Licence Application) Regulations, SI 236/1998, the statutory consultees, including the MI, were consulted by the DCMNR on 62 licence applications. Of these, 56 were marine based and of this 56, 48 were located in areas protected under the Habitats or Birds Directives. This is not unexpected as can be seen by comparing the location of aquaculture sites in Figures 1 and 2 of this report and the locations of the Special Areas of Conservation and Special Protected Areas in Figs 44 and 45 (see section “Conservation sites in Ireland”).

Aquaculture Licence Appeals Board (ALAB)

A total of 6 appeals were received by the Board in 2006. These were in relation to 5 decisions by the Minister to grant aquaculture licences; 1 salmon smolt licence, 1 arctic charr and European perch licence, 1 mussel spat licence, 1 Pacific oyster licence and 1 mussel licence.

In addition, one appeal was carried over from 2005. This appeal was referred by the Board to the High Court on a point of law. The High Court directed that the applicant company regularise its affairs with the

Companies Registration Office and resubmit its application to the Department of Communications, Marine and Natural Resources. The Board was, therefore, not required to further consider the appeal.

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
b) 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.

The Board made one determination in 2006. Five appeals were carried over into 2007. This resulted in the granting of one aquaculture licence with revised conditions. During 2006, the total tonnage licenced by the Board for arctic charr and European perch was 25 tonnes, increasing to 50 tonnes after two years of operation. The number of Ministerial decisions that were appealed in 2006 is shown in Table 10.

Table 10. Number of Ministerial decisions that were appealed to ALAB.

YEAR	MINISTERIAL DECISIONS	TO GRANT A LICENCE	TO REFUSE A LICENCE	TO RENEW A LICENCE
2006	5	4	1	0

Table 11 shows the number of aquaculture licence appeals received and Board Determinations made by the ALAB from the year 1999 to 2006.

Table 11: Aquaculture Licence Appeals Received and Board Determinations by the Aquaculture Licences Appeals Board 1999-2006. (Source – 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

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 having to make a determination on all appeals. This would result in just one of the three possible outcomes.

Conservation sites in Ireland

The implication on the decision making process on new and renewal aquaculture applications for sites in, or close to, protected areas is that the requirements of the European Communities (Natural Habitats) Regulations, SI 94/1997 apply. Under these regulations, the licensing Minister can not grant an aquaculture licence until satisfied that the aquaculture activity will not adversely affect the integrity of the

protected site concerned. Recognising this obligation, the DCMNR requested BIM to develop a screening protocol for the assessment of aquaculture licence applications within or close to protected sites. There was some contact at administration level with other official agencies including NPWS and MI on this issue. Progress on developing this protocol was made in 2006 and it was tested on a limited number aquaculture licence applications in Clew Bay. This process requires further development and needs to be finalised so that licence applications not likely to have a significant impact on protected sites can be identified and processed in a quick and efficient manner. For licence applications requiring further assessment of their implications on the integrity protected sites, criteria and procedures have to be established to ensure these assessments can be undertaken to a standard sufficient to meet the requirements of the statutory decision making process.

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 (SACs) and Special Protection Areas (SPAs).

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

SACs are prime wildlife conservation areas in the country, considered to be important on a European as well as Irish level (Figure 44). The legal basis on which SACs 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. To date, Ireland has transmitted 424 sites to the European Commission as candidate Special Areas of Conservation. These cover an area of approximately 13,500 square kilometres.

Figure 44: Special Areas of Conservation

SPAs sites are primarily areas of importance for wild birds and their habitats and are designated under the EU Birds Directive (79/409/EEC) (Figure 45). 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, 110 SPAs have been designated. A further 25 sites have been notified to landowners. Approximately 25 SPAs are also designated as SACs.

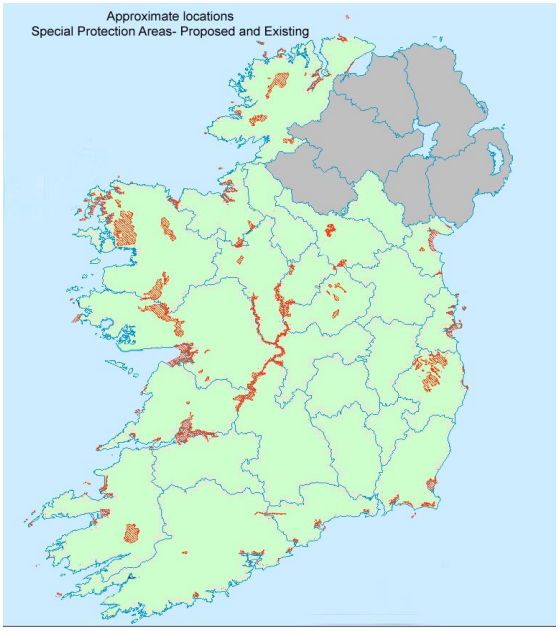


Figure 45: Special Protection Areas

Site Designation Process.

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 SACs. 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 NHAs, SACs and SPAs 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/

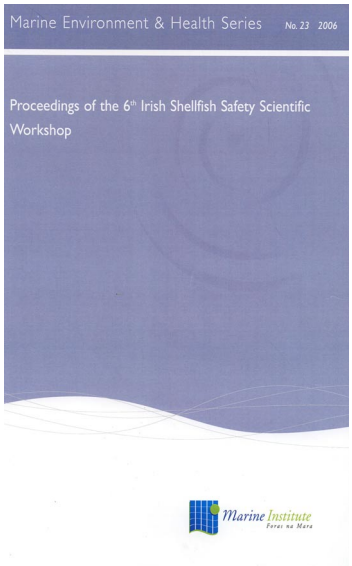
5. AQUACULTURE MONITORING – SHELLFISH

To meet market and EU demands, Ireland has established a comprehensive system of environmental and food safety monitoring for both the shellfish and finfish sectors. The results of these key monitoring programmes are set out below.

Biotoxin and Phytoplankton Monitoring

Irish National Monitoring Programme 2006.

Shellfish such as mussels, oysters, clams etc. feed by filtering micro algae and other small particles from the water. Occasionally certain species of phytoplankton may cause the shellfish to become unsafe for human consumption.



The Marine Institute has carried out a shellfish monitoring programme since the late 1980s to detect the presence of various natural toxins which can originate from micro-plankton. This work is carried out in conjunction with the Department of Communications, Marine and Natural Resources (DCMNR) and the Food Safety Authority of Ireland (FSAI). These programmes monitor seawater samples from around the coast for harmful plankton under EU Directives and examine shellfish samples for the presence of toxins before their sale is permitted. Toxicity in shellfish is grouped according to the various toxins present and the principal toxins that impact on shellfish are ASP (Amnesic Shellfish Poisoning), DSP (Diarrhetic Shellfish Poisoning), PSP (Paralytic Shellfish Poisoning) and AZP (Azaspiracid Shellfish Poisoning), see box 2.

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).

Shellfish DSP/AZP National Monitoring 2006.

A total of 2,384 samples of shellfish were received and analysed by the Marine Institute during 2006, a slight decrease on the 2005 numbers when there were 2,549 samples received. This lower number of samples can be attributed to a decrease in the prevalence of Azaspiracid (AZP) toxicity in the last quarter of 2006 compared with that in 2005. A breakdown of the shellfish species analysed in 2006 is shown in Figure 46.

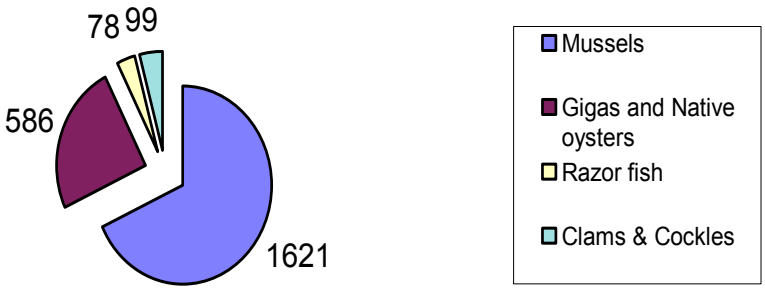


Figure 46: Number of samples tested for the National Monitoring Programme (MI).

The frequency for sampling from January to the end of May (2006) was monthly for all species and weekly for mussels (*M.edulis*). This sampling frequency changed from monthly to fortnightly on the 1st June for all species with the exception of mussels that remained on a weekly sampling regime. From the 1st of November the sampling frequency reverted back to monthly for all species. However, mussels remained on a weekly sampling frequency due to the continued presence of AZP toxicity in the south of the country. During 2006 the Marine Institute and its contract labs carried out a total of 2,091 bioassays of which there were 342 positive mouse bioassays observed. All of the positives occurred in mussel samples from the south and south west of the country with the exception of a small number of positives being observed in mussels at the following locations: Mweeloon Bay (Galway), Galway Bay North (Galway), Inver bay (Donegal), McSwynes Bay (Donegal) and Bruckless Bay (Donegal).

The Marine Institute carried out 2,384 analysis by Liquid Chromatography-MS (LCMS) for AZP and OA in 2006 and 220 of these samples analysed (9.23%) had levels of AZP above the regulatory limit of 0.16µg/g. As a result of these positive results there were 174 closures (Figure 47), 32 closed pending and 14 open statuses were issued in the "Biotoxin Shellfish Reports". One sample of Pacific oysters (*C.gigas)* from Donegal Harbour had a level above the regulatory limit of 0.16µg/g. All other positive results recorded were in mussel samples. In general DSP concentrations in shellfish were lower than those found in previous years for all samples analysed by LCMS, with only eight samples analysed (0.34%) having levels of OA above the regulatory limit. Positive bioassays were also observed in these samples. These positives samples primarily occurred in the southwest but there were also two in Galway Bay North and one in Killary middle. All DSP positives found occurred between the 27th of June and the 18th of September 2006. Figure 47 shows the duration of those shellfish production areas that were closed during 2006. By combining positive bioassay's and Liquid Chromatography-MS (LCMS) results above the regulatory limit the percentage positive result found was 16.4% for 2006 a slight decrease on the 17.5% recorded in 2005 as shown in Figure 48.

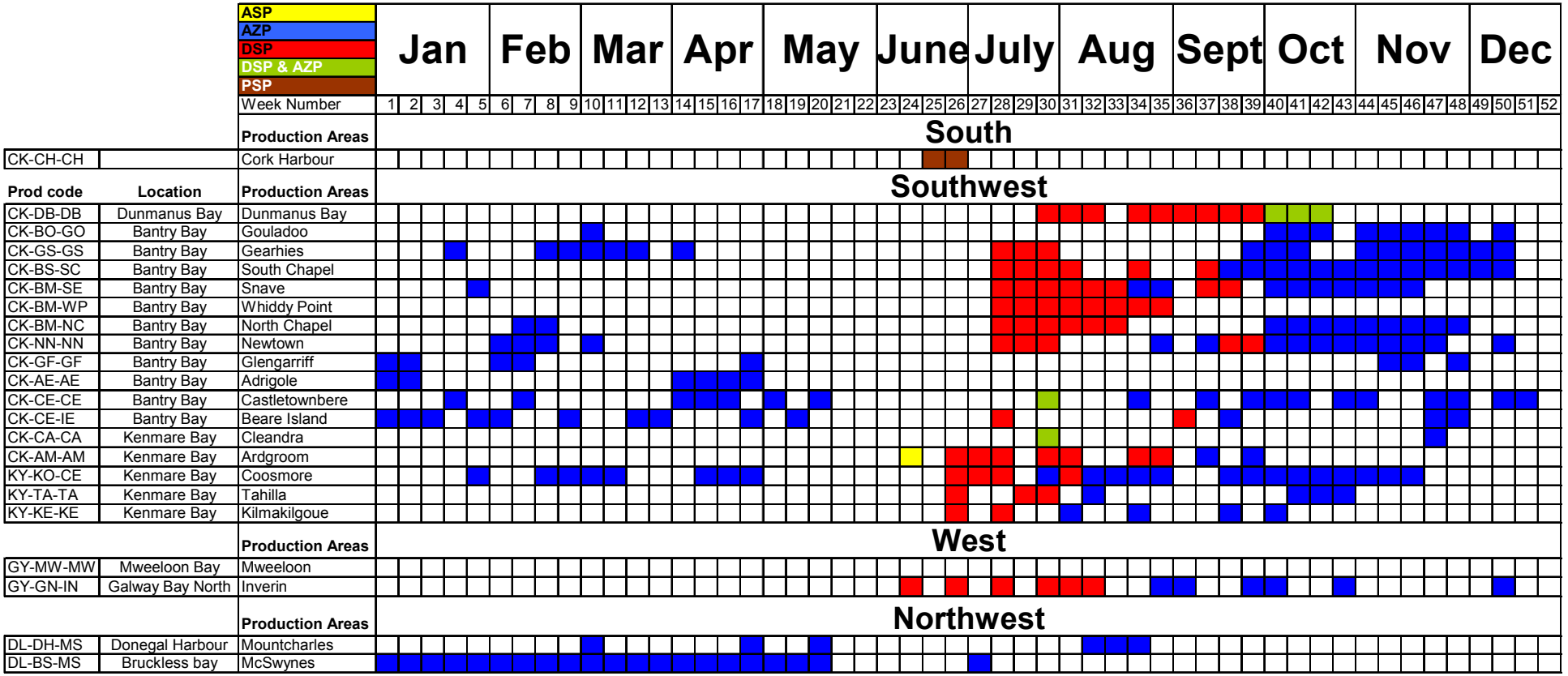


Figure 47: Production areas closed during 2006 (MI).

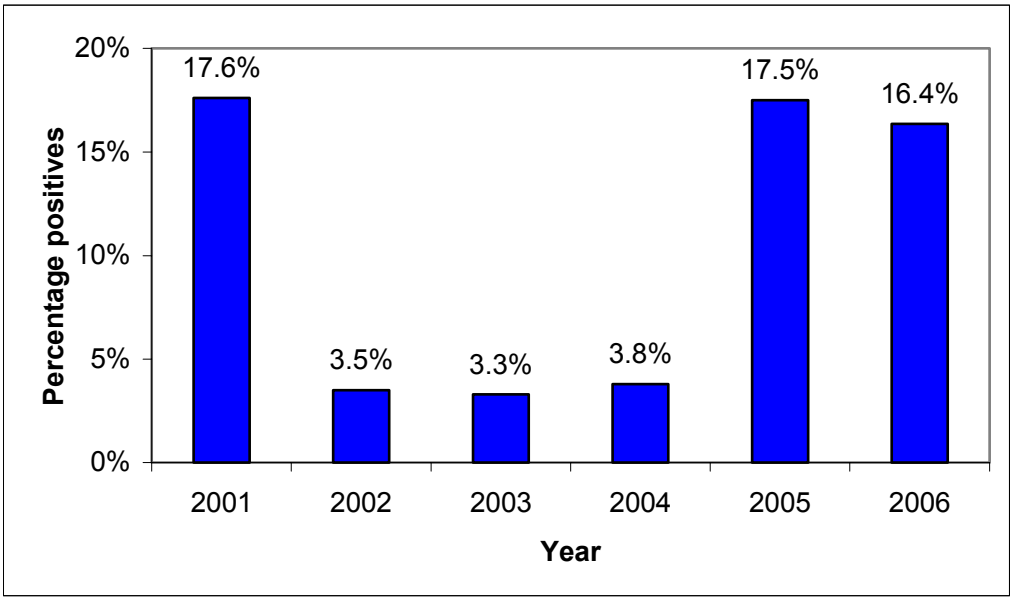


Figure 48: Percentage positive results for shellfish sampled 2001 to 2006 (MI).

Shellfish PSP National Monitoring 2006.
In the second quarter of 2006 the Jellett immunoassay rapid test kit was suspended as a negative screen due to quality control issues. A total of 146 samples were analysed for PSP toxicity in 2006 compared to 242 analysed in 2005. Three mussel samples from Cork Harbour had positive bioassays between the 20th and 29th of June. The highest toxicity calculated during this event was from the 27th of June at 81µg/g STX – di HCL eq100g^{-1} whole flesh.

Shellfish ASP National Monitoring 2006.
During 2006, Domoic Acid concentrations were significantly lower than those observed in previous years. The Marine Institute undertook 536 analyses of scallop tissues (*P. maximus*) using High Performance Liquid Chromotography (HPLC). Of these, 240 analyses of gonad tissue, four samples had levels above the regulatory limit of 20µg/g. All of the 240 adductor muscle samples analysed were below the limit. Of the other tissues analysed, 18 remainder tissues (i.e. everything except gonad and abductor) (28 analyses), 13 total tissues (27 analyses) and 1 whole flesh (1 analyses) were above the regulatory limit.

Tests were also carried out on 183 samples of mussels (*M. edulis),* Pacific oysters (*C. gigas),* Manilla clam (*T. philipinarum),* razor clams *(E. siliqua),* flat oysters *(O. edulis) and* queen scallops (*A. opercularis)* primarily through sentinel site testing which is carried out on a monthly basis. One sample tested above the regulatory limit at 20.9 µg/g from a sample of mussels taken from Ardgroom on the 12th of June 2006.

Phytoplankton Monitoring 2006.
The objective of the phytoplankton monitoring programme is to identify and quantify the presence of potentially toxic/ harmful species that may effect both shellfish and finfish production areas. The species of interest are shown in Table 12.

Table 12: Toxic and harmful phytoplankton species (MI).

Phytoplankton Species	Toxic / harmful
Dinophysis sp.	DSP toxin producer
Alexandrium Sp.	PSP toxin producer
Pseudo-nitzchia sp.	ASP toxin producer
Protoperidinium sp.	AZP toxin producer (implicated)
Karinia mikimotoi	Harmful
Prorocentrum lima	Harmful
Heterosigma akashiwo	Harmful
Noctiluca scintillans	Harmful
Lingulodinium polyedrum	Harmful
Phaeocystis sp.	Harmful
Chaetoceros (Hyalochaete) sp.	Harmful

During 2006, 1,740 water samples were examined by the Marine Institute for this National Monitoring Programme. The number of samples analysed is a slight increase on the 2005 figures when there were 1,621 samples tested. There can be considerable variation from year to year in toxicity of shellfish depending on the presence, intensity and distribution of toxic plankton. In contrast to 2005 there was a significant reduction in toxic species observed in 2006. In 2006, *Alexandrium,* which causes PSP*,* peaked at 18% of the 2005 highest count. Similarly, *Dinophysis acuminata* and *Dinophysis acuta* which are both responsible for DSP showed only 2.4% and 10.4% respectively of 2005 levels. *Pseudo-nitzschia* spp. that can result in ASP also showed a notable reduction to 14.7% of the previous year's maximum intensity. Phytoplankton monitoring results can be accessed through the Marine Institute's website: (www.marine.ie/habs).

Sample Turnaround.
In 2006 of all analysis carried out by the Marine Institute and its contract labs for the shellfish national monitoring programme 91.8% of the results were reported to the Industry, regulators and consumers within three working days (Figure 49). This was an improved turnaround on 2005 when 89% of samples were reported within three working days. All reports were issued by e-mail and published on the Marine Institute web site (www.marine.ie/habs) and by "small text message" (SMS).

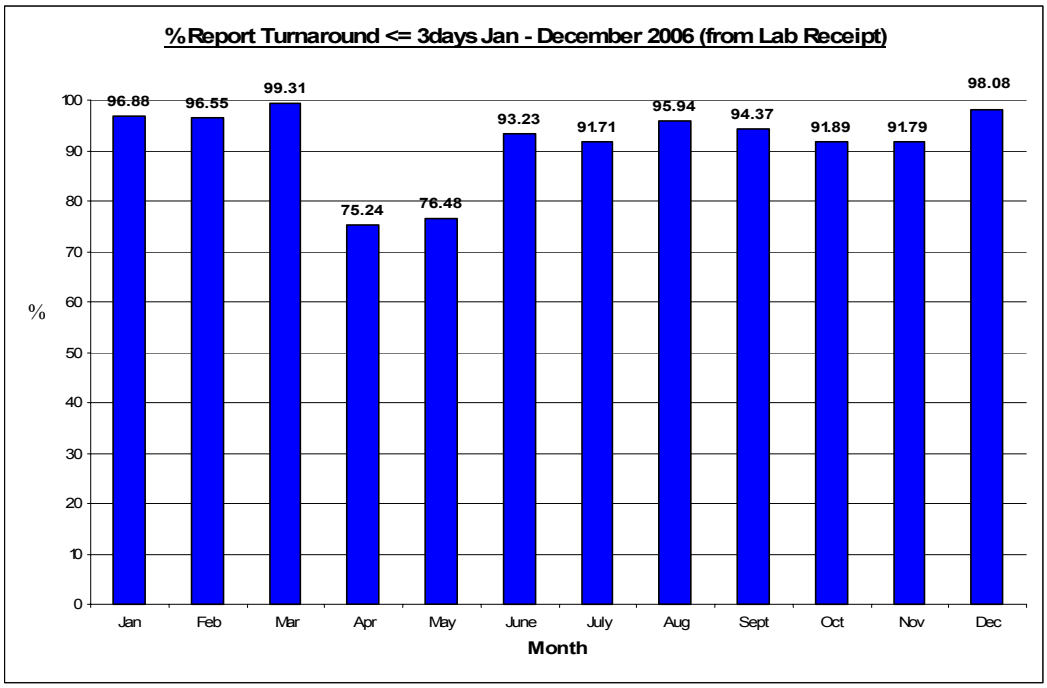


Figure 49: Percentage Sample Turnaround 2006 (MI).

Quality System.
The full suite of biotoxin phytoplankton test methods conducted within the Marine Institute laboratories, remain accredited by the Irish National Accreditation Board to ISO 17025 standard. These include:

- Okadaic acid (OA), Dinophysistoxins (DTX-1 and DTX-2) by Liquid Chromtography Mass Spectrometry (LCMS).
- Azaspiracids (AZA's 1,2 and 3) via LCMS.
- Domoic acid by HPLC via Diode Array Detection (DAD).
- DSP bioassay.
- PSP AOAC bioassay.
- Phytoplankton analysis (Galway and Bantry).

Management Cell Decisions 2006.
A group of representatives, from the DCMNR, FSAI, ISA and MI, form the Management Cell and are responsible for making decisions if the following situations occur:

- Borderline or out of character biotoxin results, where results maybe inconsistent with local/national trends e.g. when a single, unexpected negative or positive result occurs.
- When a discrepancy occurs between bioassay and chemistry results.
- If a prolonged borderline toxicity occurs then these borderline biotoxin results need consideration.
- Sample frequency has been interrupted or changed.
- Monitoring equipment Liquid Chromtography Mass Spectrometry (LCMS) breakdown.

To proactively manage a risk situation the management cell considers the following factors when assigning a status to an area:

- Species (mussel, oyster, scallop, clam, cockle).
- Bioassay results (number dead and time of death).
- Chemical results (OA, DTX-2 (Dinphysis Toxin), AZA's, okadiac acid esters).
- Time of year.
- Results of analysis from adjacent areas.
- Phytoplankton results (numbers of associated toxic species present).
- Previous history of results from the area in question.
- Any other associated data.

The following options are available to the management cell:

- Change a production area's status (open, closed, closed pending).
- Issue a production area status with bioassay data alone.
- Issue a production area status with LCMS results alone.
- Recommend a voluntary closure to producers.
- Close adjacent areas within the same bay.
- Increase / decrease sample frequency.
- Other actions as appropriate.

For the year 2006 a total of 103 Management Cell Decisions were made. This was an increase in the number of decisions compared with 2005 when there were 89 decisions. The number of management cells raised increased on 2005 numbers primarily due to a carry over from the AZA toxic event in 2005 into 2006. Table 13 shows a breakdown on Management Cells decisions taken in 2006.

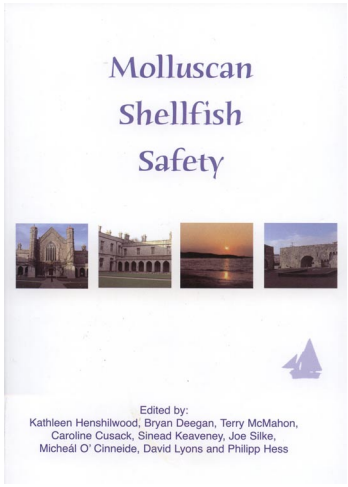
Table 13: Management cell decisions in 2006 (MI).

Original Decision	MC Decision	**Frequency**
Open	Closed Pending	14
Open	Open	16
Open	Closed	6
Closed	Closed Pending	12
Closed	Open	7
Closed	Closed	3
Closed Pending	Closed Pending	18
Closed Pending	Open	9
Closed Pending	Closed	3
Status issued without OA LCMS result	-	8
Status issued without bioassay result	-	1
ASP analysis requested	-	1
Harvesting restricted in Bantry bay middle	-	2
Management cell withdrawn	-	3
Total Management Cells		**103**

Molluscan Shellfish Safety.

In 2006 the Proceedings of the most recent Molluscan Shellfish Safety Conference was published and covers a range of topics including:

- Microbiological Status of Shellfish.
- Shellfish Viruses and Pathogens.
- Harmful Algal Blooms (HAB) and Biotoxin Contamination.
- HAB Mitigation and Depuration.
- Toxicology and Shellfish Toxins.
- Current and Emerging Analytical Methods.
- Quality Assurance and Consumer Safety.
- Regulation and Management of Shellfish Safety.
- Role of Industry in Risk Management and Innovation.



Microbiological Quality of Shellfish Waters

Bacteriological Contamination.

Shellfish production areas are classified yearly by the Sea Fisheries Protection Authority (SFPA) based on the results for monitoring of shellfish for bacterial contamination and in accordance with the terms of E.U Regulations 853 and 854 of 2004 (Table 14, Box 3). 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 is shown in Figure 50. Some production areas shown are sub-divided and may have more than one classification. Additionally, production areas can have different classifications for different species, e.g. sea urchins from a production area can be harvested directly for consumption (Category A) but mussels need relaying/depuration prior to consumption (Category B).

The classification of monitored sites (Box 3) can change and the summary for October 2006 includes a combination of upgrades and downgrades of some of the October 2005 classifications.

Table 14: Criteria for the classification of bivalve mollusc harvesting areas under Regulation (EC) No 854/2004 and by cross reference in the Council Regulation on microbiological criteria for foodstuffs and the 2005 and 2006 production areas classifications. Note: This 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[1].	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[2].	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.

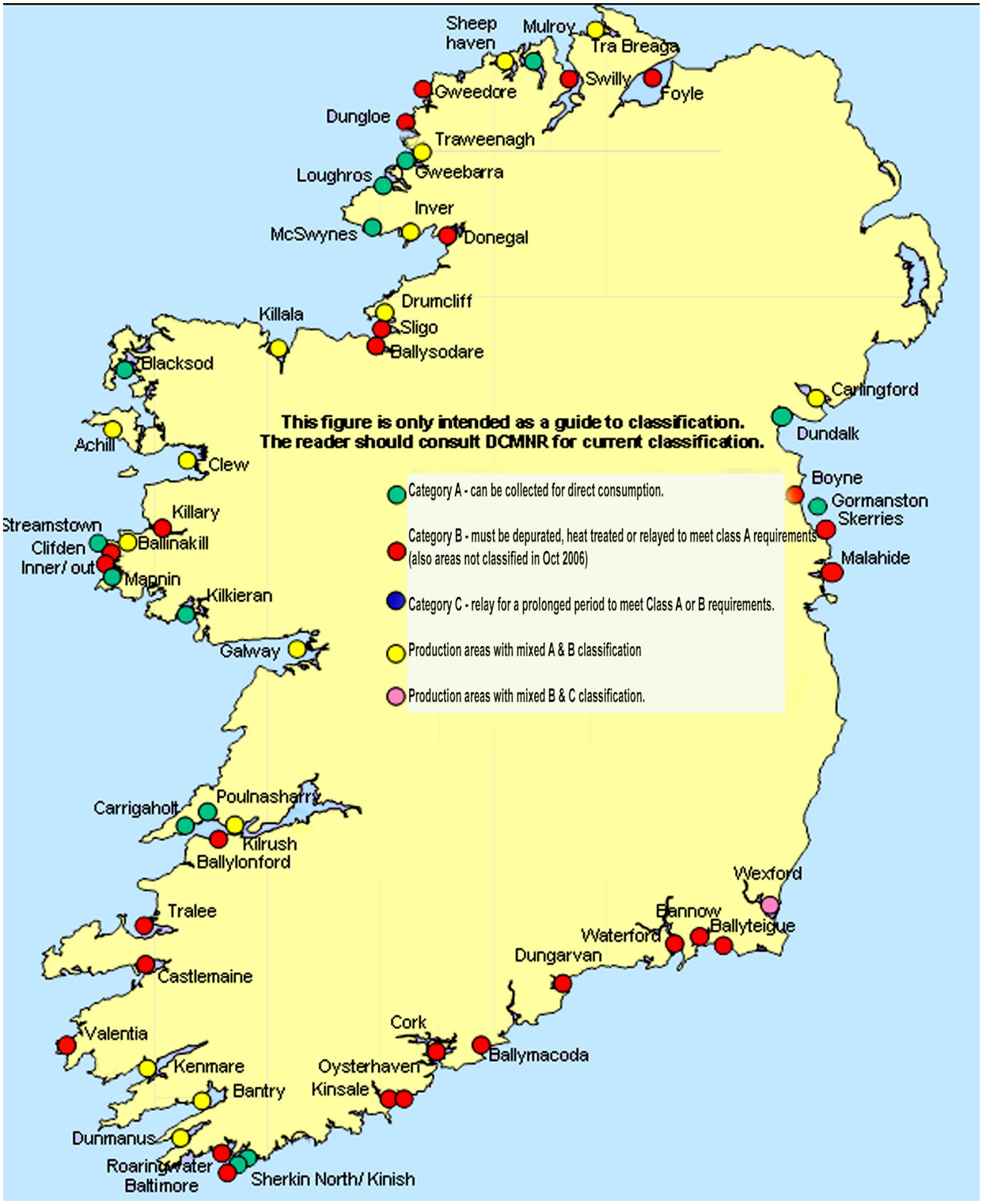


Figure 50: Microbiological Classification of Shellfish Production Areas October 2006 (SFPA).
In accordance with E.U Regulations 853 and 854 of 2004. Source: Live Bivalve Molluscs (Production Areas) Designation, 2006. Please note this figure is only intended as a guide to classifications in Oct 2006 and that classifications change (Appendix III).

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.

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 (Box 4).

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 it's 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.

Contaminants in Shellfish and Shellfish Waters

Monitoring of a range of parameters in shellfish and shellfish growing waters is undertaken annually by the Marine Institute to ensure that the quality of edible species is maintained or enhanced.

Shellfish.

The level of contaminants in shellfish (Box 5) can provide valuable information regarding the quality of the shellfish and the waters in which they are grown.

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.

During 2006, samples of shellfish (blue mussels, Pacific oysters and native oysters) from 30 locations where shellfish are grown were analysed for metals. The results for 2006 are presented in summary format in Table 15 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 2006 generally conformed to the guidelines of Council Directive 79/923/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 limit of 0.5 mg kg^{-1} wet weight, as set by the European Commission.
- All of the shellfish samples tested for cadmium were within the limit of 1.0 mg kg^{-1} wet weight, as set by the European Commission. The highest concentrations of cadmium were in oysters (*O. edulis*) from Tralee Bay with one sample (*O. edulis* sampled in Tralee Bay, Castlegregory - 0.78 mg kg^{-1}). This is consistent with previous results for O edulis from this area. Elevated levels of cadmium were also detected in a mussel (*M. edulis*) sampled in Tralee Bay, Fenit (0.78 mg kg^{-1}).
- Elevated levels of chromium were detected in a mussel (*M. edulis*) sample from Lough Swilly – Inner Lough (2.32 mg kg^{-1}) which is higher than levels measured in previous years. This will be further investigated.
- No specific growing area stands out as having notably elevated levels of zinc, silver or nickel in comparison with other areas.

Table 15: Results of monitoring of shellfish-growing areas in 2006 and standard values for contaminants (Source – Marine Institute).

Contaminant	Species (No. Samples)	Range for 2006 (mg kg^{-1} wet wt)	No. Samples <LOQ	Standard Value (mg kg^{-1} wet wt)	Qualifier	Country
Cadmium	*O. edulis* (4)	0.53 – 0.78	0	1.0	Max. Limit	EC[1]
	C. gigas (10)	0.11 – 0.48	0	1.0	Max. Limit	
	M. edulis (22)	0.07 – 0.76	0	1.0	Max. Limit	
Mercury	*O. edulis* (4)	<0.02 – 0.04	2	0.5	Max. Limit	EC[1]
	C. gigas (10)	<0.02 – 0.04	3	0.5	Max. Limit	
	M. edulis (22)	<0.02 – 0.04	13	0.5	Max. Limit	
Copper	*O. edulis* (4)	5.75 – 24.6	0	-	-	-
	C. gigas (10)	5.20 – 19.6	0	60	Standard	Spain
	M. edulis (22)	1.33 – 2.26	0	20	Standard	Spain
Zinc	*O. edulis* (4)	294 – 488	0	-	-	
	C. gigas (10)	103 – 311	0	-	-	
	M. edulis (22)	12.5 – 29.3	0	-	-	
Chromium	*O. edulis* (4)	0.15 – 0.25	0	-	-	
	C. gigas (10)	0.08 – 0.35	0	-	-	
	M. edulis (22)	0.09 – 2.32	0	-	-	
Silver	*O. edulis* (4)	0.72 – 1.63	0	-	-	
	C. gigas (10)	0.09 – 1.22	0	-	-	
	M. edulis (22)	<0.013 – 0.14	4	-	-	
Nickel	*O. edulis* (4)	<0.13 – 0.19	1	-	-	
	C. gigas (10)	<0.13 – 0.52	4	-	-	
	M. edulis (22)	<0.13 – 0.72	2	-	-	

Notes: 1. Commission Regulation 466/2001/EC (as amended by Regulation 221/2002/EC and Regulation 78/2005/EC).
For values reported as "< value", value = Limit of Quantitation (LOQ) for the relevant determinand
Lead analysis had not been completed by the time of going to press

The results for 2006 are consistent with those from previous years (e.g. Boyle *et al.*, 2006; Glynn *et al.*, 2003a, b, 2004; McGovern *et al.*, 2001) 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 79/923/EEC, seawater samples were collected from the 14 Irish shellfish waters, designated under SI 268 of 2006, twice during 2006 (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.

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 (see Table 16).

Table 16. Contaminants in seawater - summary results for samples collected from shellfish growing waters during 2006 (MI).

	No. of Samples	Range (µg/l)	Median (µg/l)	No. <LOD
Mercury (Hg)	29	All < 0.01	<0.008	29
Silver (Ag)	29	All <1.00	<1.00	29
Cadmium (Cd)	29	<0.0400 - 0.57	0.07	19
Chromium (Cr)	29	<0.045 – 3.87	0.26	1
Copper (Cu)	29	0.10 - 14.1	0.65	0
Lead (Pb)	29	<0.024 – 18.2	1.12	1
Nickel (Ni)	29	0.058 – 20.8	1.26	0
Zinc (Zn)	29	1.17 - 124	10.22	0
Arsenic (As)	29	<1.000 – 1.37	1.17	9

Shellfish Health Status

The 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 (Box 6). As part of this work, a minimum of thirty *O. edulis* are sampled twice annually from each growing area and tested for the diseases Bonamiosis and Marteiliosis caused by the protistan parasites *Bonamia ostreae* and *Marteilia refringens*. Bonamiosis, a disease of flat oysters, was first identified in Ireland in 1987 in Cork Harbour and has since spread to a number of other growing areas including Lough Foyle in 2005. Following the discovery of *B. ostreae* in Lough Foyle an epizootic investigation was undertaken to investigate the source and spread of infection. The Report on the Lough Foyle investigation was completed and disseminated in 2006.

In 2006, *B. ostreae* was again detected in a new area. Following the discovery of *B. ostreae* in Lough Foyle surveillance for the disease in Lough Swilly had been increased due to the close proximity of the two growing areas. An Epizootic investigation for Lough Swilly is now underway. In 2006 a total of 1,574 *O. edulis* were sampled and tested as part of the screening programme and epizootic investigations.

In 2006, there were eight growing areas in Ireland positive for *Bonamia ostreae*. 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 and the entire coastline remains free from Marteiliosis. Movements of shellfish susceptible to these diseases are not permitted from infected or “non-approved” zones to free or “approved zones”.

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 2006 the FHU examined 359 molluscs and crustaceans following reports of abnormal mortalities. A further 414 animals were screened for the presence of *Candidatus Xenohaliotis californiensis* the causative agent of the exotic disease Withering Syndrome in abalone. Approximately 200 clams were also submitted for Brown Ring Disease testing.

The FHU provides advice to the DCMNR in relation to movements of shellfish within the country and for import. The FHU provided advice on 154 applications received in 2006. Also on advice from the FHU documents were issued to cover the export of 11 consignments of shellfish.

Box 6. Listed Diseases of Finfish and Shellfish

EU Directive 91/67/EEC (as transposed into Irish Law by S.I. 253 of 1996) concerns the animal health conditions governing the placing on the market of aquaculture animals and products. It represents the main fish health legislation under which the Irish aquaculture industry is regulated. The aim of the Directive is to prevent the spread of fish and shellfish diseases whilst promoting trade in aquaculture animals and products, and providing protection for countries (such as Ireland), which have a very high health status. EU Directive 91/67/EEC categorises the main fish diseases into three lists:

List I diseases are exotic to the EU and must be eradicated from any place in which they are found. ISA (Infectious Salmon Anaemia) is the only disease on this list. The ISA virus was isolated from two rainbow trout farms in Ireland in 2002. The virus was isolated in the absence of clinical disease and was picked up as part of a routine screening programme. Both cases were managed as per the Irish ISA Withdrawal Plan, which was approved by the EU Commission in 2001. ISAV has not been isolated, nor clinical signs of the disease observed, since 2002.

List II diseases are present in certain parts of the EU but not in others. These diseases can cause a severe economic impact on infected sites. The List II finfish diseases are VHS (Viral Haemorrhagic Septicaemia) and IHN (Infectious Haematopoetic Necrosis). IHN has never been detected in Ireland but a marine strain of VHS (Genotype 3) was detected in turbot, which were cultivated at Cape Clear off the southwest coast, in 1997. The farm was cleared and fallowed according to the procedures laid down in Council Directive 93/53/EEC. The List II shellfish diseases are Bonamiosis and Marteliosis – both of which occur in the native (flat) oyster *Ostrea edulis*. Under Commission Decision 2002/300/EU, the entire coastline of Ireland obtained Approved Zone status with respect to Marteiliosis, and the entire coastline of Ireland with the exception of Clew Bay, Ballinakill, Galway Bay and Cork Harbour obtained Approved Zone status with respect to Bonamiosis. However, following the detection of *B. ostrea* in Achill and Blacksod Bays in late 2002 and Lough Foyle in 2004, these bays have now been added to the list of Bonamia poisitive areas in the country; by Commission Decisions 2002/378/EC (Achill); 2003/729/EC (Blacksod) and (L.Foyle).

List III diseases are widespread in certain parts of the EU, but certain countries have farms or zones, which are free of these diseases. The finfish diseases of interest on this list are IPN (Infectious Pancreatic Necrosis), Furunculosis, ERM (Enteric Redmouth Disease), BKD (Bacterial Kidney Disease) and *Gyrodactylus salaris*. BKD and *G. salaris* have never been detected in Ireland. Furunculosis and ERM have been detected in Ireland in the past but are now generally controlled by the use of licensed vaccines. IPN has been isolated sporadically in Ireland since the 1980s, both in rainbow trout and Atlantic salmon. However, 2005 saw a sharp increase in the number of isolations of IPNV. The virus (Sp serotype) was isolated from nine sites throughout the country. Clinical disease was observed in only one of these cases, with the remainder being sub-clinical in nature. Risk Reduction Measures were instigated on all sites, in order to control the spread of the virus.

Although all the diseases outlined above are listed in Annex A of Council Directive 91/67/EEC, the diseases mentioned in List III were not fully recognised by the EU Commission until 2004. Late in 2003, Ireland and a number of other countries made applications to the EU Commission, for recognition of its disease free status in relation to the diseases BKD and *G. salaris*. This application was successful and was granted under Commission Decision 2004/453/EC. Ireland can now insist on freedom from these (and the other diseases in List 1 and List II) both in imports from other Member States and from Third Countries. Additional Guarantees were not granted for Furunculosis or ERM as these diseases are now routinely managed through vaccination and therefore, do not warrant the implementation of trade controls. Although the EU Commission granted Ireland an Additional Guarantee for IPN, at the request of industry, it was decided that for trade reasons, IPN would be controlled through a joint industry/government Code of Practice. Drafting of the Code of Practice began in 2004, and continued in 2005.

AQUACULTURE MONITORING – FINFISH

Sea Lice Monitoring

Sea lice (*Lepeophtheirus salmonis*) have a serious damaging effect on cultured salmon, resulting in major economic losses to the fish farming industry.

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.

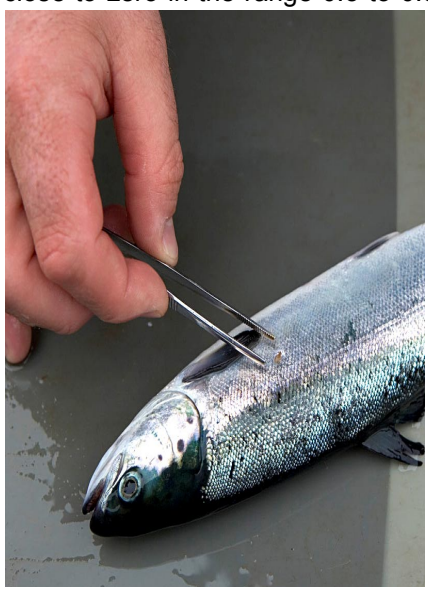
The management strategy for sea lice control has five principal components:

- 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.

The setting of appropriate treatment trigger levels is an integral part of implementing a targeted treatment regime (Box 7). Treatment triggers during the spring period are set close to zero in the range 0.3 to 0.5 egg bearing females per fish and are also based on the number of mobile lice on the fish. Where numbers of mobile lice are high, treatments are triggered even in the absence of egg bearing females. Outside of the critical spring period, a level of 2.0 ovigerous female lice per fish acts as a trigger for treatments. Over the period since the initiation of Single Bay Management (SBM), treatment triggers have been progressively reduced from a starting point of 2.0 ovigerous female lice per fish during the spring period to the current levels which are the optimal sustainable at present. Triggered treatments are underpinned by follow up inspections and, where necessary, by sanctions. Sanctions employed include; peer review under the SBM process; conditional fish movement orders; and accelerated harvests.



In late winter and early spring the sea water temperatures are low and development rates of lice are reduced. This has the effect of synchronising the development of lice larvae. As a result of this strategic treatment at this time can break the cycle of lice infection.

Ovigerous female lice are those which produce larvae which can infect salmon and therefore treatments are timed to remove adult females before they can release their larvae. Setting the treatment trigger at 0.5 ovigerous lice per fish ensures that treatments are carried out when a maximum of half of the fish examined have any ovigerous lice. This is the optimum time to interrupt lice development. Later in the year generations are not as synchronized and intervention at a lice level of 0.5 ovigerous by way of

treatment is generally not justified. A level of 2.0 ovigerous lice per fish has been shown to be a pragmatic level at which intervention by way of treatment is advisable. Levels of mobile lice or juvenile lice are important in advising fish health professionals in developing a lice control strategy. However, they are not of themselves appropriate measures upon which to trigger mandatory treatments.

All salmonids stocks on all of the farms around Ireland are visited on 14 occasions throughout the year and the numbers of sea lice are calculated and recorded. Follow-up inspections are carried out when required. Sea lice inspections take place on a monthly basis where fish are present, with two inspections taking place each month during the months of March, April and May; referred to as the critical spring period. Only one inspection is carried out for the December-January period. At each inspection two samples are taken for each generation of fish on a site. A sample is taken from a standard cage, which is sampled at each inspection, and a sample is procured from a random cage, which is selected on the day of the inspection. Thirty fish are examined for each sample by anaesthetising them in a container of sea-water and at the end of the fish sampling process this water is sieved for lice. Each fish is examined individually for all mobile lice. Lice are removed and placed in a plastic bottle containing 70% alcohol (one bottle per fish). The average is calculated by adding the number of lice taken from each fish to the number of lice obtained from the sieved sea-water and dividing this total number of sealice by number of fish examined (Figure 51). The annual trend for the month of May for ovigerous and mobile *L. salmonis* during the years 1991 to 2006 is shown in Figure 52.

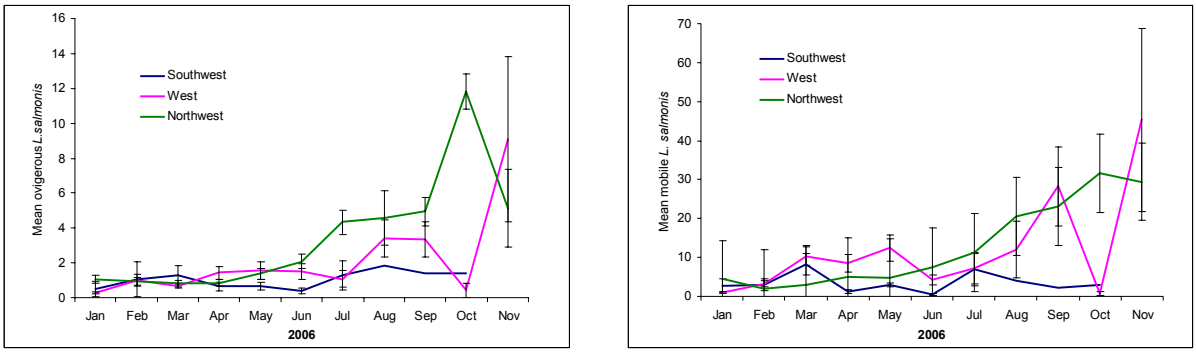


Figure 51: Mean (Standard Error) ovigerous *L. salmonis* per month per region in 2006 (left). Mean (Standard Error) mobile *L. salmonis* per month per region in 2006 (right) (MI).

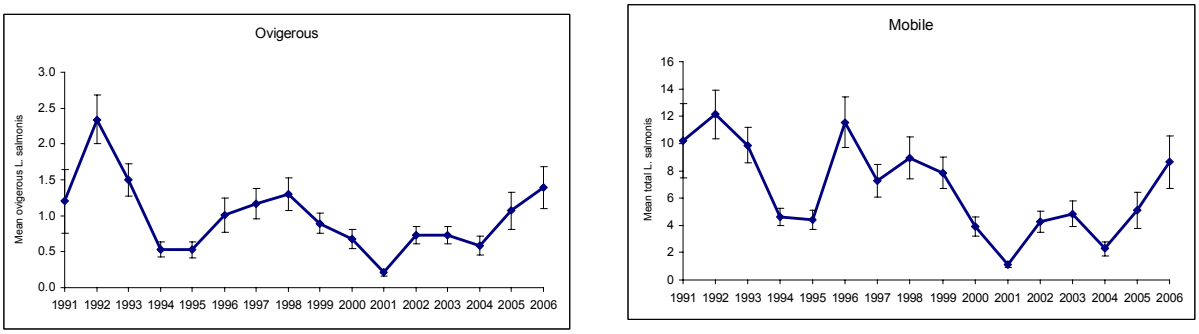


Figure 52: Annual trend (May mean) (SE) ovigerous *L. salmonis* on one-sea-winter salmon (right). Annual trend (May mean) (SE) mobile *L. salmonis* on one-sea-winter salmon (left) (MI).

Comparing the May mean annual trend *L. salmonis* graphs (Figure 52) it shows that there has been an increase in both the May mean ovigerous levels and May mean mobile levels nationally in 2006. The mean ovigerous level is the highest recorded in 12 years and the number of mobile lice is the highest since 1998.

Lice management and control during 2006 was hampered in some regions for the following reasons; high water temperatures; the presence of harmful phytoplankton; fish health; and bay management issues. These factors have conspired to delay treatments and reduce their effectiveness.

Warmer sea temperatures have been a significant complicating factor in the management of sea lice. An increase in water temperature leads to an acceleration in the life cycle of the sea louse and also an increase in reproductive output (Hogans and Trudeau, 1989). Over the last number of years mean monthly sea temperatures have been steadily climbing with average sea temperature being 0.02^{o}C higher in 2006 than in 2005, 0.25^{o}C higher than 2004 and 1.38^{o}C higher than the 30 year mean. Temperatures

for January and February were 1.4°C and 1.7°C, respectively higher than the 30 year mean (calculated from source data from Met Éireann-www.met.ie).

It should be noted that the treatment effort in some areas did not always achieve full clearance of sea lice and levels could have been in excess of treatment trigger levels on the subsequent inspections. It is also suspected that there may be reduced sensitivity in some lice populations to certain chemotheraputants being used for sea lice control in Ireland. Other factors that may have contributed to ineffective clearances are the use of full or partial skirts in carrying out a treatment. It is generally agreed that the most effective method of using a bath treatment is in a well boat. Utilising a well boat allows total control over water volume and concentration of chemotheraputant. However, due to the limited availability of well boats in Ireland, it may not always be possible to get a well boat when required and they often need to be booked weeks in advance. This makes proactive lice management difficult as populations can change dramatically while waiting on a well boat to administer lice treatments. The alternative is to use a full enclosure with oxygenation. This involves covering the sides and the bottom of a cage with tarpaulins so the water volume is controlled and concentrations can be gauged accurately. The use of partial skirts, where only a part of the cage is covered allows water to exchange out the bottom or through gaps, is not as effective in controlling lice numbers.

If all the fish present at a site are not treated this can also lead to rapid re-infestation of those fish just treated and can undermine the efficacy of subsequent treatments. Failing to carry out synchronous treatments between sites will also contribute to these problems.

Fish health combined with environmental issues such as high levels of harmful plankton present and high temperatures (especially during the summer months) also served to delay treatments or reduce their effectiveness.

Finally, a review of Single Bay Management fallow plans at the end of 2006 indicated that a sufficient fallow period (of at least 1 month) was not undertaken in a number of sites, particularly in the Northwest and West regions. Fallowing of sites helps break the sea lice lifecycle and therefore it is important in the overall management of sea lice at a site and within a bay (Jackson *et al*, 1997; Jackson *et al*, 2002). It is suggested that the practice of keeping multiple generations of fish on a site also needs to be appraised, particularly in the areas where lice control has been less effective. Table 17 shows a summary of inspections under treatment trigger levels for winter salmon and rainbow trout stocked in 2006.

Table 17: Summary of inspections under treatment trigger levels for one and two sea-winter salmon and rainbow trout stocked in 2006 (MI).

Region	% under in Spring	% under rest of year	% under total
Southwest	42	100	70
West	46	73	58
Northwest	45	55	50
National Salmon Totals	**45**	**69**	**57**
National Trout Totals	**100**	**95**	**97**

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 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 (Box 8).

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 licensee must submit a Benthic Amelioration Plan to the Department of Communications, Marine and Natural Resources with the aim of achieving an acceptable benthic standard in the licensed 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 licensed 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.

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 DCMNR and,
2) Direct communication by 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 36 (Table 17). Nationally, the level of reporting compliance with the protocol was 29 sites out of 36 eligible sites i.e. 80.5% (Table 17). Reports were provided for five additional sites for which surveys were not strictly required. They will provide useful baseline information against which to compare future monitoring outputs. Since the introduction of the Benthic Protocol (Box 8) environmental compliance has been very good with few breaches of environmental standards observed. However, despite the fact that all operators were informed by the DCMNR and Marine Institute of the mandatory requirement to carry out benthic surveys and submit reports from 2001 to 2005 there was a gradual decline in the level of compliance in terms of reports submitted for the period 2001 to 2004 but this has subsequently increased in the past two years with a high of 80.5% reporting compliance observed for 2006.

Table 18: Summary of compliance with reporting requirements and environmental standards 2001–2006 (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%**

All of the sites (100%) for which reports were submitted during 2006 had conditions that were within agreed environmental standards and thus deemed acceptable as per the protocols (Table 18). Nevertheless, it must be pointed out that while all sites were deemed compliant overall, individual reports did highlight problems mostly related to large amounts of uneaten feed reaching the seafloor. Reducing the amount of waste feed enriching the seafloor should be addressed by better management of feed input or modification (reduction) of stocking densities. Reducing the amount of feed wastage would be of economic benefit to the farm operators and minimise any environmental impact.

While the level of reporting compliance at 80.5% is a considerable improvement on levels reported in previous years (Table 17), it is still not full compliance. Non-reporting is still apparent despite early notification in 2006, by the Coastal Zone Management Division of the DCMNR, to all relevant producers that surveys were required for some or all of their aquaculture sites. It should be noted, that the number of sites surveyed in 2006 (n=29) has not increased since 2003. Consequently, the recommendations presented below are broadly similar to those provided in previous reports as the issue of non-reporting continues to present itself. It is clear that while some producers comply 100% of the time there are other producers that have consistently failed to submit reports or give any indication as to why they have not submitted reports.

Appropriate arrangements need to be put in place to ensure that all operators comply with licence conditions and submit reports of benthic monitoring on an annual basis. This could be done by way of sanctions e.g. reduction in licensed tonnage for those operators who fail to comply and/ or incentives such as increasing the licensed tonnage for those operators who fully comply.

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 DCMNR and the MI.
2. Survey reports should continue to include all details outlined in Box 8.
3. 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 DCMNR and MI as to the status of each site subject to monitoring protocols each year.

Residues Monitoring in Finfish

The Marine Institute, through the DCMNR, is charged with the responsibility of monitoring farmed finfish (Box 9).

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)[3];

[3] 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.

- To provide a body of data to assure that Irish farmed finfish is of a high quality - this is particularly important for supporting the marketing of finfish; and
- To promote good practice in aquaculture.

During 2006, target samples were collected on 31 sampling events (salmon were collected on 29 occasions, and freshwater trout twice) from fish farms and packing plants for residues testing in accordance with the National Residues Control Plan (NRCP). Generally, five fish were taken from each producer. In total 162 target samples were collected from fish farms and packing plants in accordance with the NRCP for 2006 as follows:

- 104 target samples were taken at harvest which comprised 96 farmed salmon and 8 fresh water trout;
- 58 target samples were also taken at other stages of production; 50 salmon smolts and 8 freshwater trout, from twelve farms for Group A and malachite green analysis.

Box 9. Residues Monitoring

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 and Food (DAF) are responsible for implementing the Directive in Ireland and DCMNR 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 (NRCP) for aquaculture is submitted annually to DAF 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 for (Table 10). These are specified in the 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 DCMNR, FSAI and DAF. 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 DCMNR, 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 DCMNR, DAF and FSAI. It is the responsibility of DAF 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.

There were no suspect samples taken during 2006 compared with the 17 samples which were taken in the year 2005.

The main findings of the 2006 residues target-monitoring programme were:

i. A total of 160 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 104 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 2006 residue surveillance-monitoring programme, a number of samples were found to have concentrations of authorised treatments below the Maximum Residue Limit (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.
iv. "*Other Substances and Environmental Contaminants*" (Group B3) includes dyes (malachite green and its metabolite, leuco malachite green), metals, PCBs and chlorinated pesticides. All target samples tested for malachite green and its metabolite, leuco malachite green were 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.

Therefore, in 2006 there were no non-compliant (i.e. no positive) results detected in the National monitoring programme for finfish farmed in Ireland. A summary of the results for 2006 residues monitoring and a summary table of the residue results since 2003 is outlined in Table 19 and 20 respectively.

Table 19: Summary of 2006 Residue Monitoring Results for Target Samples (MI).

RESIDUE	GROUP	NUMBER EXAMINED	COMPLIANT	NON-COMPLIANT	Source of Maximum Level to assess compliance #
Group A - Unauthorised Substances					
Corticosteroids	A3	53	53	0	(v)
Methyltestosterone	A3	47	47	0	(v)
Betaestradiol	A3	44	44	0	(v)
Beta-agonists	A5	51	51	0	(v)
Chloramphenicol	A6	51	51	0	(v)
Nitrofurans	A6	51	51	0	(v)
Group B - Therapeutic treatments					
B1 - Antibacterial substances					
Antibacterial Screening:					
Tetracyclines	B1	104	104	0	(i)
Nitrofurans	B1	104	104	0	(i)
Quinolones	B1	104	104	0	(i)
Sulphonamides	B1	104	104	0	(i)
B2 - Other Veterinary Drugs					
Emamectin B1a	B2a	104	104	0	(i)
Ivermectin	B2a	104	104	0	(ii)
Cypermethrin	B2c	104	104	0	(i)
Deltamethrin	B2c	104	104	0	(i)
Teflubenzuron	B2f	104	104	0	(i)
Diflubenzuron	B2f	104	104	0	(i)
B3 - Other Substances & Environmental Contaminants					
CCB Congener 28	B3a	21	21	0	(iii)
CB Congener 52	B3a	21	21	0	(iii)
CB Congener 101	B3a	21	21	0	(iii)
CB Congener 118	B3a	21	21	0	(iii)
CB Congener 138	B3a	21	21	0	(iii)
CB Congener 153	B3a	21	21	0	(iii)
CB Congener 180	B3a	21	21	0	(iii)
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.

Table 20: Summary Results for Residue programme since 2003-2006 (MI).

	2003	2004	2005	2006
No. Target samples[1]	180 (168, 12)	183 (124, 59)	164 (105, 59)	162 (104, 58)
Total Group A[2]	80/0	145/0	163/0	162/0
Total Group B[2]	163/13	130/5	105/2	104/0
Total No. of Results[3]	2733/13	2214/5	2251/2	2207/0
% non -compliant results	**0.48**	**0.23**	**0.09**	**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 number of results as samples taken for Group A and Group B substances are tested for multiple residue categories within each group.

Finfish Health Status

The disease classification outlined in EU Directive 91/67/EEC (see Box 6, in Shellfish Health section of this report) 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' (see Box 6) 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 DCMNR/ Marine Institute. All such mortalities are investigated by the Marine Institute, generally in conjunction with the farm veterinarian, and findings are reported back to DCMNR.
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 DCMNR 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 2006:

i. All marine and freshwater finfish sites were inspected and sampled as outlined in Council Directive 91/67/EEC. 1,570 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 and *G. salaris*.

ii. On the diagnostic side, FHU staff examined 2,505 finfish during 2006, generally as a result of mortality events in aquaculture facilities. *Vibrio anguillarum* was isolated from several marine sites; *Yersinia ruckerii* was isolated from a single freshwater site and *Pseudomonads* and various *motile Aeromonads* were isolated from both farmed and wild freshwater fish. The most striking feature of the diagnostic samples received during 2006 was however, the increase in prevalence of both IPN virus and IPN disease. Clinical disease was observed in 5 hatcheries and 1 sea site, whilst IPNV was isolated from an additional 8 sea sites, in the absence of clinical disease.

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, 32 Movement Documents were issued for finfish movements within the EU, and an estimated 6.8 million salmon ova and 1.4 million live salmonids were exported for on-growing, mainly in the United Kingdom, but also in France and Denmark. An additional 15 Sanitary Certificates were issued for the export of salmon ova to Chile. In total, approximately 20 million ova were exported to Chile in 2006.

Tri-Nation Initiative on Pancreas Disease.

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 2006, there were two seminars were held in Oslo and Galway with presentations given on over eight Pancreas Disease related projects which were funded, through National programmes.

These Tri-Nation seminars had the following objectives:

- To create dialogue and open exchange of knowledge, research results and experiences on PD and similar pathologies.
- To facilitate information flow and synergy between groups and countries.
- To communicate new results from the research areas to the coordination committee.
- To harness these results and accelerate development of mitigation strategies.

The Tri-nation consortium operates under the following ethos and rationale:

- A spirit of openness / candidness and cooperation.
- An exchange of preliminary results in good faith.
- Mutual disclosure and trust.

This pragmatic approach to addressing the problems of PD and realted pathologies has led to:

- Successful research and industry partnership.
- The procurement of research funding.
- The exchange of information on related projects, results and development of strategies to address disease issues.

Current research on PD in Ireland.

Funded by the Marine RTDI Applied Industry measure, a project investigating the biophysical properties of the PD virus was completed by Queens University Belfast and the ISGA (Graham *et al*., 2007). There is an ongoing project “Site investigations and disease management of the PD virus”, funded under the NDP Marine RTDI Strategic Programme is currently in its second year. The studies objective is to increase knowledge on the epidemiology of PD, diagnostic capabilities and management strategies. Information from both projects will be disseminated to the industry through a proposed Fish Health seminar to be held in 2007.

7. AQUACULTURE RESEARCH & DEVELOPMENT

Aquaculture Research 2006

Aquaculture research is undertaken by third-level institutes, industry and state sectors with funding from national and EU programmes. This section of "Status of Irish Aquaculture 2006" gives a synopsis report on research projects that were undertaken in 2006 and an overview of funded research between the years 2000 to 2006. Also included are a summary of research in Northern Ireland and a section on Aquaculture training.

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

This segment of the report gives an outline of the Aquaculture research and development projects funded under Sub-Measure 3: Marine Research, Technology, Development and Innovation (RTDI) of the National Development Plan (2000 to 2006). This Marine RTDI Measure is administered by the Marine Institute on behalf of DCMNR and Department of Enterprise and Trade and Employment. Sub – Measure 3 was divided into two programmes - Applied Industry and Strategic Projects. There were also a number of supporting initiatives, such as desk studies, fellowships (post-doctoral and post graduate), networking and technology transfer. In total €12.95 million was allocated to the overall fund and of this, €3.856 million was grant aid approved for Aquaculture projects. The projects which were approved for grant aid are shown in Tables 21 to 25. For further information the reader should 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 objective of the Strategic programme 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 objective was achieved through providing grant-aid, on a competitive basis, for collaborative, problem-oriented marine RTDI projects. The projects that received grant aid approval are shown in Table 21.

Table 21: Strategic projects grant aid approved under the Marine RTDI measure (NDP 2000 to 2006) (MI).

Strategic Projects.	Project duration (years)	Grant aid approved €
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	€399,500
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	3	€419,854
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.	3	€361,362

tasman.crowe@ucd.ie		
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	€404,634
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	€160,102
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	€186,714
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@ucc.ie	2	€186,775
	Total	**€2,118,941**

Post-Doctoral Fellowships.

The aim 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 received grant aid approval are shown in Table 22.

Table 22: Post Doctoral Fellowships grant aid approved under the Marine RTDI measure (NDP 2000 to 2006) (MI).

Post Doctoral Fellowships.	Project duration (years)	Grant aid approved €
Sea Lice Biology and Interactions. Host Institute: GMIT. lorraine.copley@marine.ie	3.5	€157,400
Investigations into the Hatchery Rearing of Cod (*Gadus morhua*) in Irish Conditions. Host Institute: NUI, Galway. declan.clarke@nuigalway.ie	3	€210,000
Investigations into a Reliable Supply of Scallop (*Pecten maximus*) for the Inshore Fishery and Aquaculture Industries. Host Institute: UCC. g.burnell@ucc.ie	3.5	€209,280
Advanced Technologies for Aquaculture. Host Institute: University of Limerick (UL). daniel.toal@ul.ie	2	€119,928
	Total	**€696,608**

PhD Scholarships.

The objectives 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 23 shows the PhD scholarships that received grant aid approval.

Table 23: PhD Scholarships grant aid approved under the Marine RTDI measure (NDP 2000 to 2006) (MI).

PhD Scholarships.	Project duration (years)	Grant aid approved €
Modelling of *Alexandrium* Bloom Dynamics in Cork Harbour. Host Institute: National University of Ireland, Galway. robin.raine@nuigalway.ie	Submission 2006	€98,350
Health and Disease in Clams (*Ruditapes philippinarum*) in Ireland, with Particular Reference to Brown Ring Disease. Host Institute: University College Cork. s.culloty@ucc.ie	Submission 2006	€118,136
Advanced Technologies for Aquaculture Fellow/Host Institute: UL daniel.toal@ul.ie	2	€119,925
	Total	**€336,411**

Applied Industry Programme.
The applied industry measure was designed to facilitate small and micro companies who because of size were generally unable to participate in other R&D grant aid programmes (Table 24). 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 24: Applied Industry Projects grant aid approved under the Marine RTDI measure (NDP 2000 to 2006) (MI).

Applied Industry Projects.	Project duration (years)	Grant aid approved €
A Novel On-growing System for Abalone. Industry Partner: Awabi Teo., Co. Galway. Research Partner: Aquaculture and Fisheries Development Centre-ERI, UCC. g.mouzakitis@ucc.ie	1.5	€44,484
Technological and Scientific Development of Turbot Broodstock Management and Larviculture in Ireland. Industry Partner: Turbard Iathar Chonamara Teo., Co. Galway. Research Partner: Aquaculture Development Centre-ERI, UCC. accquaculture@ucc.ie	1	€97,236
Technological and Scientific Development of Turbot Broodstock Management and Larviculture in Ireland (Part II): Further Development and Commercial Application. Industry Partner: Turbard Iathar Chonamara Teo., Co. Galway. Research Partner: Aquaculture Development Centre-ERI, UCC. accquaculture@ucc.ie	1	€58,100
Establish a Commercial Use for Starfish. Industry Partner: Connemara Seafood Ltd., Co. Mayo. Research Partner: The National Food Centre, Teagasc. amulloy@connemaraseafoods.com	1	€66,264
Dunlop Offshore Cage Development Programme. Industry Partner: Bonnar Engineering Ltd., Co. Donegal. info@bonnarengltd.ie	0.7	€42,868
A Novel System for Intensive Larval Culture of the Sea Urchin (*Paracentrotus lividus*). Industry Partner: Dunmanus Seafoods, Co Cork. Research Partner: Aquaculture and Fisheries Development Centre-ERI, UCC. seaurchins@eircom.net	1	€38,958
Development of an Artificial Roe Enhancement Diet Based on Waste Products from the Fishing Industry. Industry Partner: Red Mills, Co. Kilkenny. Research Partner: Aquaculture and Fisheries Development Centre-ERI, UCC. g.mouzakitis@ucc.ie	1	€54,308
Acclimatization Potential of Arctic Char (*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	€59,685
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	€58,500
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	€58,595
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	€59,430
	Total	**€638,428**

Desk Studies.
The primary aim of the desk studies funded under the Marine RTDI Measure of the NDP was to provide grant-aid for desk research on identified and priority RTDI topics of relevance to the sustainable development of marine resources. Desk studies were typically six to nine months in duration and are shown in Table 25.

Table 25: Desk Studies grant aid approved under the Marine RTDI measure (NDP 2000 to 2006) (MI).

Desk Studies.	Project Year (finished)	Grant aid approved €
Strategic Review of the Feasibility of Seaweed Aquaculture. Martin Ryan Institute, NUIG. michael.guiry@nuigalway.ie	2003	€39,797
Disposal and Re-utilisation of Fish and Fish Processing Waste (including Aquaculture Waste). Nautilus Consultants (Ireland) Ltd. nautilus-info@nautilus-systems.com	2003	€26,185
	Total	**€65,982**

Some selected examples of NDP funded projects.
Many of the research projects funded under the RTDI Measure of the NDP were finished in 2006 or nearing completion in 2007. Examples include:

*Biological Oceanography of Harmful Algal Blooms off the West Coast of Ireland (BOHAB).*The strategic aim of this project was to determine and measure baseline ecological and biological oceanographic parameters in two geographic areas of high aquaculture importance (Killary Harbour and Bantry Bay) in order to develop the necessary data for the biological component of a conceptual HAB (Harmful Algal Bloom) model.

Site Investigations and Disease Management of the Pancreas Disease (PD) Virus in Irish Farmed Salmon. Pancreas Disease is the single most significant infectious disease agent affecting salmon aquaculture in Ireland. Pancreas Disease causes high mortalities (up to 50%), it has a detrimental affect on growth rate of stocks and results in administrative restriction on fish movements. As a result of these factors PD is seriously curtailing the growth of the finfish aquaculture sector. The primary objectives of this study were; a) to provide useful information on screening and early warning mechanisms b) To develop effective management strategies that will mitigate the effects of the disease ensuring the long-term viability of the industry.

An Investigation into the Ability of Pacific Oysters, Scallops & Abalone to Act as Carriers of the Protozoan Bonamia ostreae. Bonamiosis is a critical disease of native oyster (*Ostrea edulis*). The occurrence of Bonamia also creates problems for the movement of certain bivalves and molluscs as EU regulations prevent the relocation of live shellfish that potentially could be vectors of the parasite, e.g. scallops and abalone. The primary objective of this study is to increase the understanding of the life cycle of the parasite *Bonamia ostreae*. This project used novel molecular-based techniques to screen Pacific oysters, abalone and scallops for the presence of *B. ostreae*. The resultant clarification of the possible role of these molluscs as carriers, or otherwise, for the *B. ostreae* parasite would allow the industry to respond according to the outcome.

Dunlop Offshore Cage Development Programme. Bonnar Engineering in Donegal has patented an interactive modelling system, which will optimise the use of offshore fish cages. This is the first time worldwide that a fully integrated tool is available to match cage structure to the appropriate environmental conditions offshore and gives the company a strong edge in the market for specialist cages.

Aquaculture related projects supported under FP6. Sixth Framework Programme 2002–2006.
The European Union Framework Programmes (FP) plays a major role in supporting Irish participation in collaborative European marine research projects. The key areas for European Aquaculture funding were "Research for Policy Support". Other areas with strong Irish participation included: seafood quality, biotoxins and harmful algal blooms. Ireland has played a leading role in promoting marine science on the European Agenda (e.g. Galway Declaration 2004) ensuring that marine sciences and technologies are identified as priorities in the new €54 billion EU FP7 Programme (2007- 20013).

The list of Aquaculture projects presented in Appendix IV were obtained from the "Directory of Irish marine success in the EU FP6 Programme (2002 – 2006)" and Oceans of Opportunity II (Mercer *et al*. 2006). Further useful information may be found at:

- The EurOCEAN database: www.eurocean.org (European Information – FP6).
- The EU FP6 Major Projects Library:http://ec.europa.eu/research/fp6/projects.cfm.

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 (Table 26).

Table 26: An example of a major INTERREG IIIC project that received grant aid approval (MI).

INTERREG IIIC	Project duration (years)	Grant aid approved to Irish partner (€)
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	€1,426,758

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.

In 2006 the AquaReg Regional Framework Operation funded under the INTERREG IIIC programme North Zone funded 12 sub- projects (with 35 organisations) to the value of €2,730,000. At a meeting in June 2006, the INTERREG IIIC North Zone Steering Committee made the decision to approve additional funding for the AquaReg Programme. A total of €300,000 ERDF and €75,000 Norwegian national funding was allocated to the programme. Four of the sub-projects were chosen for extension until June 30th 2007. The projects selected were: OPEL – Optimisation of environmental conditions for cultivating marine finfish larvae, CZM – A Common Framework for Sustainable Aquaculture, Restocking of Lobsters – A Regional Strategy for stock enhancement of clawed lobsters (*Homarus gammarus)* and RegEx – Regional Exchange and Seawoman, an amalgamation of both projects. For more information visit www.aquareg.com.

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, will 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 will be submitted to the EU Commission in February 2008.

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- 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 I and II.
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, thereby providing new opportunities in employment and social advancement (see section 12 of this report for a summary of aquaculture related issues discussed in the report).

Third Level Aquaculture Research

Table 27 gives a summary of the wide range of Third Level aquaculture related research undertaken by third level institutions.

Table 27: Overview of aquaculture-related research in the third-level sector (Sources MI and Third Level Institutes).

Institute	No. Research Groups	No. Researchers	Research Focus/ Potential
University College Cork	1 Large 4 Medium 1 Small	30	• Fin/shellfish aquaculture, aquaculture systems, new species (2) • Mussel, abalone, sea urchin, & artic charr (8) • Bonamia (1) • Fish & shellfish health and immunology (2) • Salmonid genetics, genetic interactions (4) • Water quality assessment and modelling (4) • Marine ecology, biodiversity and ecosystem functioning (6) • Fisheries Management, marine mammals (3)
National University of Ireland Galway	2 Large 1 Medium	34	• Marine modelling (3) • HABS (5) • Novel aquaculture technologies, (11) • New species evaluation • Seaweed culture, innovative fish feed (5) • Bio-toxin identification/testing • Molecular biology of salmon (4) • Functional genomic approaches to stock selection • New technologies, recirculation and marine finfish hatchery. • Commercialisation of applied projects (1) • Water quality monitoring and assessment (2) • Live food production systems • Broodstock programmes for fin and shellfish • Quarantine capacity • Vaccine evaluation trials • Carrying capacity studies (3)
University College Dublin	1 Medium	1	• Toxicology, development of in vitro tests for bio-toxins

Galway Mayo Institute of Technology	1 Small	7	• Out-of-season spawning in perch aquaculture • Storage, handling and transport protocols for shellfish • Population genetics • Sea lice biology, monitoring marine biodiversity • Novel marine and freshwater species aquaculture • Sustainable/Alternative Energy Systems for Aquaculture
Cork Institute of Technology	1 Large	9	• Bio-toxin analysis & isolation
Letterkenny Institute of Technology	1 Large	10	• Bivalve larval identification • Bivalve dietary analysis • Shellfish spat production • Shellfish toxins • Shellfish processing/MAP • Diagnostics for pathogen detection • Marine bio actives from processing waste • Marine antifouling
Dublin Institute of Technology	1 Medium	4	• Salmon smoltification • Shellfish histology and pathology • Salmon disease and stress diagnostics

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 a unique facility in Northern Ireland for focused and applied research in sustainable marine aquaculture (Table 28), inshore fisheries and marine resource management.

Table 28: Aquaculture-related research in the third-level sector Northern Ireland (2006) (CMAR).

Institute	No. Research Groups	No. Researchers	Research Focus/ Potential
Centre for Marine Resources and Mariculture (C-Mar), Queen's University Belfast	1	7	• Shellfish Aquaculture • Micro-algal cultivation • Macro-algal cultivation • Bivalve hatchery technology • Shellfish biology • Bivalve restoration • Recirculation technology • Nutrient analysis • Marine monitoring • Seabed survey work using ROV • Shellfish purification • GIS • Carrying capacity modelling

Aquaculture Training 2006

Aquaculture training is integral to the long term development of the aquaculture industry. The document 'Steering a new course' has emphasised the importance on providing increased training to the aquaculture sector and 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".

Vocational Irish Aquaculture training began during the 1990's with a strategic alliance between BIM, County Galway VEC and Údarás na Gaeltachta/ Taighde Mara Teoranta. Aquaculture training has since developed significantly and provides courses as required around the country using BIM's two state-of-the-art mobile Coastal Training Units and also at two colleges i.e. Regional Fisheries College in Castletownbere and the National Fisheries College in Greencastle. All of these activities are co-ordinated by an aquaculture and business training executive.

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 29 shows the main courses which are available to the aquaculture sector:

Table 29: List of courses available to the Aquaculture industry in 2006 (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
Computer and communications training FETAC level 4 Information Technology Skills
FETAC Level 5 Communications module
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
Slinging and Crane Arm operations
Engineering FETAC Level 5 Marine Engineering Processes module
Food safety training Primary course in Food Hygiene
HACCP training
Commercial Fishing Training
FETAC Level 5 Fishing Gear Maintenance and Repair module
Boat Handling training FETAC Workboat 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
New Courses Fish welfare training FETAC Level 6 Commercial Diving Supervisor module Supervisory management training for finfish and shellfish farmers

Student numbers 2006.

BIM provides FETAC (Further Education & Training Awards Council) nationally accredited seafood industry training courses emphasising practical training skills. In 2006, BIM was the sole provider of practical vocational training courses to the aquaculture/ fishing sector in Ireland and there were a total of 310 attendances during the year. However, many more people who wanted to enter the industry also undertook training courses (Figures 53 and 54). Six people in 2006 completed the full time certificate in aquaculture. This course runs for 15 weeks and includes eight modules (shellfish ongrowing, finfish ongrowing, hatchery production, communications, information technology, engineering, workboat handling, safety at sea and work experience).

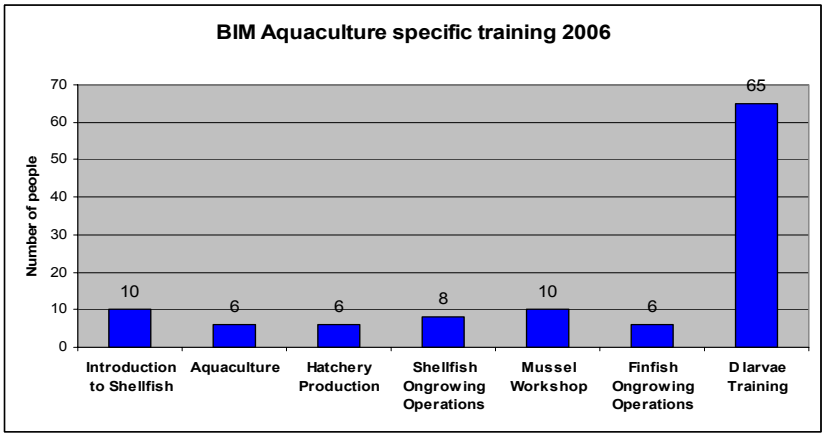


Figure 53: Number of attendees that undertook specific technical aquaculture training in 2006 (BIM).

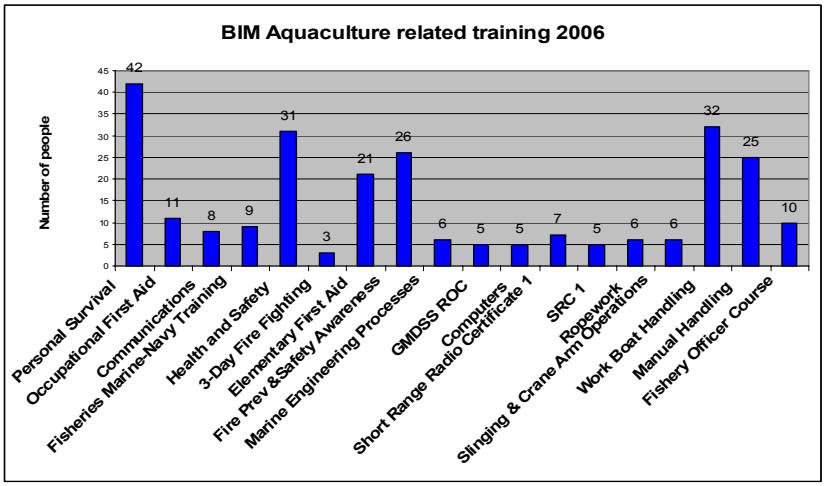


Figure 54: Number of attendees that undertook aquaculture related training in 2006 – N.B. not all of those shown were necessarily involved in aquaculture (BIM).

Training was also provided to students from Northern Ireland (see below), Shetland Islands, Denmark, France, the Irish Naval Service and DCMNR.

Training courses and alliances developed in 2006.
At the end of 2006 FETAC level 6 training courses in Fish Welfare were being developed. BIM Aquaculture training has also developed a strategic partnership with C-Mar (Queens University Belfast) to provide a cross border aquaculture training program (see Table 29 below).

BIM has formed an alliance with the Institute of Technology, Tallaght to develop a new training course called BASS (Building Advanced Supervisory Skills), which involves the use of new technologies and video conferencing to deliver supervisory skills training. This course was prepared in 2006.

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).

Northern Ireland Aquaculture training.
Table 30 shows an example of marine aquaculture training that is being undertaken with other development agencies.

Table 30: Marine Aquaculture training.

Project Title	Marine Aquaculture Training Course.
Funding Body	DARD Task Force with additional support and funding from BIM, Sea Fish Industry Authority and the Sea Fish Industry Training Authority Ltd. (SFITA (NI)), being part-financed by the European INTERREG IIIA programme for Ireland/ Northern Ireland.
Project Duration	2006-2007
Project Leader	C-Mar, Queen's University Belfast
Partners	BIM, Sea Fish Industry Authority and the Sea Fish Industry Training Authority Ltd. (SFITA NI).
Project Aims	The main aim of this project is to provide training (practical and taught) to individuals from the aquaculture and fishing communities, in all aspects of marine aquaculture. Courses offered include shellfish, finfish and seaweed aquaculture, food hygiene, licensing and legislation as well as Workboat Handling, Safety at Sea and Navigation.
	 **Marine Aquaculture Training Course on a field trip in Castletownbere (C-MAR)**

AquaTT

AquaTT is an international foundation which provides project management and training services to support the sustainable development of Europe's aquatic resources. AquaTT supports its target audiences through the provision of support services and through participation in, and coordination of EU projects and initiatives in the areas of education, training and technology transfer. As a non-profit making organisation, AquaTT's function is to provide services to fill the needs of those involved in a spectrum of activities throughout the aquaculture sector: students (including life-long learners), teachers and trainers, researchers, policy makers, company employees and managers. In this capacity AquaTT's key services in response to the industry needs are:

- Professional development assistance: jobs, mobility, exchanges (PiscesTT Jobs).
- Provision of reliable news: succinct, monthly updates highlighting developments in education & training (Training News).
- Project funding: proven capacity to source funding for articulated needs.
- Project management.
- Provision of useful tools for cross-sector benefit.

PISCES TT Jobs (http://www.piscesttjobs.com/) is a free online service provided by AquaTT 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 CVs, respectively, thus facilitating human resource development in the industry. During 2006 the number of vacancies placed on the site by employers increased significantly, as did the number of responses to vacancies.

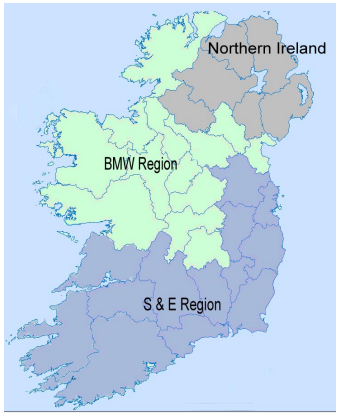
AquaTT also produces a free news service "TRAINING NEWS" specifically for the aquaculture industry. The newsletter is sent out once a month and is intended to keep subscribers informed of developments in Education & Training and related areas. Previous Training News issues are archived on the AquaTT website: http://www.aquatt.ie/index.php/152/training-news-archive/ .AquaTT has a wealth of experience in applying for funding and subsequent participation in and coordination of projects. AquaTT has a specialised project management team working with institutes across Europe and further afield to identify needs and source funding opportunities, usually under a variety of calls within the EC programmes. In lead initiatives, AquaTT is responsible for managing all administration and financial elements. In 2006 AquaTT had 11 projects running.

Commercial Development 2006

BIM Grant Allocations.

The Aquaculture Development Measures of the two Regional Operational Programmes of the 2000 to 2006 NDP provided the overall framework for the commercial aquaculture programme. Total investment in aquaculture projects supported by BIM during the year 2006 was €13.352 million compared with €18.710 million during 2005 (-29%). The decreased investment in 2006 is partly explained by the fact that investment during the year 2005 was boosted by the arrival of five new mussel dredgers which had been approved during 2003 and 2004. It also reflects the 23 month gap in approving the last tranche of aquaculture projects at the end of June 2006 and this delay is shown in the implementation of investment.

NDP Approvals.



The main instrument of policy in promoting investment in aquaculture is the Aquaculture Development Measures of the National Development Plan 2000 to 2006. A formal call for applications under the Aquaculture Development Measures of the National Development Plan 2000 to 2006 had been advertised in the trade press in October and November 2005. Decisions on these applications were taken at meetings of the Aquaculture Selection Boards at the end of June 2006. Thirty-eight of the projects assessed by BIM were approved for NDP grant assistance of €8.9 million on eligible investment costs of €19.291 million. Twenty-one of these projects, with an investment of €8.68 million were located in the Border, Midlands and Western Region (BMW) and seventeen projects with an investment of €10.6 million were located in the Southern and Eastern Region. Table 31 shows the total FIFG (Financial Instrument for Fisheries Guidance) and Exchequer grant approvals for these projects, the remaining balance of the investment (€10.3 million) was made up by private sector contributions. Five of the projects supported by BIM were assisted under the Technical and Economic Support Programme for Aquaculture (TESP) to support investment in measures to improve the environmental impact and competitiveness of salmonid farming.

Table 31: FIFG and Exchequer Approvals for projects in the South & East and BMW regions (BIM).

Species	FIFG Grant	Exchequer	FIFG Grant	Exchequer	Total
	Approved	Approved	Approved	Approved	Approved
	South & East	South & East	BMW	BMW	
Oysters	620,198	222,968	469,247	67,308	**1,379,722**
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**	**8,908,417**

BIM Approvals.

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 pilots the introduction of new technology and the opening up of new site locations for aquaculture. During 2006, 101 projects were approved for Exchequer grant assistance of €1.798 million (Table 32) on aggregate investment costs of €4.142 million. The greatest percentage payments were for the rope mussel and salmon sectors of 39.7% and 25.1% respectively.

Table 32: BIM Aquaculture Grant scheme (BIM).

BIM Aquaculture Grant Scheme	
Grant Payments from 1st January 2006 to 31st December 2006	
Salmon	453,206.06
Salmon hatchery	20,609.00
Perch	114,457.00
Charr	30,020.00
Barramundi	9,873.00
Ornamental Finfish	14,457.00
Sea trout	44,282.25
Freshwater trout	10,970.10
Rope mussel	714,231.12
Oyster	242,616.38
Lobster	46,874.00
Abalone	5,758.00
Clams	12,367.00
Scallops	5,306.37
Seaweed	42,711.06
Others	30,744.00
Total	**1,798,482.34**

A further 11 projects were approved for Exchequer grants of €0.262 million on investment costs of €0.722 million under the Fish Handling Grant Scheme, which aims to promote improved quality and hygiene in the marketing of fish and shellfish.

Grant Payments.

NDP Grant Payments

Payments of €3.888 million were made to aquaculture projects supported under the NDP, comprising €2.951 million in FIFG (Financial Instrument for Fisheries Guidance) grants and €0.938 million in Exchequer grants.

BIM Grant Payments

During 2006, BIM made grant payments of €2.453 million to 105 projects under the Aquaculture and Fish Handling Grant Schemes.

Grant payments of €1.798 million under BIM's Aquaculture Grant Scheme and a total of €0.302 million under the Fish Handling Grant Scheme.

Údarás na Gaeltachta.

R & D and commercial grants, administered by Údarás na Gaeltachta and Taighde Mara, are available to operators in the Gaeltacht areas of counties Donegal, Mayo, Galway, Kerry, Cork and Waterford. In 2006, aquaculture projects received approval for grant aid under NDP funding totalling €4.383 million (Table 33). 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%).

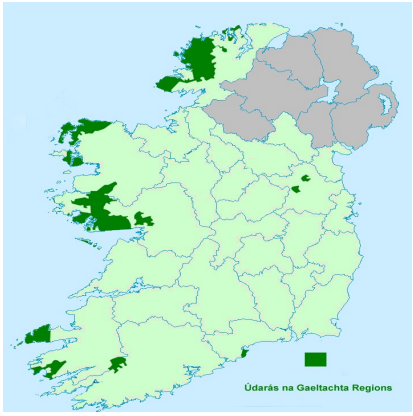


Table 33: Grant Aid Approved in 2006 (Údarás na Gaeltachta).

Approvals under NDP					
	South & East FIFG	South & East State	BMW FIFG	BMW State	Total Grants
Gigas Oysters	61,242	74,399	34,160	4,880	**174,681**
Abalone	393,035	586,288	639,865	182,819	**1,802,007**
Salmon	0	0	1,798,152	608,809	**2,406,961**

Aquaculture processing/ marketing services received grant approval of €1,150,199. In 2006, the project that received the highest approval for pilot research and development funding was cod culture (Table 34).

Table 34: Pilot Research and Development Approvals 2006 (Údarás na Gaeltachta).

Pilot/R+D Approvals	
Gigas Oysters	85,320
Cod	431,276
Ornamentals	32,449

During the year 2006 a total of €2.941 million euro in grants and investments were drawn down. A total of 41.6% of this draw down was for abalone and 38.1% was for the salmon sector (Table 35).

Table 35: Grant and Investments drawn down in 2006 (Údarás na Gaeltachta).

Grant & Investments Drawn Down in 2006	
Gigas Oysters	109,808
Abalone	1,224,085
Cod	445,158
Salmon	1,120,778
Ornamentals	29,068
Turbot	12,640
Total	**2,941,537**

OTHER INDUSTRY SUPPORT MEASURES.

Environmental Protection Agency.

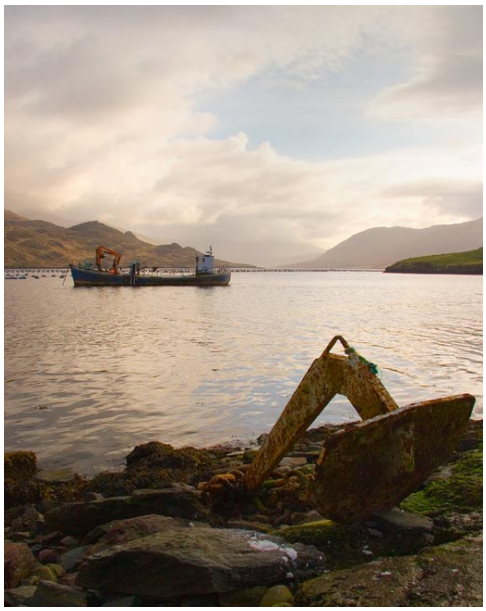
The EPA was appointed to administer the Environmental Research, Technological Development and Innovation Programme under the NDP. The programme promoted environmental friendly business through increased resource productivity, waste reduction, recovery of materials, improved efficiency in a product value chain, energy management and a change of culture within organisations (Mercer *et al*. 2002).

Technical Development Programme 2006

Mussels.

Review of the Rope Mussel Industry.

A far reaching report on the Irish rope mussel industry, commissioned by BIM in conjunction with Enterprise Ireland was completed and launched on 24th March 2006 at the Irish Shellfish Association Conference by Marine Minister, John Browne, T.D. The document titled 'A Review of the Irish Rope Mussel Industry' was compiled by Price Waterhouse Coopers. Among the 12 key recommendations which came out of the review were specific initiatives to improve production and processing efficiency (see summary in section 13 of this report).



New Zealand farming systems.

A total of 8 farms around the country converted to or continue to use the New Zealand ongrowing technology demonstrated at BIM's Rope Mussel Workshop in 2004. This system has gone far in addressing issues of sustainability for the industry both in terms of labour cost and the environment.

BIM Rope Mussel Workshop.

The BIM Rope Mussel Workshop was held in Bantry, Co. Cork in December 2006. Growers from all around the coast made presentations, summarising the technological advances that had been made at a local level and also letting their colleagues know what had and had not been successful. Processors were also given the opportunity to present their experiences. In addition participants were updated on major projects such as BIM's shellfish carrying capacity project, the progress on rope mussel relaying and technology employed in other countries. This now biennial event has proved very successful in improving communication between all sectors of the industry.

Smart Farm Trials.

It was decided to terminate the trials on the Smart Farm system in Lough Swilly. The nets have the potential to produce an excellent crop of seed which performed well when relayed onto bottom culture sites in the Lough, however, the exposed nature of the site in terms of current speed put too much strain on what turned out to be an inadequate mooring system. In Kenmare, 16 lines were deployed on a new site on the northern side of Kenmare River with a view to providing two seed crops to the bottom mussel industry per year. Smart Farm has worked closely with the farm to improve the mooring system.

Exposed Mussel Site Trial.

A large (120 hectare) site licensed for rope culture is being trialled in outer Galway Bay. The site is relatively exposed (significant wave height 4m) with strong tidal currents (> 1.0 m/s). The potential production from the site is > 1000 tonnes p.a. and there is considerable space east and west of the site for further production. The trials to date have indicated both spat collection and on-growing potential. Successful spat collection has been hindered by the strong currents. Several novel collector types to overcome these currents are being tested.

Bottom Mussel.

Approximately 18,200 tonnes of seed mussels were fished by 34 vessels from the Irish coast in 2006. 12,300 tonnes of this amount came from the Irish Sea, between Skull Martin and Rosslare. The remainder was fished from Lough Swilly, Lough Foyle and Castlemaine Harbour. Approximately 4,300 tonnes of suspended culture stocks were relaid to bottom sites in 2006. The industry requested that certain beds of very small seed found be protected and fishing exclusion zones were issued around these for a period. All vessels are now fitted with black boxes and their movements can be monitored.

Construction on a dedicated inshore survey vessel began in August 2006 in Kinsale, at Fitzgerald Marine Manufacturing Ltd. The vessel will be primarily used in surveying inshore waters and assessment of seed mussel beds.

Monitoring of transplanted wild bottom mussel seed and of suspended stock to bottom sites resumed in 2006. In general, stocks with relatively hard shells proved more resistant to predator attack. In the case of wild seed, Wicklow head, Lambay, Skull Martin and Dunany, stocks showed an initial greater survival rate than Wexford stocks. In the case of suspended stocks transferred to bottom sites, those that began as

rock seed such as Killary harbour and Roaringwater stocks showed an initial greater survival rate than stocks that came from seed collectors such as Bantry. The relatively more fragile Bantry stock initially was more vulnerable to crab attack but the rate of mortality in these stocks dropped off dramatically where intensive potting for crabs was conducted. In conclusion suspended stocks can thrive after relay to bottom sites if it arrives in good condition and receives sufficient attention, specifically regarding predator removal.

Spat collection trials using coco-rope continued in Castlemaine Harbour, Lough Foyle and Lough Swilly in 2006. Results were disappointing and it was concluded that the rope was not economically feasible as a spat collector. Further studies have been initiated in Lough Swilly, using Spanish rope as a spat collector.

UISCE project.

Understanding Irish Shellfish Culture Environments (UISCE) project is an ambitious attempt to understand a broad range of aspects of shellfish culture in Ireland. UISCE aims to model the following: individual shellfish growth, flow modification through aquaculture structures, farm scale production, bay scale production, ecosystem impact of shellfish culture, hydrodynamics, solute transport and water quality with attention also given to shellfish hygiene. The models will be integrated and will run within a Geographic Information System (GIS) desktop environment on a scenario basis. The various models will be based on end user requirements from industry, DCMNR and BIM. Examples of such 'what if scenarios' are what is the maximum sustainable tonnage that the bay can produce, where can additional farms be located, where are the hot spots for shellfish growth, what would happen if seeding density or timing changed, what would happen if aquaculture structures were aligned differently. These questions along with others can be answered cost free and within hours as opposed to implementing costly and prolonged trials on site. The ultimate rational for an application such as this is that it will lead to better resource management within farms and bays by industry and regulators alike through an increased understanding of the shellfish culture environment.

The pilot phase of this project which commenced in September 2006 and ends in September 2008 has selected three bays: Killary, Wexford and Dungarvan, which engage in rope mussel, bottom mussel and oyster culture respectively. In addition these three pilot bays present vastly differing physical environments. Thus an attempt in this pilot phase is being made to model across the range of species and environments.

The work carried out so far to achieve this has included assembling nine partner groupings into a multidisciplinary international consortium working under BIM to undertake a vast array of integrated tasks such as modelling each bay at multiple levels from individual shellfish growth up to system scale ecosystem modelling. To model at all these levels a sampling program has been designed to provide, at the correct frequency, all the driver parameters that force the models. This has involved sourcing, purchasing of equipment and training up of key BIM staff on instrument use and protocols.

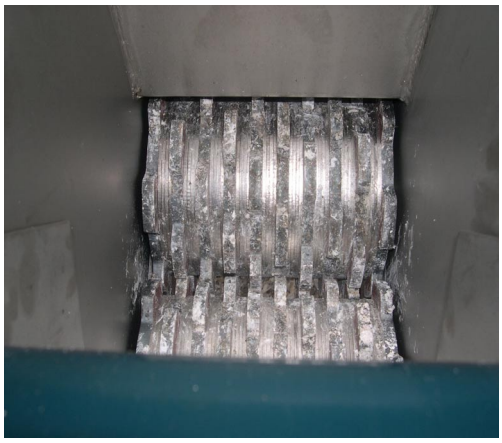
Historical baseline data for each bay has been sought and collated on a central site for dissemination throughout the consortium. Relevant legacy datasets will be used to initiate models and ongoing sampling program data will validate the models. Test cohorts have been set up to enabled modelling the full production cycle for the species within the pilot phase of the project. Farmer husbandry data, GPS surveys and standing stock assessment along with stock tracking will allow for husbandry impacts on the models. All of these disparate datasets will feed into a central database off which all models will run. Management of this vast amount of data will be done in compliance with the Water Framework Standards to facilitate data assimilation and dissemination in the future with other bodies.

The UISCE project will take the Irish Shellfish Aquaculture Industry an important step further towards optimising production in a sustainable manner whilst minimising costs and environmental impacts.

Crassostrea gigas.

Oyster shell crusher.

A machine designed to crush waste shell was installed on an oyster farm in Dungarvan. The teeth of the crusher can be adjusted on installation to suit either mussel or oyster shell, crushed to the users required size. In its crushed form when the meat is removed, shell can be a highly versatile "technical" product, used for the production of aggregates, in gardens, for drainage of land, and for the construction, maintenance and repair of footpaths, and may offer a solution to many of our shellfish processors waste management problems. Such practices are already standard in the UK and Northern Ireland and are in accordance with the EU's Animal By-products Regulation 2003.



Bag cleaner.

A mechanical oyster bag cleaner modified from a silage cutter to clean seaweed from bags on site was developed by Dungarvan Shellfish Ltd and is now in use in both Dungarvan and Clew Bay. The machine is a rotating axel on two wheels, height adjustable, with rubber bands which flay the bags to remove soft fouling. It is towed behind and powered by a tractor and can be steered using hydraulic rams. Not only does it reduce the requirement for turning bags but also cuts down on the labour involved in shaking. Two people walking behind the tractor can shake the bags without removing them from the trestles.

Seabed culture.

Commercial trials for the bottom culture of *gigas* oysters were extended to Clew Bay. Half grown oysters were deployed on two sites, both traditional native oyster beds. It is proposed that harvesting will be carried out during the native oyster season, essentially as a by-product. Return rates and dredge efficiency will be assessed to determine the long term viability of mixed bed culture for the native oyster Co-op.

Scallops.

A scallop meeting was held early in 2006, which had attendees from France and Norway and members of the Irish industry. The purpose of this meeting was to take the cumulative knowledge of the countries and combine them, in order to push forward scallop hatchery technology and commercial feasibility. The idea of a land based nursery system as used in Norway was also discussed.

As follow on from the meeting the scallop hatchery programme at the Daithi O' Murchu Marine Research Station in Bantry was revised to include a land based nursery system, which would have similar specification to that found in Norway, which was proving successful. From June four separate spawnings took place. Some of these settled on mesh and placed in bags were put to sea after settlement. The Norwegian nursery system was used for the final two spawnings and settling mesh was put in this system. The use of a down-weller was also tested.

Scallop spat were sorted every 4 weeks. First measurements on scallop size were taken 8 weeks after they were put to sea. The size range at this time for the early batches was 8 to 20mm with a mean size of 12.8mm. The bags held in Bantry did not vary significantly with a mean shell width of 12.9mm. Four weeks later they were again measured with the spat held at sea having a mean width of 19.4mm while those from the nursery measuring 17.3mm. In August, relaying trials were carried out in Bantry Bay of stock which had been produced from the hatchery in previous years (2004 and 2005). In total, 8,400 pieces of a mean shell width of 55mm were relayed and have been monitored since.

A separate project with North West Shellfish Ltd. attempted to increase spat numbers by deploying more collectors (in Mulroy Bay) over various times of the season. This was made possible by the purchase of a prototype scallop spat grading machine from Canada, which enabled more collector bags to be sorted in a given time thereby allowing more to be deployed resulting in additional spat. The sorter arrived later in the year and has been used over the winter period and has successfully speeded up the process of sorting and grading.

Salmon.

Sea lice control.

BIM installed two Sealice Emitters in Celtic Atlantic Salmon. These emitters are based on Bioenergetics, which is the transmission of specially encoded signals through electromagnetic fields. As these signals are emitted into a given area, they seem to be altering the natural life cycle of the sea louse and thus preventing the appearance of the females. All the groundwork has been carried out in conjunction with the two farms in Connemara, where the Aquatic Emitter System was installed at each farm before the fish were introduced to the cages. The resulting lice counts were very low. These emitters are now also in Marine Harvest Ireland, where results look promising.

Stunning trials.

In the interest of fish welfare and in order to continue to comply with the requirements of organic certification schemes, BIM together with two Irish organic salmon producers investigated alternative methods of stunning fish to replace the current practice of anaesthetizing fish before killing with a combination of CO_2 and iced water.

a) Electrical Stunners

Electric stunning of fish in water was recently identified as a suitable method. The electrical system, Ace Aquatec Pipeline Stunner, was at the prototype stage of development and trials were carried out at one of the two organic salmon farms involved in the project. The Pipeline stunner system, operates by moving fish along a channel through a volume of re-circulated freshwater in which an electric field is maintained. The length of this channel was sufficient to ensure that the fish do not exit the electric field until they are dead.

Using the pipeline was operationally easy and the fish did not struggle when they reached the harvest bins. The system had the advantage of being able to control various parameters, including voltage, current, time and frequency, which was a huge plus in this method of slaughtering fish. There were issues associated with the electrical slaughter process, such as staff welfare, training and logistics. However, this system had the benefit that the fish were not removed from the water before they were killed.

b) Percussion Stunners

BIM's Aquaculture Technical Section had purchased an MT4 and MT5 stunning machine in 2005 in order to support and promote the development of improved harvest practice. Richard Bass Ltd., Australia supplied and demonstrated the stunners along with a prototype delivery system. The percussion stunners work on the basis of giving the fish a physical blow to the head. Richard Bass Ltd. was commissioned to develop a delivery system suitable for farmers wishing to use brailing systems or pumped delivery systems. This method is highly effective when applied properly. Requiring only air to operate the stunner, the system requires a limited amount of space and can be set up or relocated in only minutes. Unfortunately the delivery system needs more work for it to become efficient. If the industry is to move away from the current practice to percussive stunning there is a need for a delivery system designed to handle fish from brailer to stunner in a controlled manner without causing undue stress.

Quality.

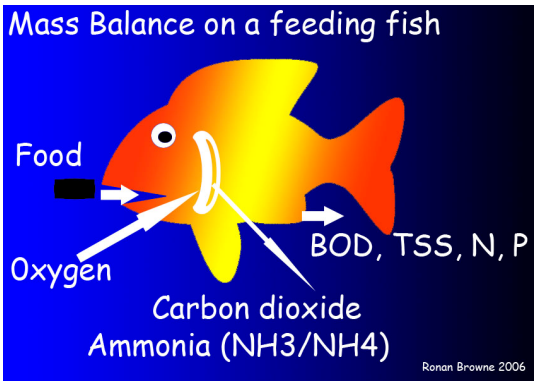
The quality of the fish from the two methods (along with the control – current practice) was assessed using various parameters such as muscle pH, lactate levels, rigor stiffening, gapping and colour. Overall data from the trials for the prototypes for percussive and electrical stunning of salmon appear positive, both methods need to be verified on a production scale, which will be continued into 2007.

Wrasse.

Wrasse trials, as a means of controlling sea lice on farmed salmon, continued in various bays throughout the country with varying results. The main problem is that in some bays it was not possible to catch sufficient numbers of wrasse for the trials, which has led to Marine Harvest undertaking the task of initiating a breeding programme for wrasse which will take place in Carna, Co. Galway in conjunction with the MRI.

IPN.
In 2006 several of the freshwater smolt sites tested positive for IPN (Infectious Pancreatic Necrosis) (See section on Finfish Health in this report). This is a viral condition affecting salmon during the freshwater phase, which necessitated BIM to help farms establish temporary hatching capabilities at sites that were disease-free, in order for the smolt production for subsequent years to be maintained. BIM supplied three 20 ft containers, which were equipped with hatching materials and which were placed on disease free sites to allow eggs to be brought in and hatched to fry before they were transferred back to the original sites which had to be fallowed and sterilised.

Technical progress in Recirculation Aquaculture Systems.



A collaborative workshop jointly organised by BIM, Taighde Mara Teo and the Martin Ryan Institute entitled, 'Working with recirculation systems – developing an efficient modular land based farm' was held in Galway during July 2006. The workshop was a targeted practical two-day event covering both freshwater and marine applications. The workshop included Irish practitioners and guest speakers from Europe, the US and South Africa. The workshop speakers gave in-depth analysis of system design and build including tank design, water treatments, system monitoring and management, growth of fish and waste generation, fish health and economic considerations. The second day of presentations concentrated on four Irish case studies, shellfish (abalone), ornamental fish, marine finfish and freshwater fish in Irish recirculation systems. Workshops such as this one are key to bridging the knowledge gaps between the industry and the equipment suppliers. Ireland's aquaculture sector is becoming increasingly technical. In Ireland we now have new innovative recirculation systems, producing high quality fish and shellfish product such as perch, arctic charr, abalone and sea horses, with other projects are in the pipe line.

Perch.
Aquaculture Initiative (EEIG) and BIM are involved with the development of hatchery and on-growing sites for this novel species. PDS Irish Waters Perch Ltd continued to build on its success in 2005. An out of season spawning of the perch brood stock was achieved at the end of February at the company's brood stock unit in Corlismore, County Cavan. A natural spawning was also completed in May. The protocols developed to achieve artificial spawning of brood stock involve light and temperature control of 60 brood fish over the preceding six-month period. Brood stock are first acclimatised in outdoor ponds before moving into the holding unit in September. A chill period followed until January when temperatures were gradually increased. Dawn/ dusk simulation triggered spawning at the end of February and into March resulting in 227,000 larvae. Weaned larvae were subsequently moved to Emlagh Fisheries Ltd in Roscommon for grow – out. Winter 2006 provided its own challenges with a very wet period causing floods on site at Emlagh Fisheries Ltd with the resultant loss of stock. Key Water Fisheries Ltd consolidated its position in 2006 with the installation of a polytunnel to cover their grow-out area, facilitating better growth of fish during the colder winter months.

The EU Craft funded project which PDS Irish Waters Perch Ltd is partnering was completed in 2006. The final results of the project that involves SME and RTDI partners from around Europe were presented at a meeting in Montpellier in June. BIM is the key sponsor of this event and the companion document for the event is largely to be written by Irish authors. Two commercial units, Clune Fisheries Ltd and Ballybay Perch Ltd were approved for NDP funding in 2006. Building at the Clune Fisheries Ltd. site started in 2006.

Cod.
The rearing trial of cod in sea cages in Beirtragbui Bay, Conamara by Trosc Teo made good progress. The first fish stocked were to be ready for harvest in 2007. The second year class, (hatched and weaned at MRI Carna Laboratory) were successfully transferred to sea at a much smaller size (10 – 15 g) than those in 2005 significantly reducing the cost of juveniles. The delay/ control of maturation during their first winter is one of the major challenges for the ongoing trials.

Arctic charr.
The year, 2006 saw the commercialisation of the Arctic charr programme. A total of 36.4 tonnes of Arctic charr was produced to market by the two commercial units in Ireland; Cool Springs Arctic Charr Ltd in Co. Sligo and Stofnfiskur Ireland Ltd. (SIL) in Co. Galway. Cool Springs Arctic Charr Ltd is a state of the art charr production facility. SIL also produces salmon fry for smolt producers and is planning a major charr initiative with the installation of further recirculation capability on site to increase production capacity to 100 tonnes of charr per annum.

The 50 tonne unit in Sligo is very important, as it is the only fully functional re-circulation unit in the border counties and has generated great interest among potential producers with regard to its technology and effluent treatment system using reed beds.

Abalone.
Modest production of *Ezo awabi (Haliotis discus-hannai)* continues on Cape Clear Island. The focus of the pilot phase has been on husbandry, feeding regimes and stocking density. This farm and two additional Gaeltacht based farms received FIFG approval for their planned buildings.

Freshwater crayfish.
A licensed freshwater crayfish producer in Northern Ireland is currently looking for an INTERREG grant to set up a cross border project with a perch producer in Cavan to facilitate the production of crayfish and potential uses other than for food e.g. restocking where stocks are depleted both in ROI and UK and use for reducing blanket weed in perch ponds.

Seaweed.
The seaweed programme continued apace with the putting to sea of further seeded *Alaria esculenta* collectors from the Daithi O' Murchu Marine Research Station in Bantry to the licensed seaweed site in upper Roaringwater Bay in December 2006. This is the third year of this programme and year on year there have been incremental changes to fine tune the methodology to harvest the *Alaria* and grow the culture prior to spraying on the collectors. This methodology is fully described in the BIM Aquaculture Explained Manual No. 21, *'Cultivation of Brown Seaweed – Alaria esculenta'.*

Storm conditions during the deployment of collectors in December 2006 caused some difficulties and there was also some damage to the lines. At deployment stage the plantlets are extremely delicate and any rubbing of the lines causes the detachment of the plantlets and poor coverage of the grow-out line at harvest. Unfortunately *Alaria* lines must be put to sea during the winter as the growth of this plant is over the cold water period, so the weather can adversely affect the tonnage harvested.

8. QUALITY

Quality of Aquaculture Production

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 2006 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.

In the salmon sector, a reduced level of supply over the last number of years has meant that the industry has been channelled into niche markets such as organic. This has proved a very successful strategy due to the high value of organic products in the marketplace. To service this organic sector, the Irish Quality Salmon scheme has added an organic standard to the suite. The 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), and was developed, with the input of organic farmers, and with the approval of the Department of Agriculture and Food.

Box 9. Quality Seafood Programme

What is the Quality Seafood Programme?
BIM has devised a number of quality assurance schemes for Irish aquaculture products; Irish Quality Salmon (IQS), Irish Quality Mussels (IQM) and Irish Quality Trout (IQT) (see main text for further details of the schemes). The Quality Seafood Programme is the umbrella-marketing programme for these base schemes.

How does a consumer or trader recognise the Quality Seafood products?
Aquaculture products approved under the Quality Seafood programme will carry a distinctive symbol, which assures the buyer that products carrying this symbol have either been caught, or raised on farms with excellent standards of safety, hygiene and quality throughout the supply chain.

This symbol has been adapted accordingly for European, UK and US markets. In order to comply fully with EU labelling regulations, companies licensed to use the symbol will add the country of origin at the base of the symbol. The origin denotes the origin of the product, not the location of the country.

What are the benefits of the Quality Seafood Programme?
Placement of the QS symbol on a seafood product is an assurance that the product has been caught/reared, harvested, packed and processed under a strict quality assurance scheme. It is also an assurance that there is traceability of the product to retail store. For those retail stores stocking QS products, ensuring that only the best quality, fully traceable seafood products are offered for sale in their outlet enhances their reputation.

In order to place the QS symbol on a seafood product, all seafood within that product and the process through which it has been produced must be certified under a quality assurance scheme, independently audited by an EN45011 accredited body.

The scheme, which is ready to accept members in 2007, will be the Irish National Organic Standard for salmon and is an extension 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 and is in accordance with the principles of organic farming and management.

This quality standard includes farming activities across freshwater, saltwater, harvesting, packing and processing (smoking) or Irish farmed salmon. There are also specific clauses for the production of feed for feeding organic stock.

The organic principles that must be demonstrated for the product to be eligible for certification are:

- Maintenance of a healthy and sustainable aquatic ecosystem.
- Environmental impact assessment of farming activities such as benthic monitoring, farming practices employing single bay management and site fallowing principles, stocking of healthy, naturally selected stock.
- The use of feed from sustainable sources. The marine component of feed must come from fisheries having a defined Total Allowable Catch (TAC) and Quota based on a government recognised scientific evaluation and employing legal and responsible fishing practices.
- Protection of fish welfare and promotion of fish health. Stocking densities of <10kg/m3; identification and avoidance/reduction of stressful husbandry practices; restricted harvesting practices; avoidance of chemicals, pesticides and treatments.

- A respect for nature, the environment and a commitment to recycling, reuse and recovery. Nutrient discharge monitoring and reduction; waste management plan identifying waste streams and their reduction.
- The use of natural over synthetic products and processes. Avoidance of chemicals such as anti-foulants on nets; avoidance of chemical treatments; the promotion of natural/biological control of sea lice; the avoidance of solvent/chemical extraction processes and synthetic inputs for feed manufacture.
- Exclusion of GMO's. Avoidance of genetically modified organisms, products and processes throughout the life cycle.

Sustainability.
There is an increasing focus on sustainability in seafood and it is the new "hot topic" in the media and with consumers. For fisheries products there is the well-known Marine Stewardship Council brand but they do not certify aquaculture products- which leaves the producer in a quandary. How to prove their environmental credentials?

To answer this need, an Eco-Label for mussels and salmon has been developed in 2006. This has taken the basis of the Environmental Management System (EMS) for aquaculture ECOPACT, and used this to establish an environmental standard for salmon and mussel production.

ECOPACT addresses the EMS needs of these companies, because it can be individually designed to make environmental management a reality in day-to-day operations. It has been developed by BIM's Aquaculture Environment & Quality Section, in co-operation with the Irish Farmers Association (IFA Aquaculture) and has already been adopted by more than 50 companies across Ireland. BIM's aim is for all aquaculture operations to embrace an environmental management system, whereby all aspects of the business are examined and a programme is put in place to enable continuous improvement of environmental performance. In all, 15 environmental aspects are addressed by the ECOPACT scheme including waste management and recycling, the use of cleaning agents, fuels and lubricants, nature conservation, visual/noise/odour Impacts and the use of public access piers. Following the initial assessment of these issues, key areas for actions are prioritised and are time-lined. An Environmental Management Programme is then drawn up to ensure that these issues are addressed.

The Eco-Label standard takes these environmental aspects highlighted by ECOPACT and sets standards for them, which must be attained in order to be certified. The Eco-Label follows the FAO guidelines for eco-labelling marine fishery products for sustainable use of resources, sound management practices and consideration to ecosystem impact. Development of European Union guidelines on eco-labelling for aquaculture products is underway and BIM will contribute to this working group in 2007. Piloting of the mussel and salmon standards will take place in 2007.

Rope Mussels.
Arising from the ISA "Review of Rope Mussel Sector in Ireland 2004", BIM, at the request of industry, embarked on a project to develop a Rope Mussel Raw Material Delivery Protocol. The PWC Report, "Review of the Rope Mussel Industry", also endorsed this Protocol. The overall aim of the Protocol was to establish what the current problems are, for both the producer and processor, with regard to raw material delivery and to establish a means of best addressing these issues, to the mutual advantage of both parties addressing the PWC Recommendation Core Theme 6. The objective was to build a bridge of understanding between the producer and the processor, to the mutual benefit of both parties.

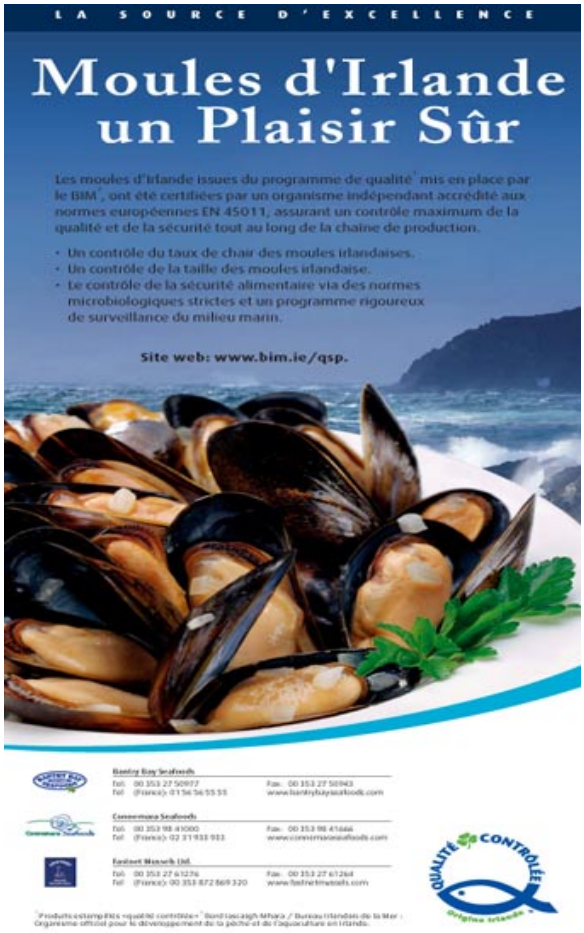
After completion of the first round of consultation, the common ground emerging from the parties consulted were summarised as follows:

- Waste (Tare).
- Size grade/ Pieces per Kilo.
- Shell fouling.
- Meat yield.
- Water Loss.

Having agreed the key parameters the next step was to define and agree on their objective measurement. BIM's approach was to codify the measurement of these parameters into Standard Operating Procedures (SOPs), which together with sample delivery paperwork may be used as a template for regularising the relationship between the grower and the processor in a win-win situation.

The approach has been captured in a user friendly DVD entitled "Rope Mussel Delivery Protocol - Building Bridges", which was launched at a BIM workshop in Bantry in November 2006. Since November, digital weighing scales have been purchased for each certified IQM member, the Control Sheets have been finalised and legal advice is being sourced to establish the final terms and conditions of the bi-lateral agreements, which in-turn will establish a harmonised and transparent approach for all parties involved. The protocol will feed into the already well-established Irish Quality Mussel scheme; members of the scheme will be able to avail of the system and will receive all the tools to carry out the SOPs along with the arbitration facility that will form part of the system. The full system will be rolled out in 2007 and the DVD explaining the protocol and demonstrating the SOPs is available from Vicky Lyons in BIM's Quality and Environment Section.

Quality Seafood Programme.



The Quality Seafood Programme is the marketing arm of the Irish Quality Salmon, Trout and Mussel schemes. The symbol is the guarantee that the product displaying it has been grown and processed under the strictest quality, food safety and traceability controls. In 2005 the marketing campaign focused on salmon. For 2006 the spotlight moved to mussels. Given that the main market for Irish mussels is France, it was decided to focus the marketing campaign here. A series of adverts and editorials were placed in 4 major catering and trade magazines and newspapers, Neo Restauration, Cuisine Collective, Le Monde du Surgelé and Produits de la Mer.

The mussel communication campaign highlights the Irish Quality Mussel Standard under the title "Moules d'Irlande, un plaisir sûr" (Irish mussels, a safe / sure pleasure). This title reflects the strict food safety measures included in the Irish Quality Mussel standard and replies to buyers needs for assurance on this aspect of the mussel industry.

As part of the QS mussel campaign being carried out in the French market throughout 2006, a media trip was organised to the Galway region on the 13th of June. Four French trade journalists as well as the technical advisor of the largest import frozen food trade association (SNCE) participated. The media group were able to observe at first hand the operations of a rope mussel farm. A visit of the newly inaugurated Marine Institute was carried out in the afternoon, that included detailed presentations on Ireland's biotoxin monitoring programme and analyses techniques. In the evening the journalists were given a further presentation of BIM's Quality Seafood Programme and also had the chance of meeting QS processed mussel exporters. The exporters had the opportunity to display their QS labelled product to the journalists.

All products approved to carry the QSP logo are listed on the BIM website at: http://www.bim.ie/templates/text_content.asp?node_id=668

For further information on the Quality Seafood Programme see BIM's website; www.bim.ie or contact the BIM Market Development Division.

Oysters.
Work on the Irish Quality Oyster scheme was completed in 2006 and the first draft submitted to the National Accreditation Board for review and comment. The standard was devised by a Technical Advisory Committee with members from BIM, the Marine Institute, Food Safety Authority of Ireland, IFA Aquaculture and Industry. The document includes standards for sourcing, production, harvesting, handling, packing and the distribution of oysters. It includes requirements for hygiene, food safety, traceability, methods of control and inspection of product quality criteria according to detailed product specifications. The specification includes criteria for shell shape, size, fouling, meat yield and microbiological criteria.

Piloting of the standard with industry will commence in 2007. The membership number of Irish Quality Schemes are shown below in Table 36.

Table 36: Number of members of Irish Quality Schemes (BIM).

Scheme	Standard	No of members
Salmon	Freshwater	7
	Saltwater	5
	Packing	4
	Smoking	2
Mussel	Harvester	12
	Processor	4
Trout	Freshwater	3
	Saltwater	1

For further details on the Irish Quality Schemes (salmon, trout, mussel and oyster) see: http://www.irishqualityfish.com

9. LOCAL AQUACULTURE MANAGEMENT SYSTEMS

CLAMS Activity 2006

Local Area Management Systems.

The Co-ordinated Local Aquaculture Management Systems (CLAMS) process 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 55). It 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 (BIM) around the coast of Ireland with nine CLAMS plans published.

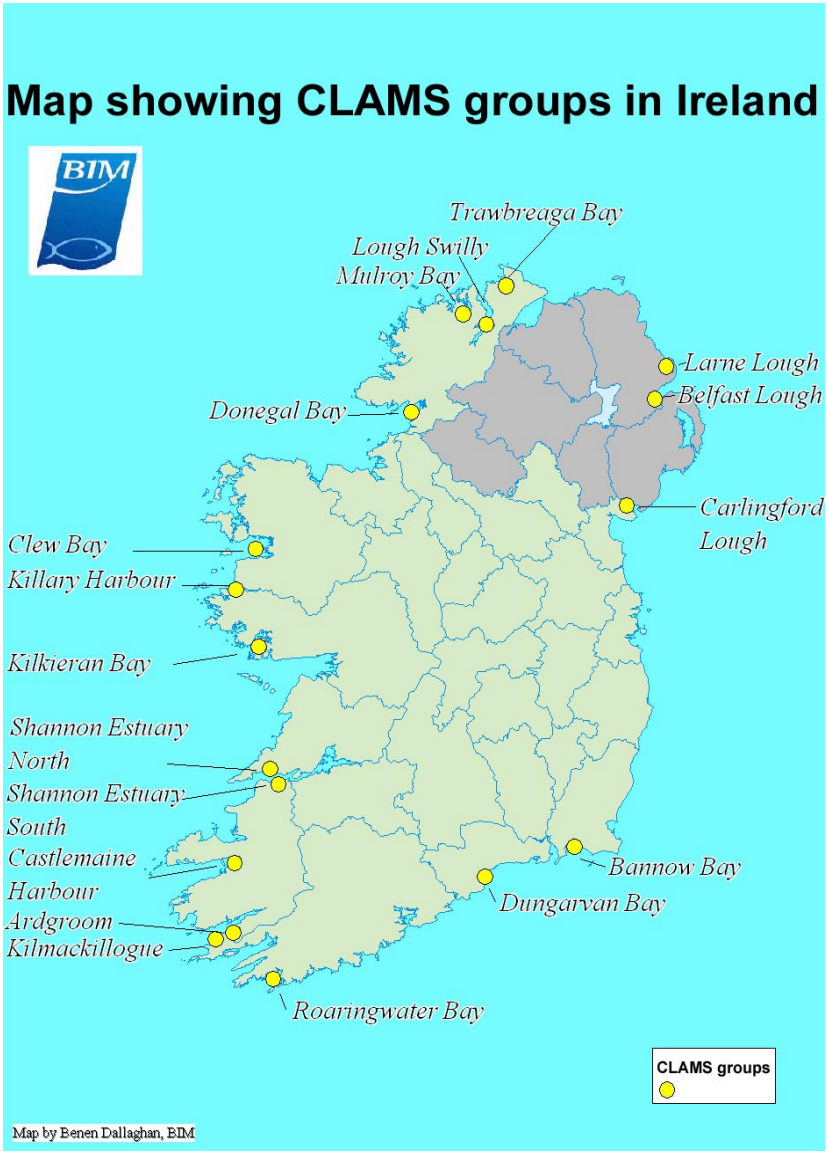


Figure 55: Map showing CLAMS groups around Ireland.

Continued implementation of the CLAMS process formed the backbone of the BIM/ CBAIT aquaculture regional development programmes in 2006. Around that framework, individual officers provided expertise and assistance in formulating and implementing navigation plans, environmental management projects such as trestle removal, pier cleaning, licence applications and ground division projects.

Ardgroom.

The Ardgroom CLAMS group carried out a very successful project to reduce the number of longlines in the bay. Stocking densities for longlines was set at 220m of line per licensed hectare and all producers in the area have reset their lines accordingly. This has brought about increased growth rates of mussels; in most cases the production cycle has dropped from a 36 month period down to 14-18 months. A programme for starfish removal was also implemented with 150 pots being deployed and these were lifted three times a week over a six week period. The programme proved successful, showing a marked reduction in starfish predation in the bay.

Bannow Bay.
The CLAMS group in Bannow Bay have implemented navigation projects for their areas and the growing sites are now clearly marked using navigational poles and buoys. This work has been carried out under the advisement of the Commissioner for Irish Lights. The project allowed all producers in the area to work together to mark their sites and improve navigation and ensure safe use of the area for all stakeholders and aquaculture producers.

Castlemaine Harbour.
A full scale clean up of the point at Cromane was organised in June. All old or defunct aquaculture and fishing materials were removed from the site and sorted, with metals and recyclable material separated. All general waste was also removed and disposed of responsibly. A predator control programme was also put in place with funding from BIM. Green crabs, which are a major predator in the area, were fished in an organised and consistent basis throughout the year, leading to a large reduction in losses from predation.

Clew Bay.
Aquaculture Navigation Plan: The majority of the Clew Bay CLAMS Navigational Plan, which was drawn up in consultation with Department of Marine Engineers, Commissioners of Irish Lights and MSO, was implemented in 2006 with the deployment of St. Andrews Crosses and yellow marker buoys in key Pacific oyster areas of Clew Bay. Statutory Sanction was received from Commissioner of Irish Lights. Laminated maps were sent out to the aquaculture producers, local fishermen and other boat users around the Bay. Phase II of the Plan to be completed in 2007. Training was undertaken through the IFA Skillnet programme and BIM ran a three day safety course in March 2006 that was organised in liaison with Bob Walsh BIM and Noel Conlon a local trainer provider from Seatec Ltd. Trestle recycling is ongoing in the area. BIM assistance is given to the group through the use of a trestle cleaner and assistance with disposal.

Dungarvan.
Work on trestle removal and a recycling programme continued in 2006 on the back of the large amount of work done in 2005. This work has significantly improved the visual impact of the oyster trestles in the area. As part of this exercise, extensive mapping of the area has been carried out to illustrate the improvement that the removal programme has made.

Kilmackillogue.
A new group was formed in 2006. Several projects have been carried out in the area during 2006. A pier and beach clean was organised which involved the removal of old boats, thinning rafts and general waste from the area. As with other CLAMS clean up operations, local producers give their time and energy to cleaning up the area to improve the facility for all users. The training area for mussels in Kilmackillogue was improved with washed, crushed stone laid on the thinning area allowing for better access and a cleaner environment.

Roaringwater Bay.
The training area in Roaringwater was also improved in 2006, with washed, crushed stone and the placement of rock to protect the area. The pier was concreted by the council and this has led to an improvement in conditions on and around the pier. Producers also took part in a beach and pier clean to remove redundant material.

Cross-Border Aquaculture Initiative (CBAIT) CLAMS/ Loughs Agency
There are four CLAMS groups currently set up in the border-counties. These are situated in Swilly, Carlingford, Mulroy, and Trawbreaga. CLAMS groups have also been set up in Northern Ireland for both Larne Lough and Belfast Lough.

Lough Swilly.
Work continued in this Lough on issues such as integration of mussel producers with native oyster fishermen and better interaction between producers. CBAIT is assisting the native oyster fishermen through their co-operative with their licence application and is also assisting with the formulation of a basic business plan for their members. Issues such as suitable berthing, loading/offloading were also being addressed.

Carlingford.
While the published document is still awaiting its launch the CLAMS group is active in pursuing common goals and has been involved with developing a navigation plan. Site markers have been deployed, meeting the requirements of the relevant agencies in both jurisdictions. Another issue that was being addressed by the group was a problem with mussel being washed from relay beds due to wake from ferries. A Carrying Capacity Model, Sustainable Mariculture in Lough Ecosystems (SMILE) has been completed for Carlingford Lough and this model and a CLAMS strategy is planned for Lough Foyle. In addition the Loughs Agency is currently developing a Strategic Environmental Assessment (SEA) for the introduction of legislation to licence and manage aquaculture and shellfisheries activities in both Loughs and their catchment areas. The consultations, assessment procedures and collection of scientific data being undertaken by the Agency will inform the framework for the implementation of licensing and management of aquaculture and shellfisheries in the Agency's areas.

Mulroy.
This Mulroy group is active in ensuring the building of the new bridge across the Bay will not affect aquaculture production either during or post construction. The CLAMS document has undergone a number of drafts and it is due for publication. A navigational project has been instigated in the Bay.

Treabreaga.
This group have been active in areas such as the drawing up of a navigational plan and attempting to achieve changes on licenses relating to problems common to most producers in the Bay. During the year producers self funded a trestle removal scheme with CBAIT assistance. Funding was secured from the CLAMS executive for the upgrading of access road to the shore.

Larne.
Work began on the production of a document about water quality issues with local industry as these are being highlighted in an effort to put in place suitable sampling procedures.

Belfast Lough.
It was agreed at a mussel group meeting for the Lough, hosted by DARD, that all producers (which are bottom mussel producers) would be contacted by letter regarding the setting up of a CLAMS group in 2007.

The success of all the CLAMS groups and the projects that they undertake are dependent on the dedication and enthusiasm of the producer members and the regional officers that support them in their efforts. The above summary is only a glimpse of the work that has been undertaken throughout the year.

Cross-border Producer Groups.
The facilitating co-operation programme for Irish North Coast Oysters (INCO) was completed during the year. It assisted the group with drawing up plans for the continuation of the group post grant aid.

Cross border Trout Producer Group. BIM completed a survey of production units both North and South. A report was published on the status of these units and projected needs for the sector to develop.

Environmental Code of Practice for Aquaculture Companies and Traders (ECOPACT).
ECOPACT is an initiative developed by BIM to ensure the widespread introduction of environmental management systems in the Irish Aquaculture Industry.

Single Bay Management in 2006.
In 2006, Single Bay Management (SBM) plans were in place for all finfish producing bays in the country. These are:

- Bantry
- Kilkieran/Greatman's/Bertraghbui
- Mannin
- Killary Harbour
- Clew Bay
- Mulroy Bay
- Lough Swilly

This initiative began in the early 1990's shortly after the introduction of the Sea Lice monitoring programme to advise on codes of 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 all regions towards the end of 2006 with the objective of updating production/ fallow plans and undertaking strategic autumn/ winter synchronous sea lice treatments. In most cases these treatments were carried out by well boat.

Fallow plans were also reviewed in terms of the effectiveness for three year projection plans, which resulted in more regular updating of the plans throughout the year. The Aquareg CZM pilot study has looked at the application of GIS for the spatial visualisation of current activities and datasets in the Clew Bay region. The application in the SBM context is to be reviewed and it is planned that the database capabilities will be extended to other regions.

Coastal Zone Management (CZM) Aquareg Project 2006.
The objective of the INTERREG IIIC Aquareg coastal zone management project is to review aquaculture and inshore fisheries management activities with the objective of producing guidelines for best practice by these industries. Many stakeholder groups were consulted in the initial stages of the project through questionnaires and workshops in the participating regions, with a view to highlighting issues and concerns they may have on administration, licensing, monitoring and current management frameworks such as SBM and CLAMS.

Through 2006 much focus was on the development of geodatabases in pilot programmes in the Aquareg regions. In Ireland the pilot area was Clew Bay. Seabed maps were produced for the pilot areas giving bathymetry data, sediment distinction, locations of marine features and shipwrecks, slopes and elevation. Thematic maps were produced showing nursery grounds for commercial fish species (based on historical fishing data), suitable areas for anchoring fish cages, oxygen depletion zones, and water current patterns. This information was then layered into a GIS.

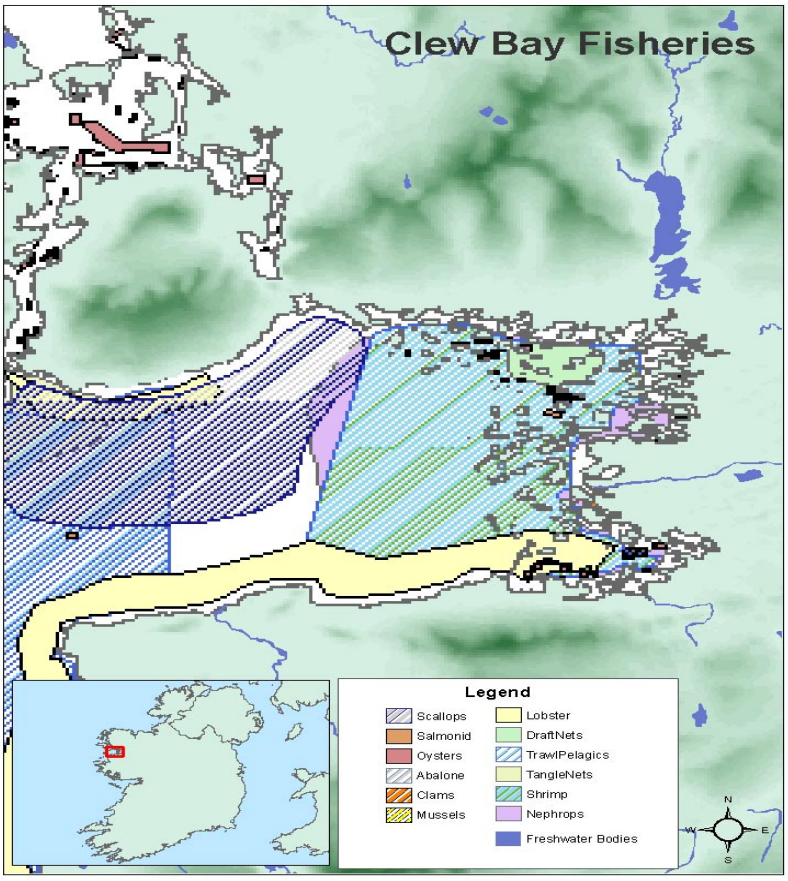


Figure 56: Map from the Clew Bay (Ireland) geodatabase, showing the locations of the major commercial fishing and aquaculture activities (MI).

The final report will comprise recommendations and best practice in aquaculture management and CZM for industry and policy makers.

10. IRISH FARMERS ASSOCIATION (IFA)

IFA Aquaculture Activities 2006

IFA Aquaculture is the section within the Irish Farmers' Association providing professional representation for the Irish Salmon Growers' Association (ISGA), the Irish Shellfish Association (ISA) and the Irish Trout Producers' Group (ITPG). The year 2006 was an extremely active year for each sector demanding support from the representative organisations.

Salmon
Having achieved a minimum import price (MIP) with the assistance of the Irish Government and the Scottish salmon industry, Irish salmon farmers were faced with a situation of rising prices and being unable to supply enough fish to meet market demand. In 2006 over 40% of Irish fish were certified as organic and the reputation of Irish salmon at home and abroad was high. Processors were also confronted with the prospect of no wild salmon harvests after the year 2006 and as a result were anxious to secure supplies of quality Irish farmed salmon. Meanwhile, salmon farmers were busy diversifying their production activities and the first batch of farmed cod was on the way to reaching market size in Connemara.

In 2006 the occurrence of Infectious Pancreatic Necrosis (IPN) overshadowed an otherwise successful salmon sales year. Imported eggs tested positive for IPN, which is an unlisted and unregulated disease, common in the UK and Norway. IFA Aquaculture, producers and BIM quickly brought this IPN disease situation under control, sourcing disease free replacement eggs and the necessary infrastructure to hatch them while the IPN affected hatcheries were disinfected.

While the salmon minimum import price was a major topic in Brussels in 2006. There were other significant pieces of legislation which were also being monitored by IFA Aquaculture, which again held the chair of the EU's consultative committee on aquaculture. Examples of these were:

- Fish health legislation, almost five years in development, was signed off in 2006 after extensive and detailed consultation with industry through the Federation of European Aquaculture Producers (FEAP) and the European Mollusc Producers Association (EMPA). This new legislation will come into effect in 2008, but the principles of prevention, zoning, and the listing of diseases are under examination by the Irish Fish and Shellfish Health Committee.
- The Alien Species in Aquaculture regulation was passed in 2006, which is designed to protect both aquaculture and the environment from the unintentional introduction of alien species.
- Another major piece of legislation passed in Brussels in 2006 was the European Fisheries Fund (EFF). The successor to the FIFG, the EFF sets out the rules for national governments on funding aquaculture development and this will affect all aquaculture producers. IFA Aquaculture has been involved in negotiating this document with the Commission since the year 2005 and on account of these discussions it contains many Irish issues. This includes a series of measures to compensate shellfish producers for extended biotoxin closures and mechanisms to reward producers that are involved in CLAMS-type ventures by prioritising collective actions for grant aid. The EFF was translated into a National plan in Ireland by a team headed by Dr Noel Cawley. They gathered information on the seafood industry's requirements and translated these into a plan to encompass the EFF and other policy measures. IFA Aquaculture contributed to this with a comprehensive set of proposals for aquaculture. Following thorough consultation and wide discussion, the final Cawley Report ("Steering a New Course" – see report summary in section 11 of this report) contained and endorsed over 30 of IFA's proposals for the aquaculture sector and represents a major success for IFA members.

The ISGA held a number of meetings throughout the year covering issues such as IPN, sea lice, markets and their AGM was held in January 2006 in Galway.

Shellfish
Bottom mussel producers faced a number of problems in 2006, such as disappointments with the share-out of the seed quota and poor seed supply. Coupled with this, many of the smaller traditional vessels were not permitted to fish due to their inability to achieve certificates of compliance in accordance with the

terms of the Torremolinos Protocol (www.imo.org). There are currently no plans by the Government for replacement of this fleet. In addition, some producers have highlighted what they felt were the inequities of the Voisinage agreement for those seeking mussel seed in the Irish Sea and have gone to court to find a resolution. The Irish Shellfish Association (ISA) successfully sought a review on the economic and planning aspects of the industry.

The bottom mussel sector alleviated some of the ongoing problems with AZA closures in the rope sector. Undertaking relaying trials with rope mussels from closed areas onto bottom mussel growing sites. Preliminary results of these trials indicate that successful growth and survival are dependent on the sites chosen, age of the mussels etc.

Biotoxin issues continued to be problematic for the rope sector in 2006. Demand for rope mussels on both the fresh and processed market was good throughout the year. However, the biotoxin situation prevented a lot of top quality product from going on sale. Fortunately the new regime negotiated by IFA Aquaculture with the Food Safety Authority of Ireland (FSAI), Marine Institute and DCMNR within the MSSC committee on summer-bioassay/ winter-chemical testing helped to keep many areas open which would otherwise have been closed while, at the same time providing total food safety.

In the course of its representative work, IFA Aquaculture identified key shortcomings in the strategies for the rope mussel sector and pointed out the persistent problems, which have seen production in this sector plateau. IFA had persuaded BIM and Enterprise Ireland to employ Price Waterhouse Coopers (PWC) to carry out a study in 2005 and the subsequent report was launched at the ISA's conference in Ennis in March 2006 (see section 13 of this report).

IFA Aquaculture was involved in the review of the rules of the Irish Shellfish Association, which were agreed by special AGM in November 2006. Other successes included the publication of the "Safefood guide" on farmed finfish, the drafting of the good practice guide on microbiological monitoring of shellfish waters and the initiation by Commissioner Borg, at IFA's request, to hold a special conference on offshore aquaculture.

Projects which were sponsored by or partnered by IFA Aquaculture in 2006 included:

- CRAB – antifouling project.
- Aquaetreat – improvement of effluent treatment technology.
- Aquareg – www.Aquabyproducts.com.
- Pancreas Disease – disinfection and hygiene methods.
- SUMO – Molluscan Shellfish risk management methods to reduce viral risks.
- Water Framework Directive – Implications for the Irish Aquaculture industry.
- PROFET – Communicating industry demands for EU Research.

11. STEERING A NEW COURSE

"Steering a New Course" report summary

The Minister for DCMNR, Mr. Noel Dempsey T.D. and the Minister of State, Mr. John Browne T.D., announced a comprehensive review process with the objective of establishing a strategy for the development of the Irish seafood industry over the period 2007 to 2013. An independent three person Strategy Review Group composed of Dr. Noel Cawley (Chair), Mr. Joey Murrin and Mr. Ruán O'Bric was appointed to undertake the review with a secretariat provided by Bord Iascaigh Mhara (BIM). Over five months the Review Group engaged in extensive public consultation with the seafood industry, its representative organisations and other interested parties. The Group's findings and recommendations were then presented in 'Steering a New Course – Strategy for a Restructured, Sustainable and Profitable Irish Seafood Industry 2007 to 2013'.

'Steering a New Course' – sets out a vision for the Irish seafood industry and presents a series of recommendations for the period of the European Fisheries Fund (EFF) 2007 to 2013. It proposes that there should be significant development and expansion of the aquaculture sector. The review also sets out clearly defined national policies, output targets and the need for an efficient aquaculture licensing regime. These are to be supported by an Aquaculture Development Programme spearheaded by BIM.

Paraphrased summaries of the recommendations for the aquaculture industry are listed below (for more detail the reader should consult the main document):

Recommendation 1. ***An enhanced fact based communications process between State Agencies and stakeholders- to promote better understanding and acceptance of aquaculture in the coastal zone.***

An objective of the report is the creation of an economic and regulatory climate conducive to increased flows of equity and capital investment for the development of the aquaculture sector. This should underpin existing policy, encourage industry best practice and would help to overcome the constraints that are currently holding the sector back. The aquaculture communications initiative will provide a forum for debate with other interest groups as the process of Integrated Coastal Zone Management (ICZM) is developed in line with EU policy.

Recommendation 2. ***Review the current licensing and regulatory regime.***

A review of the current regulatory and licensing regime – to provide an improved service to customers.
The Strategy Review Group recommended that the following actions are taken:

- Section 13 of the Fisheries Amendment Act, 1997, to be bought into force and strictly adhered to. This should bring about speedier licence processing within a commercially viable timeframe.
- In general, the duration of aquaculture licences to be extended to a minimum period of 20 years, providing greater security of tenure. Licenses then could be used as collateral to raise equity and working capital. This would be achieved by adopting such a policy for new licences issued and changing the licence duration for renewed licenses.
- The stocking conditions for marine salmonid aquaculture licences to be regularised and based on standing stock only. Thereafter the standing stock limitations are to be adjusted either upwards or downwards, in line with the findings of the annual benthic monitoring survey. A common understanding of such reforms should be established between DCMNR and the Aquaculture Licence Appeals Board to ensure consistency of approach.
- DCMNR to support and facilitate the acquisition of fallowing sites for the salmon farming sector to proactively assist with more effective sealice and disease control. Provision of such sites may not necessarily involve an increase in the permitted output of the industry, but should provide improved spatial and temporal stock management thereby reducing the incidence of disease. This strategy would involve the applicants and agents of DCMNR entering into detailed consultation on the location of proposed fallowing sites and agreeing on binding stock rotation and fish health management protocols prior to applications for aquaculture licensing. The applications are then to be rapidly processed through the system of regulations, without compromising the rigour of the Fisheries Amendment Act, 1997. Yielding a speedy outcome to either grant or refuse the application.
- The administration for the renewal of shellfish aquaculture licences to be accelerated.
- To meet the requirements of the EU Habitats Directive the Screening Protocol approach should be undertaken to carry out 'Appropriate Assessments' of the impact of proposed aquaculture projects in or near Special Areas of Conservation (SACs).
- A coherent and legally based mechanism to be developed for shellfish culture on a 'whole bay' basis, facilitated by the CLAMS process. This would allow for the orderly redeployment of floating

structures, once a more appropriate layout had been determined in line with emerging knowledge from the carrying capacity studies and from the experience of established producers.
- The business plans for new aquaculture licence applications to be subjected to a greater degree of scrutiny.
- There should be a standardised national approach for the provision of technical advice and the inspection reports on aquaculture licensed sites to the Coastal Zone Administration Division of DCMNR.
- The approach and process used by Local Authorities to deal with issues of effluent discharge licences from fresh water aquaculture operations to be harmonised on a national basis.
- Regulators should view aquaculture licence holders as stakeholders with rights to protection for their business interests and from actions by other resource users which might be detrimental to their businesses.

Recommendation 3. ***Implement an Aquaculture Industry Development Programme.***
BIM in partnership with Údarás na Gaeltachta to implement an integrated Aquaculture Industry Development Programme. This would cover marketing, training and seafood processing programmes set out in the review. The programme is to be devised in full accordance with the EFF incorporating provisions for new aquaculture related elements of the Regulation.

The new programme would continue to provide assistance for investment in increased production capacity. It will also have a broader focus, dealing with key areas such as; improving competitiveness, reducing environmental impact, encouraging the farming of new species, applied R&D, the adoption of accredited quality assurance and environmental management systems, and development of locally based strategies to maximise the benefit of aquaculture to coastal and rural communities.

It is recommended that there should be further cross-border initiatives and the establishment of a Seed Capital Scheme. Designed to accelerate the development of 'new species' aquaculture and the speedier adoption of new technologies. This integrated and holistic programme will be delivered in consultation with the CLAMS network and nationally via State Agencies and the Aquaculture Forum. In addition, the recommendations contained in the review of the rope mussel sector are to be implemented. Similarly the review of the mussel seed resource carried out in association with the Northern Ireland authorities will provide a blueprint for the management of this critical resource and provide guidance for the industries structures, marketing, etc.

The Strategy Review Group recommends a number of specific actions should be taken for encouraging the development and investment in Aquaculture. These are set out under the following headings:
- Aquaculture Industry Development Programme: Specific Recommendations-Investment to be supported at the maximum permitted level of grant aid under the new EFF Regulation so as to assist with leveraging increased investment into the sector. It is recommended that there should be at least two calls for projects and two rounds of approvals per annum. In addition, it is also advised that the schedule for these calls and approvals are pre-set at the beginning of the period and rigidly adhered to.
- The secretariat for the EFF development programme to be provided and administered by the State Development Agencies with oversight from the DCMNR.
- It is important that there is a seamless transition from the current NDP Aquaculture Measure to the new 2007-2013 NDP Programme without the delay experienced in the last round.

Recognising the special provisions contained in the EFF, the Strategy Review Group recommends;
- The creation of measures to assist shellfish farmers in the event of prolonged biotoxin closures along with the establishment of contingency funding for aquaculture operators to deal with natural disasters. It is also recommended that there be a modest annual allocation of contingency funding to carry out applied research dealing with emerging disease or environmental issues.
- That a special provision be made for funding local collective actions by aquaculturalists for the common good through an extension of the current role and function of the CLAMS groupings.

Assistance in raising working capital.
- The provision of a Seed Capital Scheme to assist promoters of new species and new technology to raise working capital in areas outside the Gaeltacht to be evaluated.

Marketing of farmed Irish seafood and specific R&D projects.
- The suite of standards developed and those currently under development for Irish aquaculture products, which cover quality, organic and eco-label status, should be integrated into the seafood

marketing plans for the sector. They should be used for maximum advantage in terms of differentiating Irish products to achieve price premiums in the marketplace.

- Applied research effort needed to commercialise the production of novel species to Irish aquaculture to be prioritised and that such co-funded activities should be assisted at the highest permissible rate of financial assistance under the EFF Regulation.
- There should be a greater degree of pro-activity on the part of the State services for the Irish sector with regard to market promotion for the export trade. This is particularly the case in terms of naturally occurring biotoxins and the need to have an equally stringent monitoring regime across the EU as applies currently in Ireland, with regard to biotoxins such as Azospiracid.
- Priority action to be given to the creation of special 'A-class' areas as sub-plots within major shellfish growing areas, through the use of dedicated local sampling, so as to create appropriate re-laying facilities. This is to ensure continued market access for farmed Irish shellfish in the light of emerging hygiene regulations.
- The pilot project underway to establish carrying capacities for shellfish farming to be prioritised and this programme should be extended to cover all the major shellfish aquaculture bays in the country.
- Specific applied research into the development of commercially viable methodologies for the depuration of viruses and biotoxins from shellfish to be undertaken as a priority.

Environment and other issues.

- The voluntary collaboration of the industry with the State agencies with key environmental sampling, their participation in the CLAMS process and the ECOPACT initiative, to be used with a view to generating increased public acceptance of the sector.
- The Aquaculture Forum to receive a renewed mandate from the Minister, re-energising its operation. It is believed that this mechanism has the potential to drive effective reform and to encourage constructive dialogue between the sector and the State regulatory and development services.
- Consideration to be given to the provision of financial support, consistent with EU rules to enable owners of traditional and older bottom mussel dredgers to meet Certificate of Compliance requirements.

In conclusion, the overall objective of the strategy and investment programme for the aquaculture industry will be a sizeable direct and indirect benefit to the seafood industry, the Irish economy and in particular rural communities where the industry is located.

12. SEA CHANGE I and II

"Sea Change (2007 – 2013) Part I & II" Aquaculture implications summary

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, thereby providing new opportunities in employment and social advancement. The policy seeks to promote global market opportunities linked to the development of marine technologies and resources. For example, one of its many objectives is "Exploiting growing international markets for seafood products, especially health foods" (Sea Change 2006). It is also recognised in the document that the long term success of the stratagem is dependent on successful collaboration of state agencies, researchers and industry partners.

In synopsis these strategies involve:

- Detailed analysis of where new resources should be targeted.
- It sets out a blueprint for a multi-agency approach to align the formulation of their strategies and investment plans.
- The integration of industrial development agencies.
- The incorporation of a major international dimension.

Sea Change, specifically seeks to:

- Strengthen the environmental sustainability and competitiveness of the marine sector by greater alignment between the public sector, third level research and industry needs.
- Build new multidisciplinary research capability in fundamental technologies.
- Deliver a comprehensive planned policy research programme that can be used to inform public policy, governance and regulation.

It is intended that these strategies will be implemented via three Research Measures and two Supporting Programmes. These are:

- **Industry Research Measure** – designed to integrate the existing research base with market and commercial opportunities.
- **Discovery Research Measure** – development of new research and economic opportunities associated with bio-pharmaceuticals, industrial chemicals, diagnostics, marine functional foods, renewable ocean energy and rapid climate change.
- **Policy Support Measure** – to provide stronger support for the determination of public policy relating to the marine sector.
- **Infrastructure Supporting Programme** – an investment programme to deliver essential infrastructure enabling research and innovation.
- **Innovation Supporting Programme** – targeted specifically at improving in-company R&D management and commercialisation capabilities.

Under the "Industry Research Measure (2007 to 2013)", there are three major research programmes that are directly applicable to Aquaculture. These research programmes and their aquaculture objectives for the year 2013 are described below:

1. Seafood Processing Research Programme.

Fish consumption per person has doubled on a worldwide basis over the last fifty years. Ireland's 140 Seafood processing companies in 2004 operated in an industry that was worth €670 million. A key driver for future success of this industry is raw material supply. Aquaculture has been identified as an important future source of raw material for processing; however the ability to achieve continuity and quality of supply is essential to the successful development of this aspect of seafood processing.

2. Aquaculture Research Programmes.

Finfish Aquaculture. Sea Change recommends: A focus on production and marketing of higher value, safe seafood (including organic). Developing the codes of Best Practise for farm management and fish health. An improvement in marine planning and management of aquaculture. The refinement of environmental monitoring and forecasting capabilities. The identification of sites and systems for offshore aquaculture. The transfer of technologies for charr, cod, turbot and halibut to commercial

hatcheries and juvenile production. Fostering R&D for the production of other white fish and related technologies. Building onshore recirculation technologies.

Shellfish Aquaculture. Sea Change objectives:

- The development and implementation of a science based management system for each species and production stage.
- The provision of dynamic carrying capacity models for each major shellfish production area. A promotion of shellfish production and processing capabilities.
- The strengthening of capability on shellfish health and fostering of international collaboration. Improvements in production efficiencies with technology.
- Enhanced environmental monitoring and food safety capability in support of the industry.

3. Seaweed Research Programme - An objective of Sea Change for 2013: The development of an integrated system for seaweed aquaculture, including polyculture methodologies and seed hatchery production.

Sea Change (www.marine.ie/home/SeaChange)

13. REVIEW OF IRISH ROPE MUSSEL INDUSTRY

"Review of the Irish Rope Mussel Industry" report summary

There are two main production techniques, bottom mussels (extensive) and rope mussels (intensive). In overall terms, total production volume of mussels in Ireland was 37,543 tonnes (2006). It is estimated that some 90% of output is processed through five main processing plants and exported frozen to markets primarily located in the EU. The remainder of the production is exported in a live/fresh format. Although accounting for a relatively small percentage of total output, this live/fresh trade is an important component of the industry.

The Irish rope mussel industry expanded rapidly during the 1980s and the 1990s. However between the years 2000 to 2005 output from the sector became relatively stagnant. Furthermore, profitability within the industry also declined. As a result of these pressures, the Irish Shellfish Association (ISA) called for a comprehensive review of the rope mussel industry in Ireland which Bord Iascaigh Mhara (BIM) and Enterprise Ireland (EI) jointly commissioned Price Waterhouse Coopers to undertake. The review was commenced during the autumn of 2005 and published in 2006.

The key objective of the review was to inform and guide the future development of the rope mussel industry in Ireland and to identify obstacles preventing the sector's development and to make recommendations on strategies that might be employed to overcome these challenges.

In summary they reported that the "key issues currently facing the rope mussel industry can be grouped into two categories: (a) Regulatory related issues – most notably biotoxins and licensing and (b) Industry related issues – most notably the interrelationships and operating modes that exist between the production and processing segments of the industry" (PWC 2006).

The report made a range of recommendations under 13 core development themes which are summarised in Table 36 below.

Table 36: Recommendations from "Review of Irish Rope Mussel Industry".

1: Issues relating to biotoxins. Define the optimum mix of biotoxin tests; focus increased emphasis and resources towards identifying solutions to the issue of biotoxins - including bay specific strategies; give consideration to providing financial support to producers in compensation for the temporary suspension of harvesting; establish a levy-based insurance fund to compensate producers/processors for post-processing biotoxin test failures; utlise the strength of Ireland's biotoxin control/monitoring regime in marketing/sales activities and increase the level of engagement/communication with the industry in the area of biotoxins.
2: Issues relating to licensing. Undertake a study of the carrying capacity of each bay and ensure that growers' licenses reflect the outcome of this study; reduce the bureaucracy associated with the licensing system and define reasonable response timeframes for applications; pre-define areas suitable for mussel production; increase the focus on applicants' business plans/experience in evaluating license applications; enforce the 'use it or lose it rule' with respect to licenses and issue licenses on a scale that reflects the potential to establish an economically viable enterprise.
3: Processor / producer relations. Processors should engage with producers on establishing supply partnerships; processors and producers to work together to plan for the production and harvesting of mussels. Guided by BIM, processors and producers should jointly focus on reducing reject rates and an independent mechanism to monitor reject rates should be established.
4: Producer/producer relations. At producer level, the industry representative organisation should work to establish producer discussion groups and an industry newsletter should be circulated.
5: Processor/processor relations. Increased co-operation between processors on the approach to key export markets should occur with BIM supporting/overseeing co-operative promotional/ marketing programmes. A group comprising representatives from each of the processors and the producer representative organisation should be given the task of identifying productive uses for rejected mussels.
6: Buying arrangements. BIM's buying protocol should be implemented between processors and producers on an interim basis. An independent monitor should be appointed to monitor the implementation of the buying protocol and a Mussel Pricing Grid should be established for the purchase of mussels – focusing on rewarding the production of high quality mussels.
7: Production efficiency. Demonstration farms should be established, focused on displaying best-in-class production techniques; a standardised Profit Monitor tool should be made available to growers with individual performances benchmarked against the industry average performance; the removal of labour should be the key focus of any new production technology and producers should explore the merits of group purchasing for selected inputs along with the sharing of harvesting equipment.
8: Processing efficiency. With the support of EI and BIM, processors need to adopt a range of strategies to enhance the efficiency of their processing activities – including outsourcing/sharing of processing activities. Processors may also need to consider the establishment of strategic alliances/joint ventures. Increased planning with producers around production/harvesting and joint purchasing of selected consumables should also occur.
9: Improving quality. BIM should work with the industry to assist with eliminating the obstacles affecting the uptake of the Irish Quality Mussel (IQM) scheme; ongoing promotion of this quality scheme should continue with the objective of achieving a majority of mussel growers/ processors operating under the IQM scheme within a two-year period and BIM should engage with producers and processors with the objective of increasing mussel size.
10: Marketing & Sales. BIM and EI should work with the industry to identify and capitalise on any prevailing market opportunities for both frozen and fresh product. Future marketing strategies should focus on differentiating Irish product within the market place and develop recognition for Irish product within the market. Significant increased focus/support should be given to new product development/innovation, and support for marketing activities should focus on a small number of key markets and should be prioritised towards achieving a cooperative approach by processors.
11: State support agencies/ infrastructure. State support for the rope mussel sector should be provided on a highly focused and results driven basis. The impact of this support should be monitored.
12: Areas for further development. Consider undertaking further research focused on developing solutions to a range of developmental challenges highlighted in the review - including a particular focus on azaspiracid (AZA) toxins.

The report recommends that the implementation and planning process should involve input from all the relevant industry stakeholders including the DCMNR, BIM, MI, FSAI, the mussel processors and producers/producer representative organisation.

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Council Directive 96/23/EC of 29 April 1996 on measures to monitor certain substances and residues thereof in live animals and animal products and repealing Directives 85/358/EEC and 86/469/EEC and Decisions 89/187/EEC and 91/664/EEC. O.J. L 125, 23/05/1996, P. 10-32.

Council Decision 1999/313/EC of 29 April 1999 on reference laboratories for monitoring bacteriological and viral contamination of bivalve molluscs. O.J. L 120, 08/05/1999, P. 40-41.

Commission Regulation (EC) No 466/2001 of the 8th March 2001 setting maximum levels for certain contaminants in foodstuffs as amended by Commission Regulation 221/2002/EC. O.J. L 077, 16/03/2001, P. 1-13.

Commission Decision 2002/300/EC of 18 April 2002 establishing the list of approved zones with regard to *Bonamia ostreae* and/or *Marteilia refringens* (notified under document number C (2002) 1426). O.J. L 103, 19/04/2002, P. 24-26.

Commission Regulation (EC) No 221/2002 of 6 February 2002 amending Regulation (EC) No 466/2001 setting maximum levels for certain contaminants in foodstuffs. O.J. L 037, 07/02/2002, P.4-6.

National

Animal Remedies Act, 1993 (Act No. 23 of 1993).

Fisheries (Amendment) Act, 1997 (Act No. 23 of 1997).

S.I. No. 200/1994. Quality Of Shellfish Waters Regulations, 1994.

S.I. No. 147 of 1996. European Communities (Live Bivalve Molluscs) (Health Conditions for Production and Placing on the Market) Regulations, 1996.

S.I. No. 253 of 1996. European Communities (Aquaculture Animals and Fish) (Placing on the Market and Control of Certain Diseases) Regulations, 1996

S.I. No. 12 of 2001. Water Quality (Dangerous Substances) Regulations, 2001

Appendix I: Irish Aquaculture Production (Volume) and (Value) (BIM).

Table AI.1. Irish Aquaculture Production (Volume - tonnes) 1990 to 2006.

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
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
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
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
Native Oyster	420	366	334	450	590	400	400	400	516	696	266	431	280	325	390	342	360
Clam	60	50	79	84	110	103	125	218	233	121	92	91	214	154	181	161	245
Scallop	-	-	-	-	-	-	-	24	25	33	61	49	67	80	103	87	37
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*
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
Sea reared Trout	324	560	432	677	613	470	690	1,020	1,046	1,077	1,360	977	888	370	282	717	546
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
Others**	0	0	0	0	0	15	30	0	24	89	76	63	54	40	25	6	36
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*
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**

Table AI.2. Irish Aquaculture Production (Value - €'000) 1990 to 2006.

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
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
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
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
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
Clam	305	180	251	245	321	131	516	705	827	424	361	589	1,421	795	711	849	1,382
Scallop	-	-	-	-	-	-	-	216	93	127	338	339	333	380	437	425	200
Others	-	-	-	-	-	61	-		104	531	53	65	684	142	727	380	201
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*
Finfish																	
Salmon ova/smolt	-	-	-	-	-	-	-	-	-	2,616	4,401	2,905	4,848	2,000	2,337	2,500	3,378
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
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
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
Others**	-	-	-	-	-	95	211	-	217	301	429	556	82	350	300	62	221
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*
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**

Appendix II: 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 III: Designated Bivalve Mollusc Production Areas around Ireland (October 2006).

I	II	III	IV	V	VI
Production Area	Boundaries	Bed Name	Species	Previous Classification	Current Classification
Lough Foyle	Magilligan Head to Inishown Head	All Beds	Oysters Mussels	B	B
Tra Breaga	Malin Head to Dunaff Head	All Beds	Oysters	A	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 Point4	Bruckless	Mussels	A	A
Inver Bay	St. John's Point to Doorin Point5	All Beds	Mussels	A	B
Donegal Harbour	Doorin Point to Rossnowlagh Point.	All Beds	Oysters Mussels	B	B
Production Area	Boundaries	Bed Name	Species	Previous Classification	Current Classification
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 licensed 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'W1 Area within a one nautical mile (1,852 M) radius of Roskeen Point (53° 53.46'N, 09° 40.10' W) Area bounded to the west by a line from Mulranny Pier to Old Head and to the south east by 09° 35.37' W1	Newport Bay Tieranaur Bay Corrie Channel and Rosslaher Beds All other Beds	Oysters Mussels Oysters Mussels Oysters Mussels Oysters	B B B A	A - A B 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
Production Area	Boundaries	Bed Name	Species	Previous Classification	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
Production Area	Boundaries	Bed Name	Species	Previous Classification	Current Classification
Kilrush	Ferry point (9° 32.55' W and 52° 38.53' N.) to Crusheen Point to and from Aylevaroo Point to Courtbrown Point1	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.	Castletownbere South Shore	Mussels Mussels Sea Urchins	A A	A A

	Sheep's Head to Black Ball Head	All other Beds	Mussels	B	B
Dunmanus Bay	Sheep's Head to Three Castle Head	All Beds	Mussels Sea Urchins	B A	B A
Roaringwater Bay	Cousnaganniv Point to Frolic Point	All beds	Mussels	B	B
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 licensed Beds	Oysters	A	A
Sherkin Kinish	Drawlaun Point to Long Point	All licensed 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 South 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 IV: Aquaculture related projects supported under FP6. Sixth Framework Programme 2002 to 2006.

FP6 Programme: Global Change & Ecosystems.	Project duration (years)	Grant aid approved to Irish partner (€)
HABIT - Harmful Algal Bloom Species in Thin layers. Project Type: Specific Targeted Research Project (STREP). Total Project cost (grant aid and contributions): €1,700,000. Irish Partner - (Coordinator) Martin Ryan Institute, NUIG. Contact - Dr. Robin Raine, robin.raine@nuigalway.ie (HABIT project has links with SEED project).	3	266,000
SEED - Life history transformations among HAB species and the environmental and physiological factors that regulate them. Project Type: Specific Targeted Research Project (STREP) Total Project cost (grant aid and contributions): €1,896,039 Irish Partner - Martin Ryan Institute, NUIG. Contact - Dr. Robin Raine, robin.raine@nuigalway.ie (SEED project has links with HABIT project).	4	86,320
	Total	**352,320**

FP6 Programme: Research for Policy Support.	Project duration (years)	Grant aid approved to Irish partner (€)
GENIMPACT - Evaluation of Genetic Impact of Aquaculture Activities on Native Populations - a European Network. Project Type: Coordination Action. Total Project cost (grant aid and contributions): €500,000. Irish Partner – Coastal Marine Resources Centre, UCC. Contact - Professor T. F. Cross. t.cross@ucc.ie http://genimpact.imr.no.	1	NA
AQUAFIRST - Combined genetic and functional genomic approaches for stress and disease resistance marker assisted selection in fish and shellfish. Project Type: Research for Policy Support. Total Project cost (grant aid and contributions): €5,820,000. Irish Partner - National Diagnostics Centre, NUIG. Contact - Dr. Michael Cairns. michael.cairns@nuigalway.ie http://aquafist.vitamib.com/	4	220,796
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	136,800
PANDA - Permanent network to strengthen expertise on infectious diseases of aquaculture species and scientific advice to EU policy. Project Type: Coordination Action. Total Project cost (grant aid and contributions): €494,155. Irish Partner - Department of Microbiology, NUIG. Contact - Dr. Maura Hiney. maura.hiney@nuigalway.ie http://www.europanda.net	3	22,665
PROFET - Policy Fish Policy Flow. Project Type: Specific Support Action. Total Project cost (grant aid and contributions): €766,390 Irish Partner - AquaTT & UETP Ltd. Contact – David Murphy aquatt@aquatt.ie http;//www.profetpolicy.info	3	44,783
	Total	**425,044**

FP6 Programme: Food Quality and Safety.	Project duration (years)	Grant aid approved to Irish partner (€)
BIOTOX - Cost effective tools for risk management and traceability systems for lipophilic marine biotoxins in seafood. Project Type: Specific Targeted Research Project (STREP). Total project cost (grant aid and contributions): €5,532,533 Irish Partners - 3 Institutes (Marine Institute, NUIG, Food Safety Authority), 1 SME (Oyster Creek Seafoods Ltd.) Contact - Dr Philip Hess, Marine Institute. philip.hess@marine.ie www.biotox.org	4	662,235
Consensus - Multi-stakeholder platform for sustainable aquaculture in Europe. Project Type: Coordinated action. Total project cost (grant aid and contributions): €1,447,627 Irish Partners - Marine Institute and AquaTT. Contact – Dr John Joyce, Marine Institute. john.joyce@marine.ie http://www.euraquaculture.info/	3	39,000
SEAFOODplus – Health Improving, Safe Seafood of High Quality in a Consumer Driven Farm-to-Fork Concept. Project Type: Integrated Project. Total project cost (grant aid and contributions): €26,000,000 Irish Partners – (Teagasc, UCC, Marine Institute). Contact – Dr M. Kiely (UCC), Dr R. Gormley (Teagasc) and Dr. B. Dore (MI). http://www.seafoodplus.org	5	648,469
	Total	**1,349,704**

FP6 Programme: Specific Research Activities for SMEs.	Project duration (years)	Grant aid approved to Irish partner (€)
BLUESEED – Technology development for a reliable supply of high-quality seed in blue mussel farming. Project Type: Co-operative Research (CRAFT). Total project cost (grant aid and contributions): €1,374,320 Irish Partner – AquaTT. Contact – David Murphy. david@aquatt.ie http://www.blueseedproject.com/	2	20,000
CRAB- Collective Research on Aquaculture Biofouling. Project Type: SME Collective Research. Total project cost (grant aid and contributions): €2,347,356 Irish Partners – 3 SMEs (AquaTT, Fastnet Mussels & Curryglass Enterprises) 1 Institute (UCC), 2 Associations (ISGA & Crookhaven Fishermen's Assoc.). Contact – David Murphy. david@aquatt.ie www.crabproject.com	3	464,467
FISHTANKRECIRC Project Type: Co-operative Research (CRAFT). Total project cost (grant aid and contributions): €1,324,479 Irish Partners – 2 SMEs (Killybegs Electrical Refrigeration Services Ltd. & Pollution Control Systems Ltd.). Contact – Eugene McBreaty (KERS) or Martin Horan (PCS). emcbreaty@eircom.net martin@pollution-control.ie http://www.fishtankrecirc.com/wip4/	3	109,155
KEYZONES- To Investigate Sustainable Biological Carrying Capacities of Key European Coastal Zones. Project Type: Co-operative Research (CRAFT). Total project cost (grant aid and contributions): €1,164,280 Irish Partners – 3 Irish Interests (Southeast Shellfish Co-op, La Tene Maps & Clew Bay Marine Forum). Contact – John Coleman (LTM) or Nial O'Boyle (CBMF). john.coleman@latene.com http://www.keyzones.com/	2	75,432
SPINES 2 – Sea Urchin Production in Integrated Systems, their Nutrition and Roe Enhancement. Project Type: Co-operative Research (CRAFT). Total project cost (grant aid and contributions): €970,641 Irish Partner – Dunmanus Seafoods Ltd. Contact – John Chamberlain. seaurchins@eircom.net http://www.spines.com/	2	28,882
	Total	**697,936**

FP6 Programme: Marie Curie Host Driven Action.	Project duration (years)	Grant aid approved to Irish partner (€)
AQUALABS – Advanced Laboratory Training Courses in Aquaculture for Early-Stage Researchers. Project Type: Series of Events. Total project cost (grant aid and contributions): €551,041 Irish Partner – Coordinator (AquaTT). Contact – David Murphy david@agautt.ie http://aquattinitiatives/	2	243,374
BIFF- Bivalves from Farm to Fork. Project Type: Transfer of Knowledge – Industry Academic Partnership. Total project cost (grant aid and contributions): €579,085 Irish Partners – Project Leader (Daithi O'Murchu Marine Research Station) & 1 SME (Fastnet Mussels). Contact – Dr Julie Maguire. julie.maguire@dommrc.ie	4	422,262
	Total	**665,636**

FP6 Programme: International Cooperation.	Project duration (years)	Grant aid approved to Irish partner (€)
AqASEM-ASEM Aquaculture Platform. Project Type: Specific Support Action. Total project cost (grant aid and contributions): €587,500 Irish Partner – AquaTT. Contact – David Murphy. david@aquatt.ie www.asemaquaculture.org	2	Centrally managed budget. – Travel and subsist.

Appendix V: INTEREREG IIIA and IIIB grant aid approved projects.

INTERREG IIIA (Ireland/Wales). INTERREG IIIA. 2.1. Marine & Coastal Development and the Environment.	Project duration (years)	Grant aid approved to Irish partner (€)
Shellfish aquaculture in the Irish Sea- Detection and prevention of diseases in *Crassostrea gigas*. Total project cost (grant aid and contributions): €862,454 Irish Partner – Department of Zoology, Ecology and Plant Science/ Environmental Research Institute, UCC. Contact – Dr. Sarah Culloty. s.culloty@ucc.ie	3	€249,587
SMART - Sustainable management of near shore water quality for aquaculture, recreation and tourism. Total project cost (grant aid and contributions): €883,213 Irish Partner – Department of Biochemistry, UCD. Contact – Dr Bartholomew Masterson. b.masterson@ucd.ie	3.16	€329,741
Development of Mussel Hatchery Techniques in Ireland / Wales. Total project cost (grant aid and contributions): €797,221 Irish Partner – Aquaculture Development Centre, Environmental Research Institute, UCC. Contact – Dr. Gavin Burnell. g.burnell@ucc.ie	3	€172,777

Under the INTERREG IIIA measure there are several other funded projects which are not specifically aquaculture projects but potentially will be of interest to those involved in the aquaculture sector. Such as:

- CZM-Net (Coastal Zone Management Network) (partner Enterprise Ireland).
- Marketing & Business Development Programme (partner Irish Marine Federation).

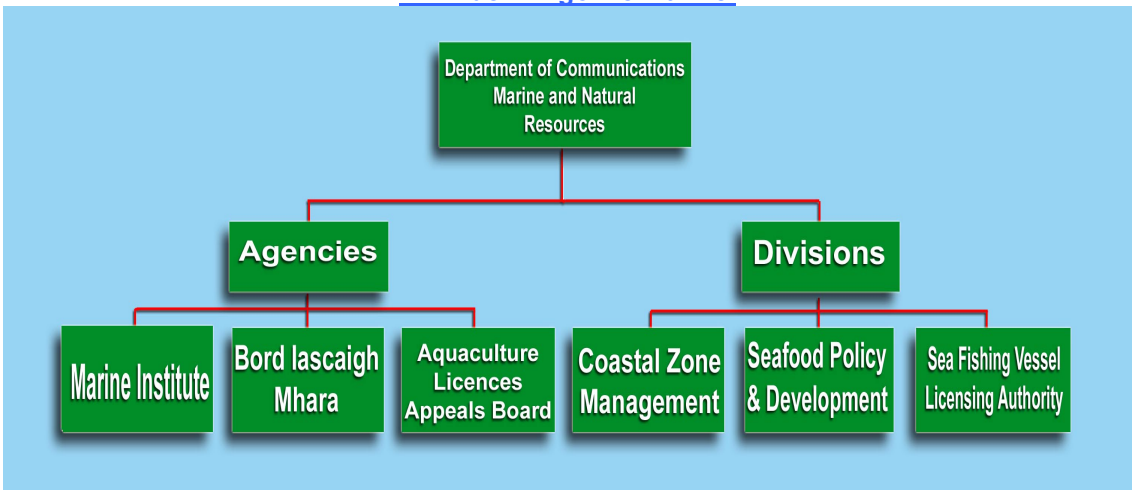
INTERREG IIIB Atlantic Area.	Project duration (years)	Grant aid approved to Irish partner (€)
e-AQUA. Analysis penetration of ICT and promotion of e-commerce within the SME's belonging to the aquaculture strategic sector of the Atlantic area. INTERREG III. B. B.2. Improving access to the information society. Total project cost (grant aid and contributions): €997,459 Irish Partners – Aqua TT & Bord Iascaigh Mhara (BIM). Contact – David Murphy and Dr. Terence O'Carroll. aquatt@aquatt.ie ocarroll@bim.ie http://www.e-aqua.org	2	€164,395
NEMEDA. Network for the diminution of the effects of Dinophysis in Aquaculture. INTERREG IIIB. C.2. Integrated management of coastal zones and estuaries. Total project cost (grant aid and contributions): €122,796 Irish Partner – (Lead) Martin Ryan Institute (NUIG) and Marine Institute. Contact – Dr. Robin Raine and Joe Silke. robin.raine@nuigalway.ie joe.silke@marine.ie	1.6	€ 22,800
SHARE. Sustainable Harvesting of Ensis (Razor Clams). INTERREG III B. C.2. Integrated management of coastal zones and estuaries. Total project cost (grant aid and contributions): €1,486,424 Irish Partner – Bord Iascaigh Mhara (BIM). Contact **–** Mr. Stuart McWilliams. mcwilliams@bim.ie www.qub.ac.uk/bb/cmar	3	€105,120
AAAG. The Atlantic Area Aquaculture Group. INTERREG IIIB. C.2. Integrated management of coastal zones and estuaries. Total project cost (grant aid and contributions): €4,160,058 Irish Partner – Aquaculture and Fisheries Development Centre, UCC. Contact – Prof. Tom Cross. t.cross@ucc.ie	3	€334,257
ASAP. Atlantic Arc Salmon Project. INTERREG III B. C.3. Sustainable management of economic activities. Total project cost (grant aid and contributions): €1,365,894 Irish Partner – Central Fisheries Board, Dublin. Contact – Dr. Paddy Gargan. paddy.gargan@cfb.ie http://www.atlanticsalmon.org.uk/	3	€170,000
Forecasting Initiation of Blooms of Toxic Algae (FINAL). INTERREG III B. 5.2. Facilitating co-operation across and between maritime and inland regions. Total project cost (grant aid and contributions): €1,154,367 Irish Partner – NUIG. Contact – Dr. Robin Raine. robin.raine@nuigalway.ie	2.83	€172,490

Another project of interest funded under *INTERREG IIIB Atlantic Area*:
COASTATLANTIC. Integrated coastal zone management: towards an Atlantic vision (partner Enterprise Ireland).

Appendix VI: Role of State Agencies.

There were a number of state bodies involved in the development, regulation and monitoring of aquaculture in Ireland (2006). An outline of their roles is given below:

Department of Communications, Marine and Natural Resources
www.dcmnr.gov.ie/Marine/



Seafood Policy Division. The Seafood Policy Section of the Department is responsible for the strategic, economic and sustainable development of the aquaculture sector, as well as the broad regulation of it, within the framework of the Common Fisheries Policy and the Fisheries (Amendment) Act, 1997.

The Department's overall goal for aquaculture is to support the sustainable development of the sector in order to maximise its contribution to jobs and growth in coastal communities and to the national economy. The key objectives underpinning this goal include:

- Increasing employment, output value and exports;
- Creating a sustainable and environmentally appropriate framework and critical mass for sectoral expansion; and
- Securing increased competitiveness through enhanced quality, value added, technology acquisition and diversification.

Coastal Zone Management Division. The Coastal Zone Division ensures that Ireland's coastal zone is used in a sustainable way to the best advantage of the Irish people from an economic, aquaculture, leisure, social and environmental perspective. As part of this wider remit the division is responsible for the licensing, monitoring and enforcement of aquaculture activities.

Seafood Control Division of the Department of Communications Marine & Natural Resources
Seafood Control Division of the Department had responsibility for the enforcement of fisheries conservation and Food Safety legislation at the ports and at fisheries facilities around Ireland during 2006, pending the establishment of the new Sea-Fisheries Protection Authority.

The enforcement and monitoring activities routinely carried out by the Division included inspections, sampling of fish, fishery products, shellfish and other marine elements and the reporting of any apparent infringements detected to the Office of the Attorney General. The Division was also responsible for the collection and compilation of fisheries statistics.

During 2006, Seafood Control Division controlled and monitored a number of key managed fisheries to ensure compliance with the provisions of the EU Common Fisheries Policy, including a range of technical control measures such as minimum gear and fish sizes and ensuring compliance with the total allowable catch limits for certain species, as established annually by regulation. The control and enforcement activities of the Division also included the enforcement of national fishery conservation measures.

The use of new technology to assist the Division's regulatory work continued to increase during 2006. Examples of such technology include the development of a fishing vessel monitoring system (VMS) that allows the Naval Service to provide the control services with daily reports of VMS data both in table and graphic format, in order to facilitate monitoring of individual managed fisheries. The division, in conjunction with the Naval Service and other users, also worked to refine the system in the light of ongoing experience.

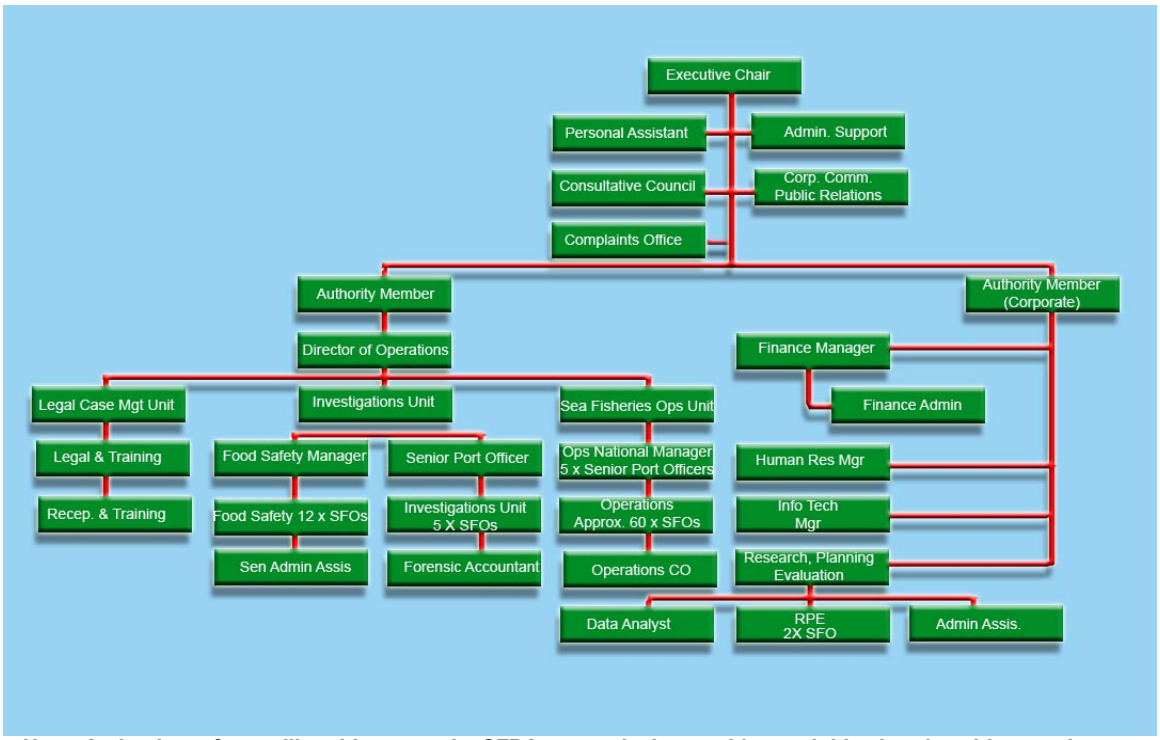
Development work also continued in 2006 in relation to IFIS (the Integrated Fisheries Information System) in collaboration with other divisions of the Department.

Clerical Officers, Sea Fishery Officers and Regional Fisheries Managers of the Division were located at the major ports of Howth, Dunmore East, Castletownbere, An Daingean, Ros an Mhil and Killybegs and at the additional office bases of the Division at Cork, Galway and at Leeson Lane, Dublin.

In undertaking the regulatory work of the Division, close partnerships were continued with the Irish Naval Service, the Food Safety Authority of Ireland, the Marine Institute and the Office of the Attorney General. During 2006 the availability of round the clock cover at the Fisheries Monitoring Centre (FMC) at Haulbowline proved to be of great assistance to the work of the Division. The Division also regularly liaised with other groups including BIM, the representatives of Fish Producers Organisations and the European Commission.

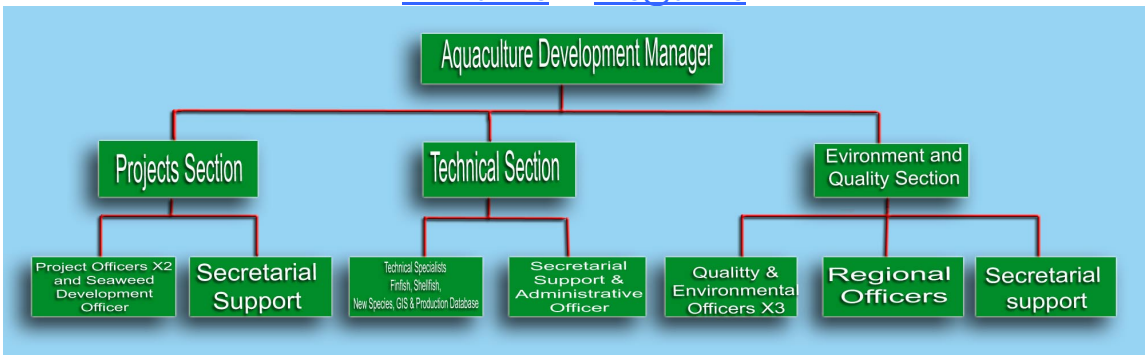
During 2006, additional Sea Fishery Officers were recruited and trained to augment the existing complement of Officers. A new grade of Senior Port Officer was established in 2006 and a number of such posts were filled after internal competition.

Along with the day to day work of fisheries control and enforcement, extensive preparations were being made during 2006 for the establishment of the new Sea-Fisheries Protection Authority (SFPA) with effect from 1 January 2007 and the transfer of operations to the new headquarters in Clonakilty, Co Cork. Some elements of the Division transferred to interim offices in Clonakilty during the latter part of the year.



Note: At the time of compiling this report the SFPA was actively recruiting and this chart is subject to change.

Bord Iascaigh Mhara (BIM)
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/templates/text_content.asp?node_id=544

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 Initiative 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 advise 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.

Loughs Agency

www.loughs-agency.com

The Loughs Agency is an agency of the Foyle, Carlingford and Irish Lights Commission (FCILC), established under the 1998 Agreement between the Government of the United Kingdom of Great Britain and Northern Ireland and the Government of Ireland. The FCILC is legislated for by the North/South Co-operation (Implementation Bodies) (Northern Ireland) Order 1999 and the British Irish Agreement Act 1999. The Board of the FCILC has twelve members who, in exercising the functions of the Body, are required to act in accordance with any directions given by the North South Ministerial Council, to which it also reports. The FCILC's sponsoring Departments are the Department of Agriculture and Rural Development (DARD) in Northern Ireland and the Department of the Marine and Natural Resources (DCMNR) in the Republic of Ireland.

The Mission Statement of the Agency is:
"The Loughs Agency aims to provide sustainable social, economic and environmental benefits through the effective conservation, management, promotion and development of the fisheries and marine resources of the Foyle and Carlingford Areas."

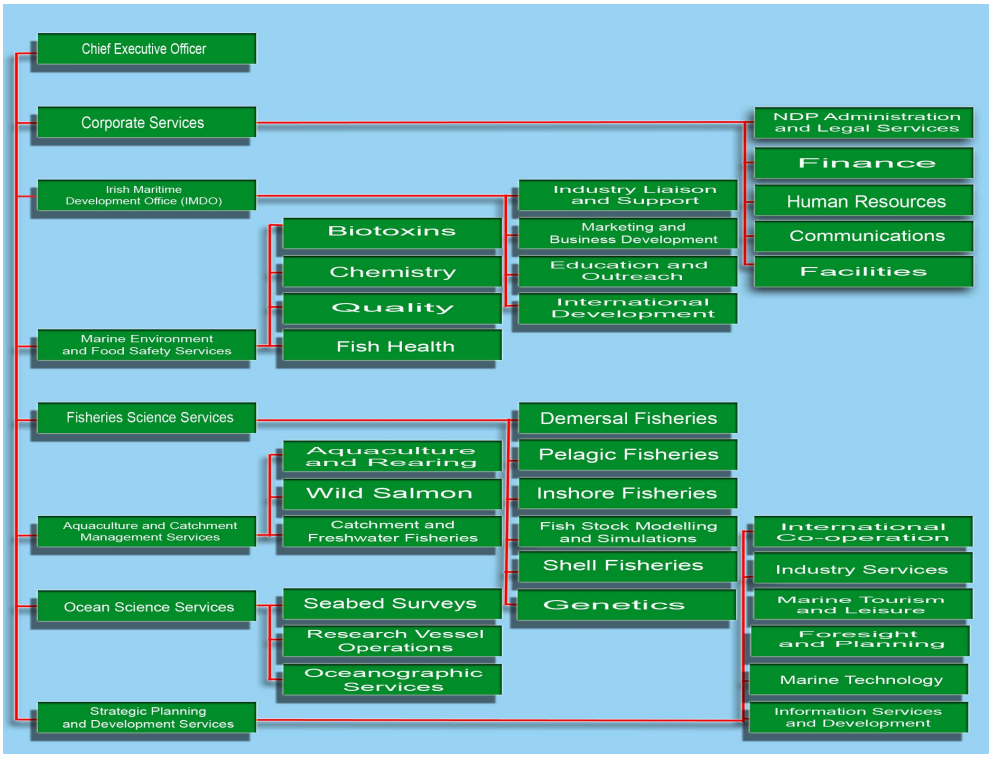
The functions of the Loughs Agency are as follows:

- The promotion of development of Lough Foyle and Carlingford Lough for commercial and recreational purposes in respect of marine, fishery and aquaculture matters.
- The management, conservation, protection, improvement and development of the inland fisheries of the Foyle and Carlingford Areas.
- The development and licensing of aquaculture.
- The development of marine tourism.

The Aquaculture and Shellfisheries Directorate within the Agency is tasked with licensing and development of aquaculture and shellfisheries in Loughs Foyle and Carlingford and their catchment areas. It is anticipated that commencement orders for the regulation and licensing of aquaculture and shellfisheries will be commenced in early 2008. The Agency's objective will be to provide economic sustainable development and promote best practice in aquaculture and the wild shellfisheries sector. The Agency continues to collect environmental and management information from both Loughs to aid in the development of the areas and inform the decision making process in consultation with our stakeholders. The Agency believes that consultation with its Advisory Forum, Aquaculture Sub-group and Stakeholders are key to the successful management of the Loughs into the future.

Marine Institute

www.marine.ie institute.mail@marine.ie



Marine Environment and Food Safety Services

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 Communications Marine and Natural Resources. 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:

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.

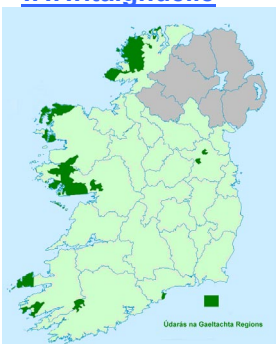
MI personnel provide statutory advice to the Department of Communications, Marine and Natural Resources in relation to the granting of aquaculture licences. MI personnel provide keys inputs to the Molluscan Shellfish Safety Committee and FSAI. It provides data and advice to the Management Cell which 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 and Taighde Mara Teoranta

www.udaras.ie www.taighde.ie



As a regional development agency, Údarás na Gaeltachta and its wholly owned subsidiary Taighde Mara Teoranta bring an integrated approach to the development of aquaculture within Gaeltachts. They are involved in the development of novel species, new techniques and business entities, from the research phase, through innovation and pilot scale trials to commercialisation. Integrating the aquaculture enterprise into the wider industry and the locale.

Both Taighde Mara and Údarás na Gaeltachta have offices and staff in each Gaeltacht region and provide advice, technical assistance and financial 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 may include investment by means of preference or redeemable shares as well as grant aid for capital, training and research and development. Technical support is equally broad and can include technology transfer, provision of technical staff while developing human resources within an enterprise as well as administration, IT, and business skill support. An overview of the industry's needs is maintained so that strategic planning and initiatives can be taken.

Appendix VII: Commonly used abbreviations.

Commonly used abbreviations	
Amnesic Shellfish Poisoning	(ASP)
Aquaculture Licence Appeals Board	(ALAB)
Azaspiracid Poisoning	(AZP)
Bacterial Kidney Disease	(BKD)
Bord Iascaigh Mhara	(BIM)
Cadmium	(Cd)
Case Management Group	(CMG)
Chromium	(Cr)
Coastal Zone Management	(CZM)
Co-ordinated Local Aquaculture Management Systems	(CLAMS)
Copper	(Cu)
Department of Agriculture and Food	(DAF)
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)
European Union	(EU)
Federation of European Aquaculture Producers	(FEAP)
Fish Health Unit	(FHU)
Food Safety Authority of Ireland	(FSAI)
Full-Time Equivalent	(FTE)
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	(NVs)
Okadaic Acid	(OA)
Organochlorine pesticides	(OCPs)
Pancreas Disease	(PD)
Paralytic Shellfish Poisoning	(PSP)
Polychlorinated biphenyls	(PCBs)
Price Waterhouse Coopers	(PWC)
Regional Fisheries Boards	(RFB)
Round Weight Equivalents	(RWE)
Saxotoxin	(STX)
Sea Fisheries Protection Authority	(SFPA)
Silver	(Ag)
Single Bay Management	(SBM)
Spring Viraemia of Carp	(SVC)
Taighde Mara Teoranta	(TMT)
Viral Haemorrhagic Septicaemia	(VHS)
Zinc	(Zn)

Appendix VIII: Common and Scientific names of some aquaculture species.

Common name	Scientific	Alternative name
Abalone	*Haliotis discus hannai*	*Ezo awabi*
	Haliotis tuberculata	
Carp	*Koi*	
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
Perch	*Perca fluviatilis*	
Salmon	*Salmo salar*	Atlantic salmon
Scallops	*Pecten maximus*	
Trout	*Salmo trutta*	