WATER QUALITY IN IRELAND 2007-2009

Edited by
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Aquatic Environment

Office of Environmental Assessment

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This Report is dedicated to the memory of our colleague
Michael Neill (1948-2010)

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FOREWORD

This report is the sixth in the series of three-year reviews of water quality in Ireland that have been undertaken by the Environmental Protection Agency (EPA) since 1995. A number of earlier reports were published by our predecessors, An Foras Forbartha, from 1970 to 1980 and the Environmental Research Unit, covering the period 1987 to 1990. Ireland is one of the few countries in Europe with such a detailed, scientifically based time series of water quality, which now spans four decades.

This report presents a review of Irish ambient water quality for the years 2007 to 2009. The aim of the report is to present a detailed overview of the main aspects of the quality of the aquatic environment in Ireland, to assist in the protection and enhancement of this key national resource. The data will provide a basis for Programmes of Measures to restore and maintain water quality.

The EPA has worked with a range of agencies to deliver a national assessment, based on the criteria and standards set out in the Water Framework Directive (2000/60/EC). The EPA published a national monitoring programme in June 2006 to meet the requirements of the WFD and the regulations implementing the Nitrates Directive (S.I. No. 788 of 2005).

The water quality data are presented in two ways: against the new ecological status criteria of the Water Framework Directive (WFD) and reporting on water quality, in the manner of previous EPA reports, so that trends can be seen.

The WFD assessment scheme for **water status**, that includes water quality, is a complex but comprehensive ecological approach, to aquatic resource management, in which the scope has been broadened to include a wide range of supporting parameters.

Thus, with many areas of aquatic systems to be covered, the report marks a transition phase towards a new, multi-agency programme.

The water quality data and other information have been generated by EPA field and laboratory based teams in the Office of Environmental Assessment, supplemented by information from

- Local authorities,
- Central and Regional Fisheries Boards (now Inland Fisheries Ireland)
- Marine Institute
- Radiological Protection Institute of Ireland
- Sea Fisheries Protection Authority
- Waterways Ireland and the Irish Coast Guard

We wish to convey sincere thanks and appreciation to our colleagues in these agencies.

The EPA looks forward to working with the Department of Environment, Heritage & Local Government and with the network of agencies to deliver the next phase of the Water Framework Directive and to meet the targets set out in the Directive for 2015 and 2021. This report makes clear that the targets are ambitious. Significant pollution remains an issue, for example in at least 20 river sites, in 25 lakes and in nine estuarine water bodies.

As previously stated by EPA, the achievement of future WFD targets will require a review of current water governance and the evolution of a regional network of agencies, based on the River Basins, in order to provide a more effective balance of national integration and local implementation.

Micheál Ó Cinnéide
Director
Office of Environmental Assessment

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CHAPTER FIVE

QUALITY OF ESTUARINE AND COASTAL WATERS

Shane O'Boyle, Robert Wilkes, Georgina McDermott and Tone Noklegaard

INTRODUCTION

Estuaries and coastal waters complete the set of water categories included in the EU Water Framework Directive. Their inclusion reflects the Directive's holistic approach to the sustainable management of water resources. The environmental status of these waters, which mark the boundary or interface between land and sea, provides an indication of how land-based human activities impact on the marine environment.

A number of pressures associated with various human activities such as urbanisation, industrialisation and intensification of agricultural practices, have the potential to impact negatively on the quality of these waters. Furthermore, stresses from external sources, such as transboundary pollution (e.g., radioactivity) and accidental, or in some cases, intentional oil spills from marine vessels, may also adversely affect their status.

This chapter presents an assessment of these different pressures and their associated impact and provides an overview of the water quality status of estuarine and coastal waters around Ireland. This assessment is based on information collected by the EPA, the Marine Institute (MI), Inland Fisheries Ireland (IFI), the Sea Fisheries Protection Authority (SFPA), the Irish Coast Guard (IRCG) and the Radiological Protection Institute of Ireland (RPII).

TROPHIC STATUS OF ESTUARINE AND COASTAL WATERS

As is the case for rivers and lakes the impact of nutrient enrichment and the process of eutrophication is also a major concern in the tidal waters environment. The direct negative effects of excessive nutrient enrichment include increases in the frequency and duration of phytoplankton blooms (sometimes of nuisance and toxin producing species) and excessive growth of attached opportunistic macroalgae. The subsequent breakdown of this organic matter can lead to oxygen deficiency which in turn can result in the displacement or mortality of marine organisms. As such the effects of over enrichment can severely disrupt the normal functioning of tidal water ecosystems.

The status of individual estuarine and coastal water bodies is assessed using the EPA's Trophic Status Assessment Scheme (TSAS). This assessment is required for the Urban Waste Water Treatment Directive and Nitrates Directive. The scheme compares the compliance of individual parameters against a set of criteria indicative of trophic state (Table 5.1). These criteria fall into three different categories which broadly capture the cause-effect relationship of the eutrophication process, namely nutrient enrichment, accelerated plant growth, and disturbance to the level of dissolved oxygen normally present;

Eutrophic water bodies are those in which criteria in each of the categories are breached, i.e. where elevated nutrient concentrations, accelerated growth of plants and undesirable water quality disturbance occur simultaneously;

Potentially Eutrophic water bodies are those in which criteria in two of the categories are breached and the third falls within 15 per cent of the relevant threshold value;

Intermediate status water bodies are those which breach one or two of the criteria;

Unpolluted water bodies are those which do not breach any of the criteria in any category.

Table 5.1. Parameters and criteria used in the Trophic Status Assessment Scheme (TSAS) for Irish estuaries, bays and nearshore coastal waters.

Category	TSAS criteria	Value from 3-year period	Threshold	Score
A: Nutrient enrichment	Nitrogen	DIN (Winter or Summer)	Salinity Corrected Threshold Value (see Appendix)	Pass/Fail
	Phosphorus	MRP (Winter or Summer)		Pass/Fail
B: Accelerated Growth	Chlorophyll	Median (Summer)		Pass/Fail
		90%ile (Summer)		Pass/Fail
	Macroalgae	WFD EQR[1] (Summer)		Pass/Fail
C: Undesirable Disturbance	Dissolved Oxygen	5%ile (Summer)		Pass/Fail
		95%ile (Summer)		Pass/Fail

[1] Ecological Quality Ratio for Good Status, derived from WFD compliant assessment method.

RESULTS FOR THE 2007-2009 TROPHIC STATUS ASSESSMENT

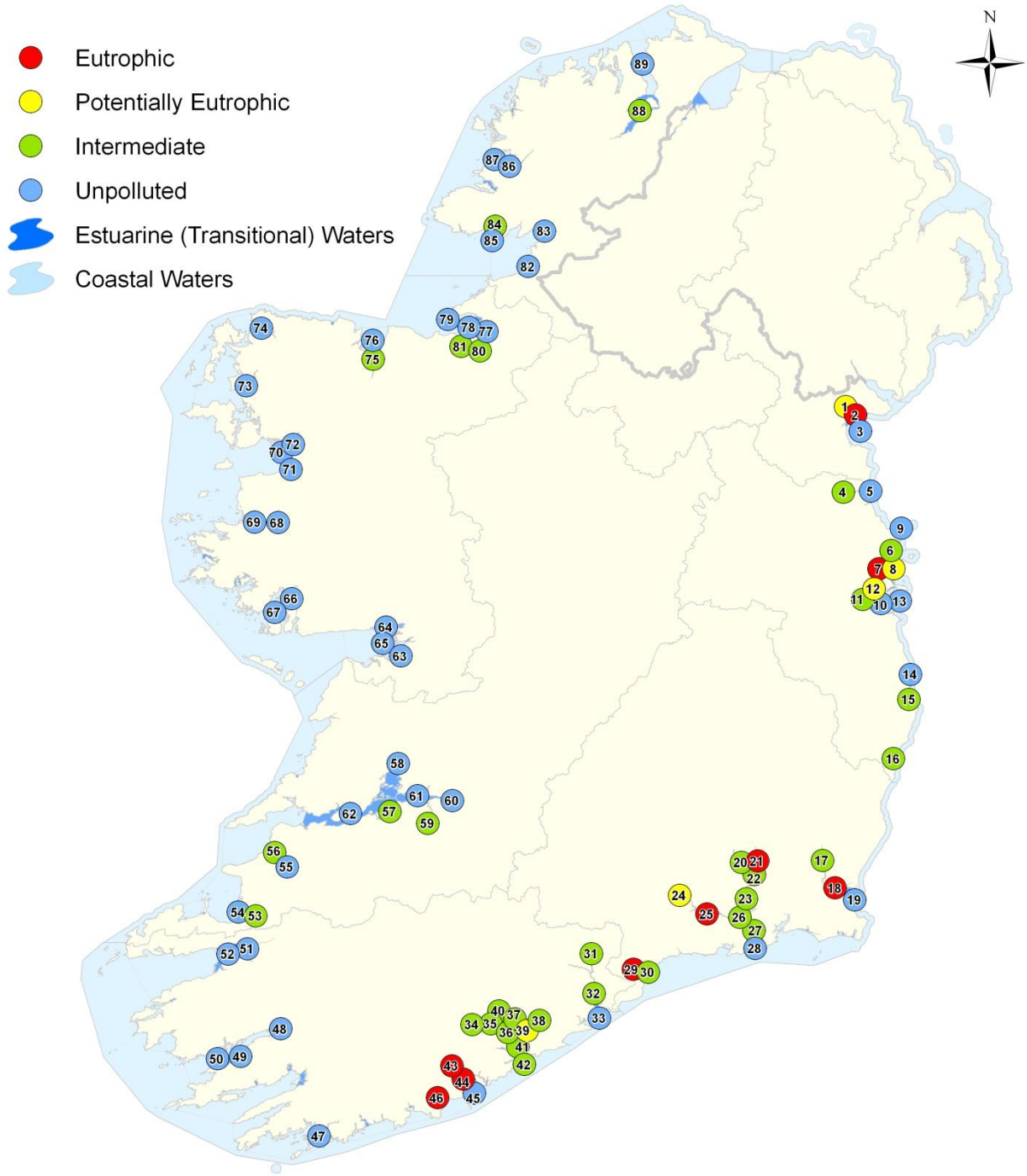
The outcome of the most recent trophic status assessment of estuarine and coastal waters for the period 2007-2009 is shown in Figure 5.1. Of the 89 water bodies included in the assessment, 9 (10.1%) were classed as eutrophic, 5 (5.6%) as potentially eutrophic, 31 (34.8%) as intermediate and 44 (49.5%) were unpolluted. In terms of surface area, 102.1 km^2 or 5.3 per cent of the total area assessed (just under 2,000 km^2) is classed as either eutrophic or potentially eutrophic.

The results of this assessment seem to indicate an improvement in overall water quality, with five fewer water bodies being classed as eutrophic when compared to the previous assessment. These include the Blackwater estuary (upper and lower) the Lee (Tralee) estuary, Owenacurra (Midleton) estuary and Wexford Harbour. In addition, a further five water bodies have improved from intermediate to unpolluted status and these include Kinsale Harbour, the Garavogue estuary, Sligo Harbour, McSwyne's Bay and the Lower Liffey estuary.

Improvements in the upper and lower parts of the Blackwater estuary in Co. Cork and Co. Waterford, is due to a decrease in chlorophyll levels and improved oxygen conditions. Improvements in the Lower Liffey estuary in Dublin city and in the Garavogue estuary in Sligo town, are most likely the result of upgraded levels of waste water treatment; the treatment plant in Sligo was only commissioned in 2009 but appears to have had a discernable effect on water quality in the estuary. In the case of the Liffey estuary, its unpolluted status would seem to confirm the incremental improvement in water quality noted in previous reports.

Some of the water bodies showing a decline in status include Inner Dundalk Bay, Upper Barrow estuary, Malahide Bay, Colligan (Dungarvan) estuary, Moy estuary and Ballysadare Bay and estuary. The deterioration in status in Malahide Bay and the Colligan estuary is due to the presence of green opportunistic macroalgae, which while previously observed in these areas had not been formally assessed.

A comparison of TSAS analyses and outcomes going back to the mid-1990s is shown in Table 5.2, and a summary of the physico-chemical data used in this current assessment is given in Appendix 1. The number of areas included in this assessment has increased in recent years due to the implementation of the Water Framework Directive. As such the proportion of water bodies in each status category is likely to be broadly representative of trophic conditions in Irish estuarine and coastal waters as a whole.



1 Castletown Estuary	19 Wexford Harbour	37 Harper's Island	55 Upper Feale Estuary	73 Tullaghan Bay
2 Inner Dundalk Bay	20 Nore Estuary	38 Owenacurra Estuary	56 Cashen	74 Sruwaddacon Bay
3 Outer Dundalk Bay	21 Upper Barrow Estuary	39 North Channel Great Island	57 Deel Estuary	75 Moy Estuary
4 Boyne Estuary	22 Barrow Nore Estuary Upper	40 Glashaboy Estuary	58 Fergus Estuary	76 Killala Bay
5 Boyne Estuary Plume Zone	23 New Ross Port	41 Cork Harbour	59 Maigue Estuary	77 Garavoge Estuary
6 Rogerstown Estuary	24 Upper Suir Estuary	42 Outer Cork Harbour	60 Limerick Dock	78 Sligo Harbour
7 Broadmeadow Water	25 Middle Suir Estuary	43 Upper Bandon Estuary	61 Upper Shannon Estuary	79 Sligo Bay
8 Malahide Bay	26 Lower Suir Estuary	44 Lower Bandon Estuary	62 Lower Shannon Estuary	80 Ballysadare Estuary
9 Northwestern Irish Sea (HA 08)	27 Barrow Suir Nore Estuary	45 Kinsale Harbour	63 Kinvarra Bay	81 Ballysadare Bay
10 Liffey Estuary Lower	28 Waterford Harbour	46 Argideen Estuary	64 Corrib Estuary	82 Erne Estuary
11 Liffey Estuary Upper	29 Colligan Estuary	47 Ilen Estuary	65 Inner Galway Bay	83 Inner Donegal Bay
12 Tolka Estuary	30 Dungarvan Harbour	48 Inner Kenmare River	66 Camus Bay	84 Killybegs Harbour
13 Dublin Bay	31 Upper Blackwater Estuary	49 Kilmakilloge Harbour	67 Kilkieran Bay	85 McSwyne's Bay
14 Southwestern Irish Sea (HA10)	32 Lower Blackwater Estuary	50 Outer Kenmare River	68 Erriff Estuary	86 Gweebarra Estuary
15 Broad Lough	33 Youghal Bay	51 Castlemaine Harbour	69 Killary Harbour	87 Gweebarra Bay
16 Avoca Estuary	34 Lee (Cork) Estuary Upper	52 Cromane	70 Inner Clew Bay	88 Swilly Estuary
17 Upper Slaney Estuary	35 Lee (Cork) Estuary Lower	53 Lee K Estuary	71 Westport Bay	89 Lough Swilly
18 Lower Slaney Estuary	36 Lough Mahon	54 Inner Tralee Bay	72 Newport Bay	

Figure 5.1. Estuarine and coastal water quality 2007-2009.

Table 5.2. Summary of TSAS analysis for the period 2007-2009, with comparative figures for the 2002 – 2006, 1999 – 2003 and 1995-1999 periods.

Water Bodies	Trophic Class	2007-2009	2002-2006	1999-2003	1995-1999
Numbers	Eutrophic	9	13	12	15
	Potentially Eutrophic	5	2	3	3
	Intermediate	31	27	28	18
	Unpolluted	44	27	26	24
	Total	89	69	69	60
Percentage	Eutrophic	10.1	18.9	17.4	25.0
	Potentially Eutrophic	5.6	2.9	4.3	5.0
	Intermediate	34.8	39.1	40.6	30.0
	Unpolluted	49.5	39.1	37.7	40.0
	Total	100	100	100	100

Nitrogen and phosphorus levels in estuarine and coastal waters

While phosphorus can limit plant growth in freshwater and estuarine systems, nitrogen is considered to be the limiting nutrient in open coastal waters not significantly influenced by freshwater run-off. The concentration of both nitrogen, as dissolved inorganic nitrogen (DIN) and phosphorus, as molybdate reactive phosphorus (MRP), is monitored in winter when levels are expected to be at their seasonal maximum due to the absence of any significant plant or algal growth. Levels of MRP are also monitored in summer to capture the potential effect of seasonal changes in river flow which in turn can result in higher phosphate concentrations in some estuaries in summer.

The highest median winter DIN values were found in the Glashaboy (Glanmire) estuary (6.3 mg/l N), the Upper and Lower Slaney estuary (5.5 and 4.3 mg/l N, respectively), the Owenacurra estuary (4.3 mg/l N) and the Upper Barrow estuary (4.9 mg/l N).

Each waterbody is assessed against salinity-related thresholds and 31 water bodies breached the winter DIN assessment criterion. The highest exceedances (greater than 100 per cent) were observed in the Glashaboy estuary (157.1%), Upper (112.1%) and Lower Slaney (119.3%) estuary and Colligan estuary (110.9%). In relation to achieving the environmental objectives established by the Water Framework Directive (WFD), three coastal areas, Cork Harbour, Outer Cork Harbour and Malahide Bay, failed to comply with the environmental quality standard (EQS) for DIN (S.I. No. 272 of 2009). Absolute concentration and exceedance values for DIN are shown in Figures 5.2a and 5.2b.

In relation to MRP concentrations, the majority (85%) of estuaries and coastal waters had MRP median winter and summer values less than 0.040 mg/l P, with half of these having levels less than 0.020 mg/l P. More water bodies had higher concentrations in summer than winter. The highest winter MRP concentrations were found in Lough Mahon (Harper's Island), Lee (Tralee) estuary, the Castletown (Dundalk) estuary, the Tolka estuary, New Ross Port, Barrow Suir Nore estuary and the Broadmeadow estuary in Co. Dublin, with values ranging from 0.049 to 0.066 mg/l P. The highest summer MRP concentrations were found in the Deel, Tolka, Nore, Broadmeadow and Upper Liffey estuaries where values ranged from 0.056 to 0.075 mg/l phosphorus.

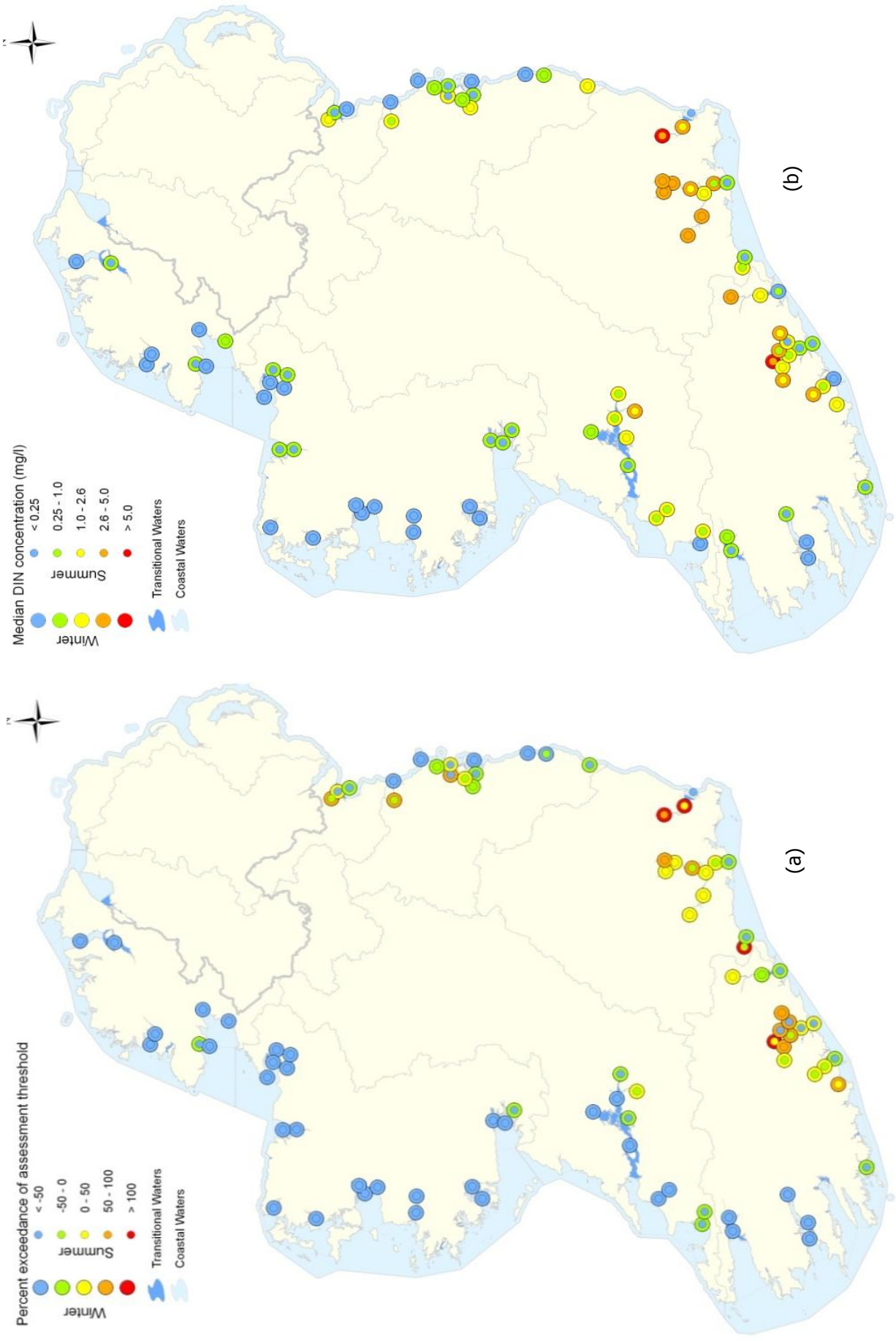


Figure 5.2. Winter and summer dissolved inorganic nitrogen (DIN) levels in estuarine and coastal waters 2007-2009, showing (a) percentage exceedance of assessment thresholds and (b) concentration.

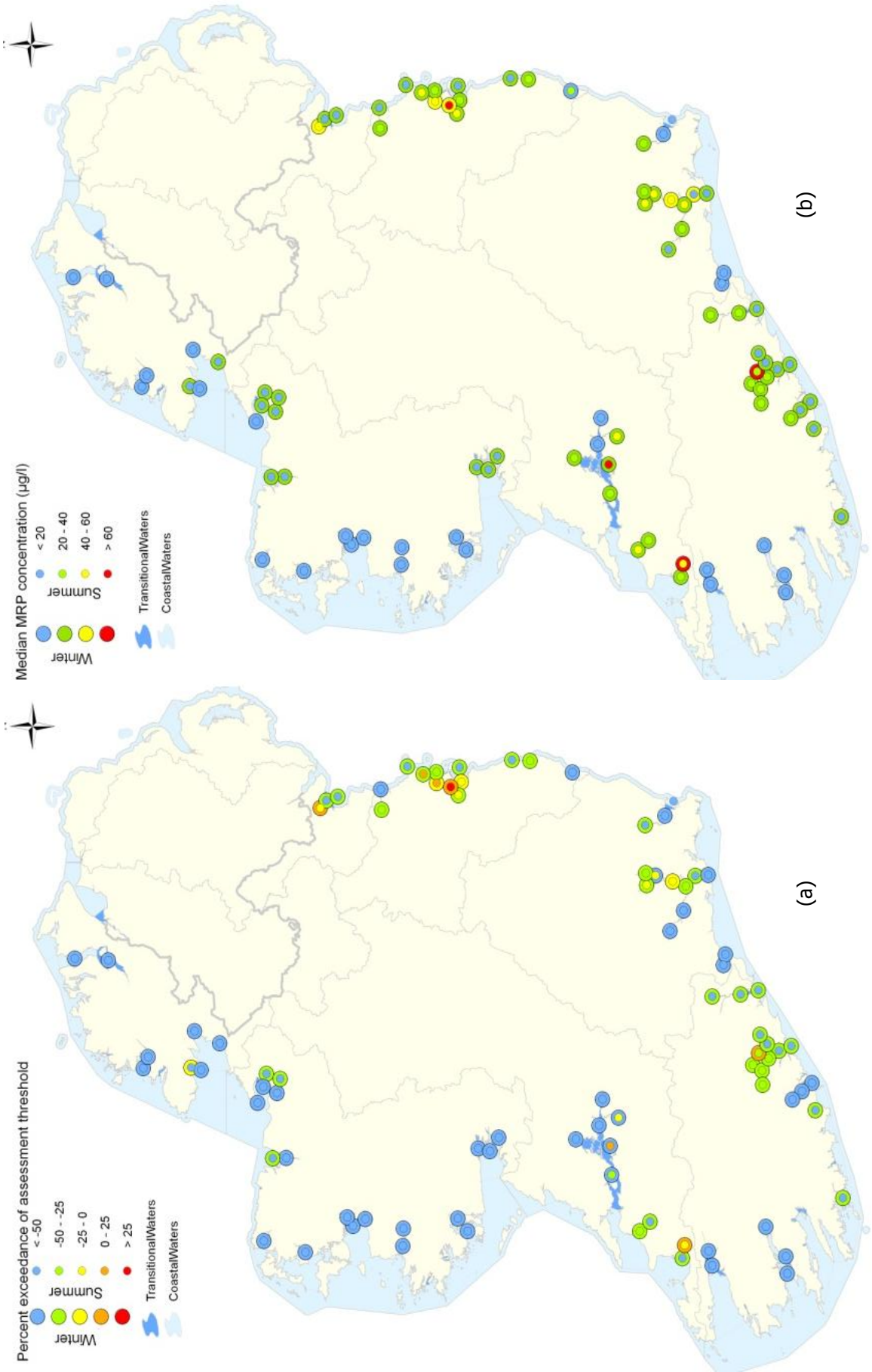


Figure 5.3. Winter and summer molybdate reactive phosphorus (MRP) levels in estuarine and coastal waters 2007-2009, showing (a) percentage exceedance of assessment thresholds and (b) concentration.

These observations are presented as concentrations and the degree of deviation from salinity-related assessment levels (see Figures 5.3a and 5.3b.). An Environmental Quality Standard (EQS) based on MRP (S.I. No. 272 of 2009) and equivalent to that used in TSAS has been established for estuarine (transitional) waters with good status being achieved if the median (summer or winter) MRP concentration is ≤0.060 mg/l (at salinity 0.0 – 17.0) and ≤0.040 mg/l (at salinity 35.0). Four water bodies, Lough Mahon (Harper's Island), Lee estuary (Tralee), Castletown estuary and Tolka estuary, breached the winter MRP criterion and therefore the EQS for MRP. The same number of estuaries (Tolka, Deel, Broadmeadow and Rogerstown) were in breach of the EQS in summer.

Before leaving this section it is worth noting that the distribution of nutrients presented here is in good general agreement with the country-wide maps of average riverine nutrient concentration presented in Chapter 3. Taken together, this information provides an excellent national picture of nutrient levels across these different water categories.

Dissolved oxygen levels and biochemical oxygen demand

When oxygen levels decline as a result of pollution they can have adverse effects on aquatic organisms including slower growth rates, impaired immune response and in severe cases mortality. When oxygen concentrations become very low, they are described as either hypoxic, when levels fall below 2 mg/l, or anoxic, when there is 'no-oxygen' present.

This assessment shows that the vast majority of waters (99.5% of the surface area assessed) had satisfactory oxygen conditions capable of supporting nearly all forms of aquatic life. Furthermore, no hypoxia or indeed anoxia was observed in any of the water bodies surveyed (Table 5.3). These findings are in good agreement with an earlier EPA study and confirm the satisfactory nature of oxygen conditions in Irish estuaries and nearshore waters (O'Boyle *et al.*, 2009). Nevertheless, deoxygenation was observed in a small number of water bodies, with the lowest concentrations being observed in the Avoca estuary, Lower Lee estuary and Upper Liffey estuary, where values fell between 3.0 – 5.2 mg/l O_2. Such levels are likely to cause some adverse effects on aquatic organisms (Vaquer-Sunyer and Duarte, 2008).

The effect of organic enrichment on oxygenation conditions, as indicated by the biochemical oxygen demand (BOD) concentration is shown in Figure 5.4, which shows that the majority of waters had acceptable levels of BOD (i.e. EQS of 95 percentile less than 4 mg/l O_2).

However, in 12 water bodies the level of oxygen demand observed indicated the presence of substantial organic enrichment, with six of these areas, Upper Bandon, Upper Swilly, Broadmeadow, Lower Bandon, Deel and Middle Suir, having BOD values ranging from 6.1-8.5 mg/l O_2.

Overall, levels of BOD appear to have declined, with the current assessment indicating a considerable improvement on the 2002-2006 assessment when nearly one-third of water bodies were in breach of the EQS.

This improvement in the level of organic enrichment is likely to be due to improved waste water treatment facilities as a result of the implementation of the EU Urban Wastewater Treatment Directive in Ireland.

Table 5.3. Proportion of water bodies in each dissolved oxygen category by number and surface area in the period 2007-2009, based on minimum (5%ile) dissolved oxygen levels.

	Anoxic	Hypoxic	Deficient	Sufficient
(mg/l)	(0 - 0.5)	(0.5 - 2.0)	(2.0 - 6.0)	(6.0-10.0)
Number (n)	0	0	5	84
(%)	0	0	5.6	94.4
Surface Area (km^2)	0	0	9.9	1922.5
(%)	0	0	0.5	99.5

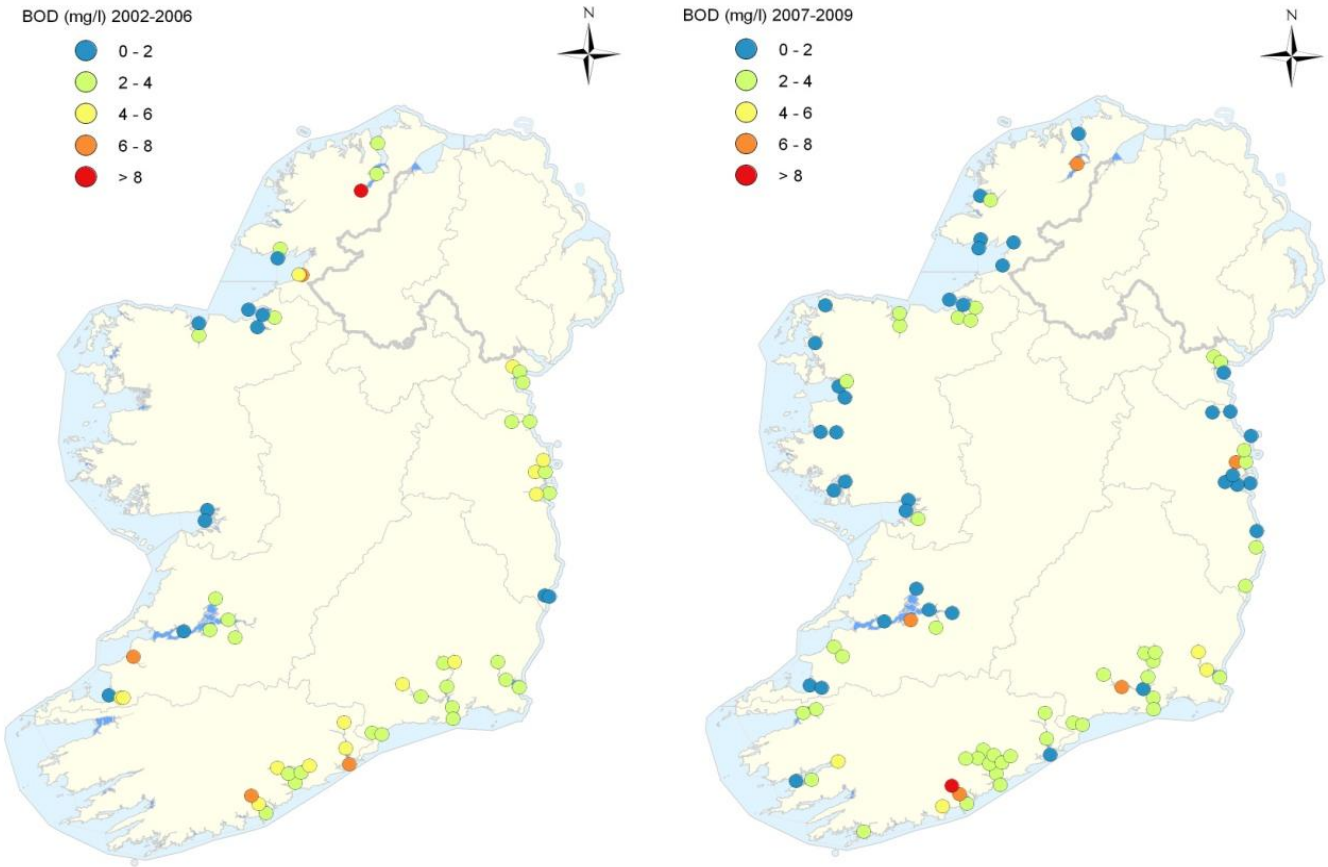


Figure 5.4. Summer biochemical oxygen demand (BOD) concentration (95 percentile) in estuarine and coastal waters in 2002-2006 and 2007-2009.

For example, between 2007 and 2008, 90 per cent of waste water arising received at least secondary treatment (EPA, 2009a). This represents a substantial improvement from the period 1998-1999, when only 26 per cent of discharges received secondary treatment, and 38 per cent of discharges received only primary treatment. A number of major wastewater treatment plants, which discharge to tidal waters, came in to operation during the period 2007-2009, including, Waterford city (Suir estuary), Sligo town (Garavogue estuary), Donegal town (Inner Donegal Bay) and Balbriggan/Skerries. The level of treatment of discharges is expected to increase further as additional treatment plants come into operation in the coming years.

At the start of 2008, however, sewage was still being discharged with either no treatment or basic treatment at 112 locations around Ireland, with the majority of these discharging directly to estuarine or coastal waters (EPA, 2009a). Although plans are in place for the provision of secondary treatment at many locations, significant towns such as Bray, (Co. Wicklow), Killybegs, (Co. Donegal), Shanganagh, (Dun Laoghaire Rathdown), Clifden (Co. Galway) and Youghal (Co. Cork) are still without this level of treatment.

The EPA is addressing the issues associated with these towns. The Agency has granted waste water discharge licences for Bray, (Co. Wicklow), Killybegs, (Co. Donegal) and Shanganagh, (Dun Laoghaire Rathdown). These licences include requirements for programmes of improvements to be implemented to ensure that a minimum of secondary treatment will be provided at these waste water treatment plants. The waste water treatment plants in Clifden (Co. Galway) and Youghal (Co. Cork) are being addressed by the Agency through the wastewater discharge licensing regime and will ensure that secondary treatment will be put in place at these plants.

ECOLOGICAL STATUS OF ESTUARINE AND COASTAL WATERS

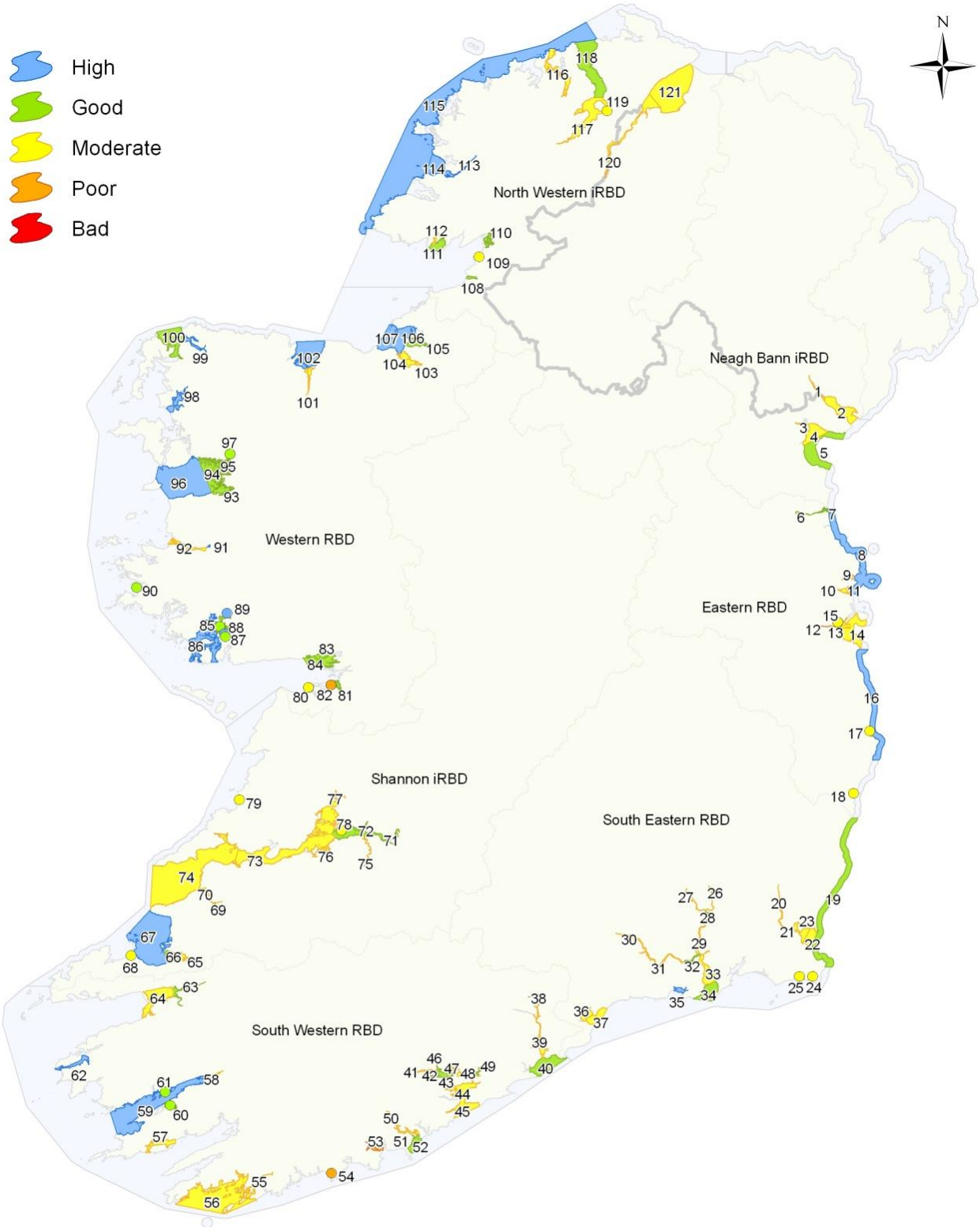
In addition to nutrient enrichment, other pressures such as hazardous substances and morphological alterations can also impact on the quality of aquatic systems. Under the Water Framework Directive (WFD), these additional pressures, along with nutrient enrichment, must be addressed. In the Directive, biological indicators are used to assess the ecological status of transitional and coastal waters. Classification schemes have been developed that use the characteristics of different biological communities, together with information on the physico-chemical environment to define ecological status. The biological quality elements (BQEs) and physico-chemical elements currently being used for WFD status assessment are listed in Table 5.4.

Ecological status is assessed on a 'one-out-all-out' basis. Overall ecological status of a water body is based on the biological quality element or physico-chemical standard with the lowest status. For example, if all the elements in a particular water body are at or near reference conditions then the status of the water body is considered to be high. However, if any single biological quality element or chemical parameter is of lesser status then classification is based on that element. A total of 121 transitional and coastal areas were assessed by the EPA, Marine Institute and Inland Fisheries Ireland between 2007 and 2009 for WFD status classification, using the biological quality and physico-chemical elements listed in Table 5.4. Of these, 55 were classed as either high (16%) or good (30%) ecological status with the remainder being classed as moderate or worse. In terms of surface area, just over 64 per cent of the total monitored area was found to be at high or good ecological status. A detailed breakdown of these classifications for each river basin district (RBD) is shown in Table 5.5, and graphically in Figure 5.5.

A number of areas, including the mouth of the Shannon estuary and Roaring Water Bay, were classed at moderate ecological status due to the presence of a polychlorinated biphenyl (PCB) substance referred to as CB118. PCBs are manmade substances that were widely used in the manufacture of electrical equipment. While their production in Europe was banned in the 1980s, PCBs are still widespread in the environment and there are few areas where concentrations are close to zero. As such their detection does not necessarily infer recent or indeed local inputs. Indeed, where temporal trends are detected for PCBs in the Irish marine environment these are invariably downwards indicating that their presence may be due to historical diffuse inputs or atmospheric deposition. It follows, therefore, that the presence of these substances should not automatically trigger local measures, unless there is evidence that the source of contamination is local.

Table 5.4. List of parameters used to assess ecological status of Irish transitional and coastal waters.

Biological Quality Elements
Phytoplankton biomass (chlorophyll) in coastal and transitional waters
Phytoplankton composition (bloom metric) in coastal waters
Rocky shore macroalgae species multimetric in coastal waters
Opportunistic macroalgal growths in coastal and transitional waters
Fish in transitional water (Transitional Fish Classification Index or TFCI)
Benthic Invertebrate fauna in coastal and transitional waters (IQI Index)
General Physico-Chemical Elements
Dissolved inorganic nitrogen (DIN) in coastal waters
Molybdate reactive phosphorus (MRP) in transitional waters
Dissolved oxygen, as per cent saturation, in transitional and coastal waters
Biochemical oxygen demand (BOD) in transitional waters
Specific relevant pollutants



1 Newry Estuary
2 Carlingford Lough
3 Castletown Estuary
4 Inner Dundalk Bay
5 Outer Dundalk Bay
6 Boyne Estuary
7 Boyne Estuary Plume Zone
8 Northwestern Irish Sea
9 Rogerstown Estuary
10 Broadmeadow Water
11 Malahide Bay
12 Liffey Estuary Upper
13 Liffey Estuary Lower
14 Dublin Bay
15 Tolka Estuary
16 Southwestern Irish Sea
17 Broad Lough
18 Avoca Estuary
19 Southwestern Irish Sea
20 Upper Slaney Estuary
21 Lower Slaney Estuary
22 Wexford Harbour
23 North Slob Channels
24 Lady's Island Lake
25 Tacumshin Lake
26 Upper Barrow Estuary
27 Nore Estuary
28 Barrow Nore Estuary Upper
29 New Ross Port
30 Upper Suir Estuary
31 Middle Suir Estuary
32 Lower Suir Estuary
33 Barrow Suir Nore Estuary
34 Waterford Harbour
35 Tramore Back Strand
36 Colligan Estuary
37 Dungarvan Harbour
38 Upper Blackwater
39 Lower Blackwater
40 Youghal Bay
41 Lee Estuary Upper
42 Lee Estuary Lower
43 Lough Mahon
44 Cork Harbour
45 Outer Cork Harbour
46 Glashaboy Estuary
47 Lough Mahon (Harper's Island)
48 North Channel Great Island
49 Owenacurra Estuary
50 Upper Bandon Estuary
51 Lower Bandon Estuary
52 Kinsale Harbour
53 Argideen Estuary
54 Kilkeran Lake
55 Ilen Estuary
56 Roaring Water Bay
57 Berehaven
58 Inner Kenmare River
59 Outer Kenmare River
60 Kilmakilloge Harbour
61 Drongawn Lough, Sneem
62 Portmagee Channel
63 Castlemaine Harbour
64 Cromane
65 Lee K Estuary
66 Inner Tralee Bay
67 Outer Tralee Bay
68 Lough Gill
69 Upper Feale Estuary
70 Cashen
71 Limerick Dock
72 Upper Shannon Estuary
73 Lower Shannon Estuary
74 Mouth of Shannon
75 Maigue Estuary
76 Deel Estuary
77 Fergus Estuary
78 Shannon Airport Lagoon
79 Lough Donnell
80 Murree Lough
81 Kinvarra Bay
82 Kinvarra Lagoons
83 Inner Galway Bay North
84 Corrib Estuary
85 Camus Bay
86 Kilkieran Bay
87 Loch Tanai
88 Loch an Aibhinn
89 Loch an tSaile
90 Lough Athola
91 Erriff Estuary
92 Killary Harbour
93 Westport Bay
94 Inner Clew Bay
95 Newport Bay
96 Clew Bay
97 Furnace Lough
98 Tullaghan Bay
99 Sruwaddacon Bay
100 Broadhaven
101 Killala Bay
102 Ballysadare Estuary
103 Ballysadare Bay
104 Garavoge Estuary
105 Sligo Harbour
106 Sligo Bay
107 Erne Estuary
108 Durnesh Lough
109 Inner Donegal Bay
110 McSwyne's Bay
111 Killybegs Harbour
112 Gweebarra Estuary
113 Gweebarra Bay
114 Northwestern Atlantic Seaboard
115 Mulroy Bay Broadwater
116 Swilly Estuary
117 Lough Swilly
118 Inch Lough
119 Foyle and Faughan Estuaries
120 Lough Foyle
121

Figure 5.5. Transitional and coastal waters ecological status 2007-2009.

Table 5.5. Ecological status of monitored water bodies by number and surface area (km^2)

RBD	High	Good	Moderate	Poor	Total
Eastern	3 (207)	1 (3)	8 (66)	1 (0.2)	13 (276)
Neagh-Bann	-	1 (64)	4 (83)	-	5 (146)
North western	3 (778)	4 (125)	7 (295)	-	14 (1198)
South eastern	1 (5)	4 (162)	14 (124)	-	19 (291)
Shannon	1 (216)	4 (58)	10 (536)	-	15 (809)
South western	2 (201)	9 (88)	14 (360)	2 (5)	27 (654)
Western	9 (472)	13 (230)	5 (37)	1 (0.1)	28 (738)
Total	19 (1879)	36 (729)	62 (1500)	4 (5)	121 (4112)

Monitoring of Toxic Contaminant Levels in Estuarine and Coastal Waters

The Marine Institute monitors the levels of certain priority hazardous substances in a range of fin-fish species landed at Irish ports and also in shellfish from selected sites around the Irish coast. These are substances, such as mercury, that have been identified as being of particular concern for the marine environment and for consumers of seafood. Levels of such substances in fish and shellfish are a good indicator of contamination in the marine environment and bivalve molluscs, e.g. mussels, are widely used as sentinel organisms in marine monitoring programmes. This monitoring is part of Ireland's contribution to the Joint Assessment and Monitoring Programme (JAMP) of the OSPAR Convention.

Environmental Contaminants in Fish

In accordance with the requirements of EU legislation, the Marine Institute samples a range of fin-fish species landed at major Irish ports. Ports sampled in 2007 and 2008 included Castletownbere (Co. Cork), Dunmore East (Co. Waterford), Rossaveal (Co. Galway), Killybegs (Co. Donegal), Arklow (Co. Wicklow), and Greencastle (Co. Donegal). The fish tissue samples are tested for mercury levels and analysed for other trace metals (such as lead and cadmium) and chlorinated hydrocarbons. European Commission Regulation (EC) No. 1881/2006 as amended by Regulation 629/2008 sets maximum levels for certain contaminants, such as mercury, cadmium and lead, in fishery products (Table 5.6). Results for both years complied with the limits for mercury, cadmium and lead. There are currently no internationally agreed standards or guidelines available for other trace metals (chromium, copper, nickel, silver and zinc) and chlorinated hydrocarbons monitored in fishery products. However, the levels of these contaminants between 2007 and 2008 were well below the strictest standard of guidance value for fish tissue applied by individual contracting parties to the OSPAR Convention.

Environmental Contaminants in Shellfish

Limits for environmental contaminants in shellfish are set by the Shellfish Waters Directive (2006/113/EC) and Regulation EC No. 1881/2006, as amended by EC Regulation No. 629/2008, which lay down the maximum levels for certain contaminants in foodstuffs. The Shellfish Waters Directive sets the physical, chemical and microbiological requirements that designated shellfish waters must either comply with or endeavour to improve. This directive is implemented in Ireland by the Quality of Shellfish Waters regulation (S.I. No. 268 of 2006) which sets the guidance and imperative values for trace metals and organohalogens in shellfish flesh.

The Quality of Shellfish Waters regulation designates 14 shellfish waters sites which were amended on the 10th February 2009 by S.I. No. 55 of 2009 with 49 additional sites. These were identified as appropriate for selection as shellfish growing areas because they were aquaculture sites or wild shellfish harvesting sites that have been active in the preceding three years or the waters are in need of protection or improvement. Monitoring of seawater from the original 14 designated areas was carried out by the Marine Institute with samples collected by Bord Iascaigh Mhara (BIM) in summer and winter of 2007 and summer of 2008. One sample from Mulroy Bay (winter 2007) exceeded the imperative values for lead, nickel and zinc set in SI No. 268 of 2006.

Table 5.6. Maximum levels for mercury, cadmium and lead in fin-fish and bivalve molluscs as set by Commission Regulation (EC) No. 629/2008.

	Cadmium mg Kg $^{-1}$ wet weight	Mercury mg Kg $^{-1}$ wet weight	Lead mg Kg $^{-1}$ wet weight
Muscle Meat of Fish	0.05	0. 5	0.3
Muscle meat of selected fish species	0.1	1.0	0.3
Bivalve Molluscs	1.0	0.5	1.5

Organochlorine pesticides and PCBs measured in seawater were all below the detection limits with the exception of a single α-HCH (a byproduct of Lindane) measurement in Bannow Bay in winter 2007.

The Marine Institute (MI) sampled and analysed shellfish tissue samples for nine trace metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel, silver and zinc), which included arsenic for the first time in 2007, and organohalogens as required under the Shellfish Waters Directive. As well as harvesting sites required for the Shellfish Waters Directive, shellfish from selected other areas reflecting different pressures were also sampled to contribute to the OSPAR Convention's Coordinated Environmental Monitoring Programme (CEMP). In 2007, 2008 and 2009 the Marine Institute sampled 35, 40 and 15 locations, respectively. Furthermore, in the latter part of 2008, the MI was tasked with implementing monitoring in accordance with the expanded designations for the Shellfish Waters Directive. The Sea Fisheries Protection Authority (SFPA) collected shellfish samples (mussel, oyster, razor, clam and/or cockles), on behalf of the MI, from some 60 locations per sampling round in shellfish growing waters during November and December 2008, June to August 2009, and November/December 2009.

The results showed that levels of cadmium, lead and mercury in shellfish tissue from shellfish growing waters were generally well within EU limits for the period 2007-2009. Elevated levels of cadmium were found in Inner Tralee Bay in October 2007, where one sample of mussels marginally exceeded (1.08 mg kg^{-1}) the EC maximum limit (1.0 mg kg^{-1}) and the guide value set in S.I. No. 268 of 2006 (1.0 mg kg^{-1}) for cadmium. While the margin of exceedance was within the analytical uncertainty of the test method, similar results were found in 2006 in the same area. For the other trace metals, almost all samples complied with the guide values for metals in shellfish. In 2008, two samples of Pacific oysters marginally exceeded the relevant value for total arsenic in Mannin Bay (Co. Galway) and Dungloe, as did another sample of Pacific oyster from Ballymacoda Bay (Co. Cork) in winter 2009. Samples of cockles from Dundalk Bay breached the guide value for nickel in 2008 and 2009. However, cockles have not been part of routine monitoring and are not sampled from other locations. The high nickel concentration may be a species specific issue and does not necessarily reflect elevated levels of nickel at this location. All organohalogen (PCBs and pesticides) concentrations were low and PCB concentrations were below the guide value.

The MI also samples additional areas not designated or licensed for shellfish production/harvesting. In 2007, as in previous years, relatively high concentrations of lead (mean 32.6 mg kg^{-1}) were recorded in mussels from Paddy's Point in Cork Harbour. Concentrations measured in 2008 and 2009 were considerably lower with respective means of 1.6 and 1.1 mg kg^{-1}. The MI reports the biomonitoring data to the International Council for the Exploration of the Sea (ICES) in compliance with the OSPAR CEMP. An assessment of temporal trends carried out by OSPAR in 2008, including data up to 2007, indicated that relatively few significant trends could be discerned for Irish waters (OSPAR, 2009). Few significant upward or downward trends were identified for trace metals although a significant upward trend was detected for cadmium, copper and zinc at the North Bull Island (Co. Dublin) in recent years. Where significant trends were detected for persistent organic pollutants (POPs) they were

invariably downward, with 26 downward trends detected for individual PCB congeners or organochlorine pesticides and five downward trends for individual polyaromatic hydrocarbon (PAH) compounds. Although a global environmental legacy associated with these POPs will remain for years to come, it is expected that downward trends will continue due to measures taken to control or eliminate environmental inputs.

Quality of Shellfish Growing Waters

The Irish molluscan shellfish industry (i.e. mussels, clams, scallops and other molluscan shellfish) is estimated to be worth some €50 million annually. These filter-feeding shellfish can accumulate microorganisms when grown in sewage-contaminated water and if eaten raw, or lightly cooked, can present a public health risk for consumers.

In order to ensure the quality of shellfish for human consumption, controls are placed on the waters used for shellfish cultivation and harvesting. Since January 2006, the controls are driven by EC Hygiene Regulations 'laying down specific rules for food of animal origin' (Nos. 852/853/854 of 2004). The Sea Fisheries Protection Authority (SFPA), established in January 2007, is the competent authority in Ireland for classifying shellfish production areas.

A shellfish sanitation monitoring programme, based on a number of parameters including microbiological criteria and levels of *Escherichia coli* (*E. coli*), for classifying shellfish growing waters has been in operation in Ireland since 1985. The scheme of classification has three categories, in addition to a prohibited one, and the criteria for the classification of shellfish harvesting areas are shown in Table 5.7.

In 2008 a new code of practice on microbiological monitoring was implemented in which three years' data were used, prior to which classifications were determined every six months based on the previous year's data. The 2009 classification of shellfish production areas in Ireland classified 125 production areas: 28 (22.4%) were classified as A, 19 (15.2%) classified as 'seasonal' A and 67 (53.6%) as B classification while a single area in Wexford Harbour was classed as C. The code of practice allows for seasonal classification to be given in areas where the data shows a clear seasonal trend in *E. coli* levels over the three-year period (www.sfpa.ie).

Occurrence of Shellfish Biotoxins

A small number of phytoplankton species that occur in Irish waters naturally produce compounds known as biotoxins that can accumulate in filter feeding organisms such as shellfish. The consumption of contaminated shellfish flesh can cause serious human illness including nausea, vomiting, stomach pain, diarrhoea and in some cases neurological damage.

In Ireland the occurrence of shellfish contamination is variable from year to year, with most of the resultant closures of production areas being attributed to *Dinophysis* species, the causative organism of Diarrhetic Shellfish Poisoning (DSP). However, other toxin-producing species, such as *Pseudo-nitzschia* causing Amnesic Shellfish Poisoning (ASP), *Alexandrium* – Paralytic Shellfish Poisoning (PSP) and *Azadinium* species – Azaspiracid Shellfish Poisoning (AZP) are also problematic. The shellfish production areas around the coast of Ireland are monitored on a weekly or monthly basis for phytoplankton and the presence of marine biotoxins. Where biotoxins are detected the production area is closed and harvesting prohibited until the danger of toxicity has passed.

Such closures are essential to protect human health and the reputation of the Irish shellfish industry. Closures of shellfish-growing areas as a result of biotoxin contamination are common in the summer and autumn when toxin-producing algae are present.

In 2007 toxicity levels were low, with unusually low levels of DSP toxin through the summer, however there was an occurrence of Azaspiracid (AZP) contamination in late summer. Overall the number of site closures due to toxin presence above the regulatory limit was much lower than 2005 and 2006

which were characterized by prolonged closures due to the presence of DSP and AZP toxins. In 2008, there was considerable shellfish toxicity, resulting in widespread closures of shellfish production areas. These closures were mainly caused, as in 2005 and 2006, by the presence of DSP and AZP toxins. While the closure of shellfish production areas can cause an economic impact, there is little evidence to suggest that the occurrence of these species or toxicity events, is related to anthropogenic nutrient enrichment. A number of studies suggest that many of these species originate offshore and are advected inshore by the wind (Raine *et al.*, 1993, Raine and McMahon, 1998).

Quality of Bathing Waters

The legislation governing the quality of bathing waters for the 2009 season is set out in the Quality of Bathing Waters Regulations (S.I. 155 of 1992) and amendments, which transposed the EU Directive (76/160/EEC) concerning the quality of bathing water.

A new Directive on bathing water (Directive 2006/7/EC) came into force on 24 March 2006 and will repeal the existing 1976 Quality of Bathing Waters Directive with effect from 31 December 2014. The 2006 Directive establishes a new classification system for bathing water quality based on four classifications 'poor', 'sufficient', 'good' and 'excellent', and generally requires that a classification of sufficient be achieved by 2015 for all bathing waters.

Table 5.7. Classification scheme for shellfish production areas under EC Regulations (No. 854/ 2004; No. 853/2005; No. 2073/2005)

Classification	*E. coli* per 100g of live bivalve mollusc flesh and intra-valvular fluid[1]	Treatment Required
Class A	<230	None
Class B	<4,600	Purification, relaying in Class A or cooking by an approved method
Class C	<46,000	Relaying for a long period (2 months) to meet Class A or B requirements/or heat treatment by an approved method
Prohibited	>46,000	Harvesting not permitted

[1] Five-tube, three dilution Most Probable Number (MPN) test

Box 5.1 The biological source of Azaspiracid (AZP) toxin

Up until recently there was a great deal of speculation regarding the phytoplanktonic source of AZP toxin, which together with DSP toxin, accounts for the majority of toxin-related closures. Earlier investigations indicated that the source of the toxin was a dinoflagellate from the heterotrophic genus *Protoperidinium* (James *et al.*, 2003). However, a number of doubts remained that this organism was in fact the source. The trophic nature of *Protoperidinium* suggested that there was a possibility that the source of the toxin could have been another organism that *Protoperidinium* was feeding on. Furthermore, there was poor correlation with the presence of this species and toxicity in shellfish. The source of AZP was finally discovered by a group of German scientists during a research cruise in the southern North Sea in early summer 2007. The source turned out to be a small photosynthetic thecate dinoflagellate (*Azadinium spinosum*), which was found at stations which had high AZP toxin concentrations. The same species has now been isolated in Irish waters from survey work carried out in 2009. Experiments on the culturing, toxin content, uptake kinetics and depuration are underway in the Marine Institute and partner laboratories under a project (ASTOX II) funded by the Irish Government and the European Union.

Transitional measures are in place in Ireland until the new Bathing Water Quality Regulations 2008 (SI No. 79 of 2008) are fully implemented and these relate the new classification system to current EU guide and mandatory standards specified in the 1976 Quality of Bathing Waters Directive (76/160/EEC). The 'good' classification is related to compliance with guide and mandatory values, the 'sufficient' classification is related to compliance with the mandatory values only, whereas the 'poor' classification is non-compliance with mandatory values. Bathing areas are not classified as 'excellent' in this interim period as the 1976 Directive does not have bathing water standards that equate to this classification.

A total of 131 designated bathing areas were monitored by local authorities during the 2009 bathing season, of which 122 are seawater and nine are freshwater lakes (See also Chapter Four).

The five microbiological and physico-chemical parameters currently considered for EU compliance purposes are:

- Total coliforms
- Faecal coliforms
- Mineral oils
- Surface active substances
- Phenols.

The new Directive on bathing water (Directive 2006/7/EC) establishes tighter microbiological standards for two new parameters, Intestinal enterococci and *Escherichia coli*. From the 2011 bathing season onwards, these two robust microbiological parameters will be monitored and used to classify bathing waters.

Local authorities are required to ensure that when any bathing water sample fails the EU mandatory values, the public are made aware of this fact by means of information notices posted at the bathing area.

Local authorities are required to take the necessary measures to ensure that the standards are complied with and are required to report the results of sampling to the EPA at the end of each bathing season.

Online Bathing Water System-Splash

In July 2009, the EPA launched a new online map-based website "*Splash*" (bathingwater.ie) that provides the public with bathing water quality information for the 131 designated bathing areas around Ireland. The website provides the latest bathing water sampling results for each bathing area during the bathing season and their compliance status with EU bathing water quality standards. It also provides information about the compliance history of these bathing areas from 2003 onwards.

Overview of compliance

In 2009, the quality of Ireland's bathing waters remained high with 93 per cent of seawater bathing areas complying with the minimum EU mandatory values and achieving sufficient water quality status (EPA, 2009b, see Figure 5.6). However, this represents a downward trend of compliance from 97 per cent in 2007 and 95 per cent in 2008 (Table 5.8). While some of this may be due to high summer rainfall in recent years (average numbers of wet days were between 10-20% above normal in 2008 and 2009 (www.met.ie)), measures need to be taken to minimise these effects on bathing waters. Further measures including the provision of appropriate waste water treatment facilities are required if all bathing areas are to comply with EU standards.

The eight seawater bathing areas that failed to achieve sufficient water quality status are as follows: Balbriggan Front Strand, Skerries South Beach, Sutton Burrow Beach (Dublin, Fingal), Clifden Beach (Co. Galway), Dunmore Strand, Dunmore East (Co. Waterford), Duncannon (Co. Wexford), Killala Ross Beach (Co. Mayo), Youghal Main Beach (Co. Cork).

While the overall level of bathing water quality remains relatively good, a small number of bathing areas are consistently classified as poor. Of particular concern are the bathing areas of Clifden, which failed to achieve sufficient water quality status for the past five years, and Balbriggan Front Strand, which only achieved sufficient water quality status once in the last seven years.

Table 5.8. Seawater Bathing Water Quality Status from 2007 to 2009

Year	2007	2008	2009
Number of bathing areas	122	122	122
Number of bathing areas achieving sufficient water quality	118	116	114
Percentage of bathing waters of sufficient water quality	97%	95%	93%
Number of bathing areas achieving good water quality	99	98	102
Percentage of bathing waters of good water quality	81%	80%	84%

Box 5.2 The Blue Flag Scheme

The Blue Flag Scheme is a voluntary scheme to identify high quality bathing water areas, administered in Ireland by An Taisce and at European level by the Foundation for Environmental Education in Europe (FEEE). To receive a blue flag, a bathing site, in addition to maintaining a high standard of water quality, must meet specified objectives with regard to the provision of safety services and facilities, environmental management of the beach area and environmental education.

The EPA has co-operated with An Taisce to check that all water quality results obtained by both organisations each bathing season are comparable.

The analysis of bathing water in respect of the Bathing Waters Directive is separate from, although complementary to, the European Blue Flag Scheme. The EPA also participates in the National Blue Flag Jury, which assists in the initial assessment of the Irish applicants for the Blue Flag Award. The award is based on the performance and standards achieved during the previous bathing season. In 2007, 2008 and 2009, respectively, 80, 78 and 75 blue flags were awarded to Irish beaches. The decline in 2009 was due to heavy rainfall putting increased pressure on waste water treatment plants which had knock-on effects on the water quality at bathing areas.

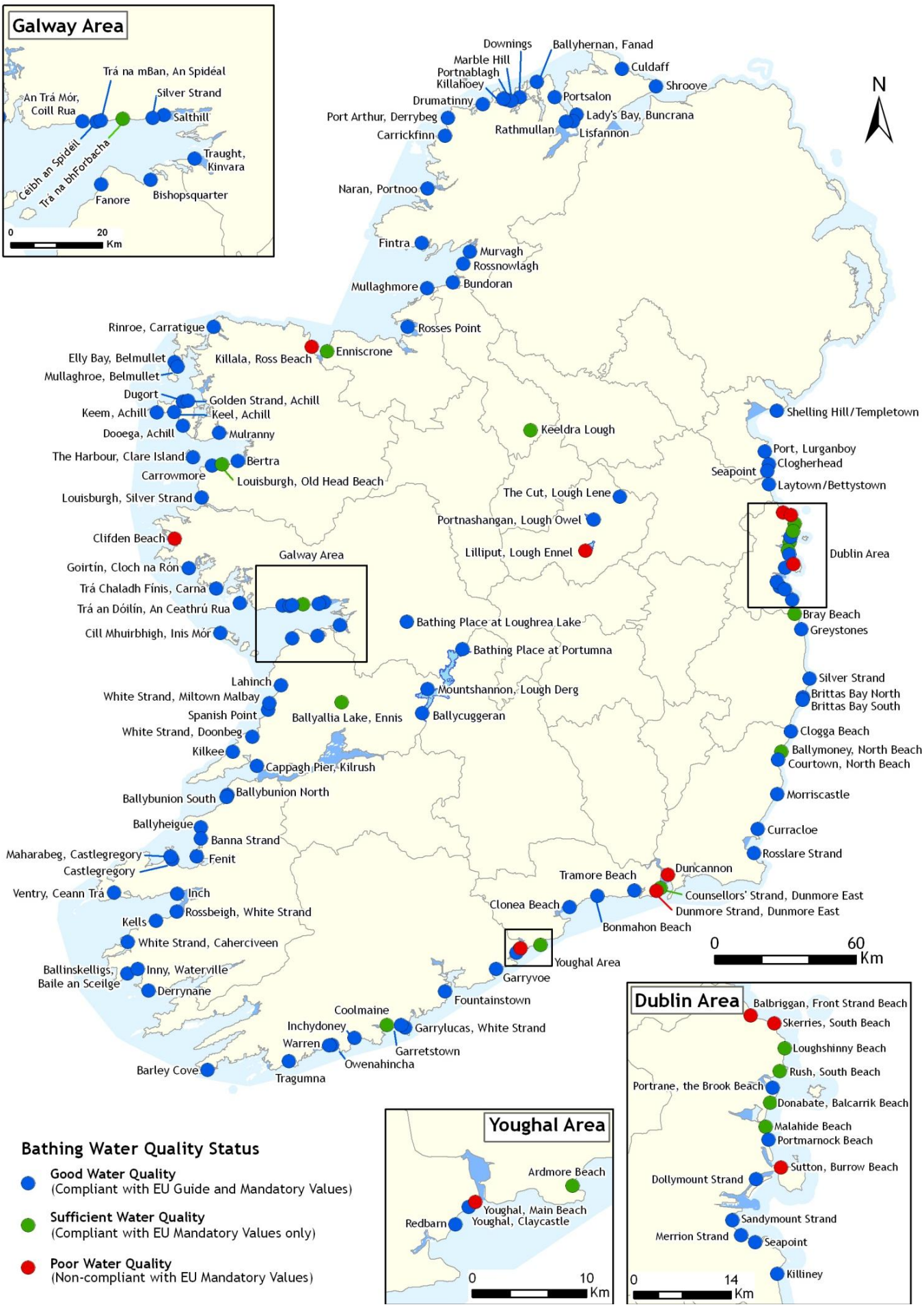


Figure 5.6. Bathing water quality 2009

RADIOACTIVITY MONITORING OF MARINE WATERS

Radioactivity monitoring of the Irish marine environment is carried out by the Radiological Protection Institute of Ireland (RPII). The primary focus of its marine monitoring programme is to assess the radiation doses to the Irish population arising from discharges from the Sellafield reprocessing plant and to assess the geographic and temporal distribution of artificial radionuclides in the marine environment. Samples of a wide range of fish and shellfish species are collected from commercial landings at major Irish fishing ports and aquaculture areas. Seawater and seaweed are analysed from coastal sites while seawater and sediment samples are taken at offshore sites in the western Irish Sea using the Marine Institute's research vessel *Celtic Voyager*. In collaboration with the Northern Ireland Environment Agency (NIEA), seawater samples from the north and north-east coast have also been collected. The most recent report on marine monitoring covers the year 2009 (McGinnity *et al.*, 2010, www.rpii.ie).

While discharges from Sellafield into the Irish Sea have been falling since the 1980s, discharges of the radionuclide technetium-99 increased sharply in the mid-1990s due to changes in waste treatment at the plant. Discharges of this radionuclide peaked in 1995 and reduced substantially after 2004 following the introduction of new waste treatment at the plant. These reductions in discharges have led to reductions in technetium-99 activity concentrations in seafood landed at Irish ports and in the Irish marine environment. By 2008, levels of technetium in the Irish marine environment had effectively fallen back to those observed in the early 1990s.

In 2008, the RPII commissioned a survey into the habits of people living along the north-east coast of Ireland. The aim of this survey was to identify the most important pathways by which people are exposed to ionising radiation as a result of discharges of radioactive materials into the Irish Sea. The survey collected quantitative information on fish consumption, beach occupancy and other potential exposure routes to allow realistic dose assessments to be made (CEFAS, 2008). Prior to this, the RPII reported doses on the basis of two hypothetical or notional seafood consumers referred to as the 'typical' consumer and 'heavy' consumer. Fish and shellfish consumption rates were estimated from habits surveys undertaken in other countries and from national average consumption figures. The typical consumer was intended to represent the dose received by an average seafood consumer while the heavy consumer represents a conservative estimate of the dose to a high-rate consumer.

The 2008 survey identified two critical consumer groups: Group A were a group of commercial fishermen who consume large amounts of fish and crustaceans (mainly prawns and crabs); Group B, were commercial oyster and mussel farmers who consume large amounts of molluscs. In 2009, the estimated annual committed effective doses to members of these two groups were 0.24μSv (micro sievert) and 0.44μSv, respectively.

These doses are small in comparison with the dose received (32 μSv) by the notional typical consumer due to the presence of a naturally-occurring radionuclide, polonium-210, in seafood. They may also be compared with the average annual dose to a person in Ireland from all sources of radioactivity of 3950 μSv. Furthermore, the annual committed effective dose to the notional typical seafood consumer has decreased steadily (Figure 5.7.), reflecting the overall reduction in Sellafield discharges since the 1980s.

The levels of radioactive contamination present in the marine environment do not warrant any modification of the habits of people in Ireland, either in respect of consumption of seafood or any other use of the amenities of the marine environment. The results of the RPII monitoring programme show that, while the levels of artificial radioactivity in the Irish environment remain detectable, they are low and do not pose a significant risk to human health.

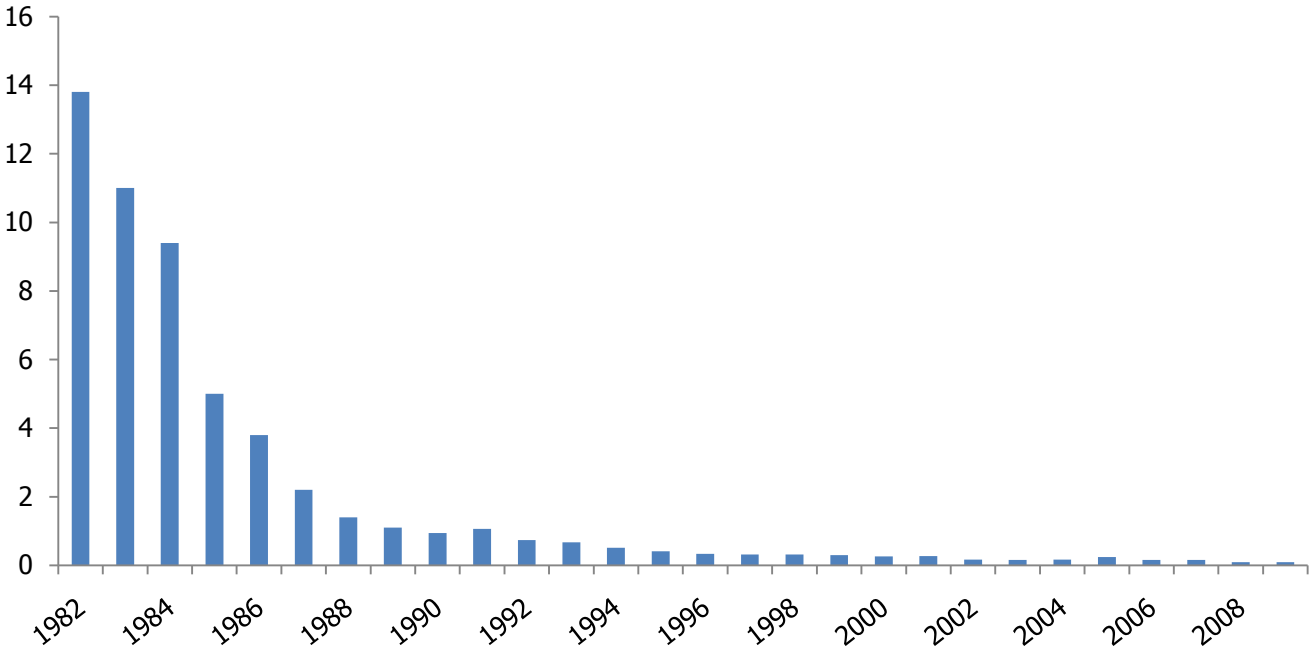


Figure 5.7. Committed effective radiation dose (μSv) to the typical seafood consumer.

OIL POLLUTION INCIDENTS

Responsibility for the investigation of oil pollution incidents in Ireland rests with the Irish Coast Guard (IRCG). The IRCG provides a response to marine pollution incidents or threat of pollution from ships and offshore platforms within the Irish Exclusive Economic Zone (EEZ) which covers an area (approx. 200,000 km^2) stretching to 200 miles off the west coast and to the median line between Ireland and the UK. The EEZ is an ecologically sensitive area with a wide variety of fauna and flora and supports an active leisure industry, with a large number of blue flag beaches, as well as commerce, including fisheries, marine transport and natural resources.

The major maritime incidents causing, or with a potential to cause, oil pollution that occurred in 2007-2009 are summarised in Table 5.9. The largest marine pollution incident during this time occurred in 2009, south of Fastnet Rock, when an estimated 300 tonnes of fuel oil and water mixture was lost during a refuelling at sea incident. The European Maritime Safety Agency (EMSA), as a result of a satellite image, first reported the oil slick south of Fastnet on the 14th February 2009. This was then confirmed by an aerial surveillance carried out by an Air Corps Casa maritime patrol aircraft, an oil pollution surveillance aircraft from the UK, an Irish Coast Guard helicopter and a Royal Navy vessel in the area. The oil slick was eventually traced back to the Russian Aircraft Carrier the Admiral Kuznetsov. The IRCG issued a large-scale response with assistance from local authorities, the Marine Institute, Air Corps, and private contractors, EMSA and the UK Maritime and Coastguard Agency (MCA). There was concern that the oil would have come ashore, but due to the prevailing weather conditions at the time, the slick trajectory was offshore and eventually dispersed.

The IRCG received 54 pollution reports during 2007, 45 in 2008 and 53 in 2009, all of which were investigated. In 68 per cent of incidents reported in 2007 and 38 per cent in 2008 and 2009, oil spillage was identified as the cause. Diesel and gas oil spills were the most frequently identified and made up roughly 58, 22 and 28 per cent of the overall total in 2007, 2008 and 2009 respectively.

Plate 5.1. Oil slick south off the Fastnet Rock in February 2009

The overall geographical pattern for oil discharges indicated that the majority of discharges occurred in the smaller harbours and surrounding areas. In 2007 and 2008 some 29 per cent of incidents were reported in the open sea while in 2009 this number was 13 per cent. The estimated number of incidents occurring in the open sea is by its nature a conservative one as the IRCG has no dedicated aerial surveillance capacity and relies on reports from shipping and commercial air traffic for such incidents. There was a rise in the reported incidents concerning offshore oil or gas installations (0 in 2007, 3 in 2008 and 4 in 2009). Although these were of a very minor nature it reflects on the readiness of the offshore oil and gas industry to cooperate with the Irish Authorities in combating potential pollution events.

The majority of the reported spills during the three years were of diesel and light oils with the estimated volume of discharge less than 1,000 litres (1 tonne). However one spill in 2009 was greater than 50,000 litres (50 tonnes) while two in 2008 were in the 1,000-50,000 litres (1-50 tonnes) volume category. There were seven reported pollution incidents in 2009 where the estimated volume of discharges was unknown. Also in 2009 there was one incident involving crude oil. The number of reported oil pollution events that beached on the shoreline was respectively two, five and six in 2007, 2008 and 2009, with the extent in all cases less than 1.6 km. During 2008, six incidents were reported involving oiled birds while there were no reported incidents of oiled wildlife in 2007 or 2009. It should be pointed out, however, that while these figures indicate little or no oiling of marine wildlife in Irish waters, they are based on rather limited information contained in reports sent to the Coastguard (H. Barry, pers comm.).

The total number of incidents reported by category of pollution in the Irish EEZ from 2007 to 2009 was:

	Mineral Oil	Garbage	Sewage	Chemicals	Other	Total
2007	43	-	2	2	7	54
2008	29	-	-	-	16	45
2009	24	-	-	-	29	53

The distribution of received reports of pollution in 2007, 2008 and 2009 by marine environmental zone within the EEZ was:

	Open Sea	Tidal River/ Estuary	Bay/Nearshore Water	Beach/Shore	Port Harbour	Total
2007	16	7	13	3	15	54
2008	13	5	6	8	13	45
2009	7	4	14	10	18	53

The breakdown of pollution sources in the three years was as follows:

	Unknown	Shore	Fishing Vessel	Oil Tanker	Cargo Vessel	Offshore Oil/Gas Installation	Pleasure Craft	Wreck	Dredger
2007	30	5	12	-	2	-	5	-	-
2008	16	5	13	1	3	3	2	1	1
2009	17	6	15	-	4	4	7	-	-

Table 5.9. Summary reports of larger maritime incidents involving the Irish Coast Guard (IRCG) during 2007-2009 in reverse chronological order (Source: H. Barry, IRCG). (NM = nautical mile)

Location	Date	Vessel	Incident	Outcome
Howth	1/08/2009	Two trawlers	Two trawlers sunk at their moorings with a resultant diesel spill.	Tier 2 response over 3 days including Bank holiday weekend. Harbour cleaned with assistance of IRCG staff and equipment and the IRCG local contractor.
50 NM S Fastnet	14/02/2009	Russian Aircraft Carrier Admiral Kuznetsov	300 tonne fuel oil lost during RAS operations	Large scale response with assistance from local authorities, Marine Institute, Air Corps, private contractors, EMSA and UK MCA. Slick trajectory was offshore and eventually dispersed.
30 m outside Killybegs Harbour Limit	4/11/2008	FV Shaun Shaun	Sunk with 1,000 l diesel, 200 l hydraulic oil and 50 l luboil on board.	Diesel observed breaking up on cliffs and at sea as weather deteriorated.
180 NM west of Loop Head	21/08/2008	FV Veni	Sunk with 123 tonnes of diesel on board.	Surveillance carried by the IRCG helicopter R115 and by Air Corps Casa 253. It reported 30 m x 30 m slick the following day breaking up in rough seas. Slick left to break up with weather action.
31 NM from Loop Head	10/07/2008	FV Koaxi	Sunk with 50,000 l diesel and 1,500 l luboil on board.	Surveillance by the IRCG helicopter R115. Slick observed to be breaking up with the weather.
53 NM W Loop Head	10/02/2008	Unknown	EMSA reported a slick which was identified by R115 9 NM x 6 NM.	AIS backtrack identified two vessels transiting that area earlier. UK and Netherlands authorities requested to inspect both vessels at next port. Netherlands inspected fishing vessel and had nothing untoward to report.
13 NM SE Ballycotton	12/09/2007	FV Jess A Dan	Sunk	5 gallons of luboil and 1500 l of diesel on board.
Mine Head	11/01/2007	FV Honeydew II	Sunk	Estimated 5,000 l diesel on board
South Coast	10/01/2007	FV Pere Charles	Sunk	Estimated 12,000 to 15,000 l diesel on board

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