Coastwatch Autumn 2012 Survey Results

Republic of Ireland

Coastwatch

Started in Ireland in Autumn 1987

ACKNOWLEDGEMENTS

Surveyors

We would like to thank the estimated 800 volunteers who were involved in this 2012 survey. While many surveyed in groups, we may only have one name for public acknowledgment overleaf.

A special thanks to all those who tried and tested new methods, grappled with our evolving instructions and handled weak computer signals. Your feedback, fieldwork observations, wonderful photos, as well as data input or posting has made this survey report worthwhile.

Regional Coordinators

A special thanks to Wexford and Galway County council, and all the groups and individuals who agreed to take on a regional coordination role with very little notice. Listed in clockwise direction: **Leo Boyle** (Meath), **Linda O Dwyer** (Dublin), **Rory Keatinge** (Dun Laoghaire), **Cliona Connolly** (Wexford), **The Tralee Wetlands Centre Team** lead by **David McCormick** and **Joanie McAuliffe** (Kerry), **Elaine O'Riordan** (Galway county), **Kevin Lynch** (Galway city + part Mayo), **Lucy White**, **Rose Kelly** and **Trish Murphy** (Donegal), with the Foyle 'Celebrate Water', Foyle Boat Club and Tralee Wetlands Centre extending their help to hosting trainers and organising events. Congratulations to Elaine's Baby 'Jonah' and Kevin's 'Oran' born just after the survey ended.

Coastwatch Core Team Volunteers

Survey planning and coordination: Karin Dubsky

New map based survey methodology design and execution: Ángel Duarte Campos

Design of On-line Data Input Programme and Photo upload: Paul Laird

Micro-litter pilot: Karin Dubsky, Ester Moncho and Ángel Duarte Campos

New questions, training, paper return data input and troubleshooting:
Karin Dubsky, Rory Keatinge, Ángel Duarte, Cathal O'Brien, Matthew Burns, Franziska Weißörtel, Mathilde Stallegger, and Emma Kiley.

Other Help

Bathing water map data and consultation: EPA, especially Dr. Micheal Lehane;
Laboratory support: Prof James Wilson, Mapping advice and surveyor video option: Gearóid Ó Riain, Compass informatics.

Results Report

Karin Dubsky, Ángel Duarte, Rory Keatinge.
Report Pictures: Coastwatchers as indicated beside each photo; Maps: Angel Duarte;
Art work: Julia Dubsky. Final edit: core team as well as Paul Dubsky and Linda Daniels.

A special thanks to Minister Jimmy Deenihan TD, for his personal support and engagement.

Sponsorship

We would like to thank the EPA for their awareness raising grant, the Dept. of the Environment, Community and Local Government Water Services Division for the grant towards report printing and the LA 21 Fund with matching support from Wexford and Donegal County Councils. Last but not least, the huge amount of benefit in kind given by many, including all regional coordinators.

SURVEYORS LIST

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Aine Walsh (and team)	Ester Moncho	Mathilde Stallegger
Alana Lyons	Ethan	Mattew Burns
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Ángel Duarte	Fergus Sweeney	Niamh Kelly
Angela Cox	Finn O Toole	Patricia Byrne
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Annmarie	Fiona Teehan	Patrick Lawlor
Anraí Ó Domhnaill	Flynn Family	Patrick Power
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Barbara Duff	Franziska Weißörtel	Paul Laird
Biddy White Lennon	Gerald Woolley	Paul Quigley
Bob Cowman	Gill Lewis	Peta Taaffe
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Danny Farren	Lucy Dillon	Suzanna O'Coineen
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David McCormick	Lucy White	Tommy Weir
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Enda Conneely	Mary Butler	

Note: This list is a subset of those who carried out the survey. For groups and school classes only 1 lead name is included. Where surveyors did not tick the box to allow publication and did not tell us otherwise, names are omitted.

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HISTORY OF COASTWATCH AND NETWORK AIMS

The Coastwatch Europe (CWE) survey was first designed and tried in Ireland in 1987 by the International Co-ordinator, in cooperation with the Irish Times. With EC aid the survey was then disseminated to eight European countries in 1988. The first large scale survey was carried out in 1989 in Norway, Denmark, Ireland, Netherlands, Portugal and the UK, and on a pilot scale in Iceland, Germany, Belgium and Italy. Participation grew in 1990 with Latvia, Spain and Sweden joining. In 1991 the survey area was further increased with the inclusion of Greece, Estonia, Lithuania and Poland. In 1992 France, Bulgaria, Ukraine and a corner of Finland were added and in 1993 Russia joined. In the same year, Japan brought 50 volunteers for training and then tried the project at home. In 1996 Romania joined. It was the year in which international coordination handed out analyses programmes to national teams to start reporting results at home and focus on follow up work to improve matters on the ground – provide the coastal public with information and deal with democracy issues – public participation in coastal zone management, planning and access to information. Several post graduate projects developed and PhDs were completed using Coastwatch methods. A faecal streptococci water pollution test kit design by Prof. Ronald Russell with students was later used internationally. Coastwatch was supported by EC project funding to do joint training, data gathering, or problem solving follow up work. Depending on country and time period, coordination teams would be volunteer, part or fully funded teams.

The survey is one base project shared by the Coastwatch Europe network members. General network aims put the role of the survey into context:

1. Training and education of volunteers and students in fieldwork, basic reporting methods and relevance of Coastwatch shore quality and problem survey results obtained to policy and legislation (from local to national, EU and international conventions).

2. Gathering baseline data about the European coast for use by local communities, authorities, governments, research organisations and NGO's.

3. Raising awareness of our coastal zone as a rich, divers European commons and as a valuable shared resource, for which we have responsibility.

4. Giving back up and expertise to members of the public, wanting to participate actively in coastal zone management (CZM), or specific protective and remedial action.

With time the focus broadened from waste and pollution to the natural environment and to coastal social and human rights issues. Lawyers joined national teams in several countries. Free legal and scientific aid was offered and significant law enforcement cases were taken as well as specific waste product changes achieved. As follow up work grew, national questions were added to the base survey questionnaire. The network went through a national focus period.

As the 25th birthday of Coastwatch approached and the new Marine Directive is being implemented, network members are planning an international survey once more. A new Google Earth, GIS and social media based survey approach was successfully designed by our Spanish volunteer researcher in Ireland. This will be presented for international use at 'The Gathering' of network members and for use in the Coastwatch Europe autumn 2013 survey.

EXECUTIVE SUMMARY

The 2012 Coastwatch survey marks 25 years since it was designed in Ireland. It is also the successful pilot of a new 'tech' version, using Google maps for site choice and mapping of select results.

Volunteers from around the coast chose survey areas on line or by contacting regional and national coordinators. After preparations, they carried out a snapshot audit of 500m long survey units from hinterland down to low water. Surveyors walked the shore around low tide and completed the Coastwatch questionnaire with international baseline and extra Irish questions. Some also used water quality test kits and collected sediment samples. Results returned on line or by post, were inputted and analysed. The draft report was presented for discussion at a results and follow up conference in the EC offices Dublin on Nov 30th 2012. The final report was then prepared.

Approx. 480 survey units (s.u.) of 500m shore lengths were examined by around 800 volunteers. All coastal counties, with the exception of Leitrim and Limerick, were represented in results returned to Coastwatch coordination in Trinity College Dublin. After omitting duplications and inaccessible shores, 389 accessible s.u. were included in data analyses. That is at least 2.8% of the Irish coastline and ~4% of the accessible shore. Further survey data, received too late for analyses, was logged, and some key findings mentioned in this report.

Results and surveyor photos show that we have something to shout about on our >6,800 km long coast with stunning landscapes and features, sheltered varied shores, many fresh water inflows (nearly 1/ s.u.) and high biodiversity value. However surveyors also found local problems to address - from foreshore quarrying, to inflow pollution, to localised dumping and shore infill. Pooled national results highlight wider issues including marine litter, waste and shore management issues which need to be addressed (inter)nationally.

High and Low lights

1. **Nature recordings and citizen science:** Volunteers discovered rare habitats and species. Some of these were recorded at new locations for the first time, including:

   Seagrass patches of *Zostera marina* in tidal channels of Tramore Backstrand Co Waterford, indicating improving conditions in this estuary and 4 *seagrass* beds fringing the Donegal shore of Lough Foyle, with one bed sporting man length seagrass blades! That brings the list of Irish sites with this valuable fish nursery habitat from the 19 officially listed on the OSPAR Convention data-base to 21. As in L Foyle, this habitat is in a cross-border area, local Coastwatchers have already taken the initiative to bring it to NI government's attention.
   Honeycomb worm reefs (*Sabellaria***)** found on more sites than in any previous Coastwatch survey. These biogenic reef creations made of sand and body glue by pink little worms are very well camouflaged. Surveyors sent photos to verify records which came from counties Wexford, Waterford, Kerry, Galway, Sligo and Donegal. Only one site found in Waterford was already on the national Biodiversity Data Centre log map.
   Native Oysters found consisted mainly of old shell halves, reminding us that this was a widespread common shellfish. But live native oysters are now very restricted in distribution. In our survey they were reported from Tralee Bay, Loughs Swilly and Foyle. In the two Donegal sites the native oyster has an introduced competitor - the Pacific (also known as Japanese or Gigas) oyster, used in aquaculture.

   Invasive Alien Species: Plant IAS records growing at the edge of more sheltered areas included Giant Hogweed, Himalayan Balsam, Japanese Knotweed and Spartina grass. Reports and photos from more exposed areas noted New Zealand flax and Sea Buckthorn, especially in dunes. Invasive animal records included the Gigas oyster and one Asian clam. The Gigas oyster is spreading in Loughs Foyle and Swilly on rocks and in native oyster beds.

2. Surveyors also reported habitat damage. 'Old sins' included the Dublin Ringsend Park splash zone, which is part-covered with an array of concrete slabs, blocks and tarmac. On-going

damage was reported from a cross border quarry on the apex of the Lough Foyle Natura 2000 site at Inis More, where part of the tidal river bed has been in filled to make a long hard surface for excavators that remove sediment in the remaining channel. Mussel seed dredging off Wexford harbour, with boats seen in the Natura 2000 site during the survey were another issue noted by surveyors, as were defunct aquaculture installations in several bays. The demolition of Blackrock bath during the survey with full trucks driving over the protected mudflats raised bird disturbance, habitat damage as well as decision making process concerns. These issues are still being followed up.

3. Almost 60% of all s.u. which were (part) in a Natura 2000 site were not known to be thus protected. This knowledge question was answered by active citizens interested in the coast, years after such designations were made. Pride in designation, care and timely implications of planned activities can't really work unless this is addressed.

4. Shore uses were recorded including bathing, noted in 52 s.u. Some sites which are not yet designated as bathing waters in Meath, Dun Laoghaire, Wexford, Galway and Donegal were described as 'popular' or 'consistent bathing water'. A pilot question asking surveyors to note if there is something they really liked about their shore, saw shore use as third most important attribute.

5. Waste and Litter continues to be a core part of the Coastwatch survey. Results show:

    - Large waste is not as widespread as it was in the 1980s and 90s. Still landfill materials remain an issue in 19% of sites. Some serves as erosion control and occasionally as wetland infill (e.g. Youghal Co Cork). The dumping of dead farm animals which was a significant problem 25 years ago has ceased. Dumped cars and machinery are also a rare sight now. While coastal landfill sites have all closed, some are eroding and releasing old waste material (e.g. Bray town dump).

    - Litter counts for drinks containers, tyres and plastic bags show plastic bottles remain the highest count litter item with over 10,500 plastic bottles counted, spread over 83% of s.u. - an average of 26/s.u. Some 4,709 cans (12/s.u.) were found on 68% of shores. In contrast the plastic bag count remained at 2/s.u. ever since the plastic bag tax was introduced. Only 13% of shores were free of 'count litter'.

    - The most widespread small litter category after plastic bottles and cans reported was fishing gear, followed by hard plastics.

6. A new Irish micro-litter survey was piloted to find a simple effective method for volunteer surveyors. Of 83 tide-line sediment samples analysed, 59 appeared free of the 0.1 to 10mm size range micro-litter, while 126 litter pieces were found in the rest. These were 90% plastic, with fine filament and polystyrene beads as the most common form.

7. Stream, drain and piped discharge quality has improved compared to earlier years. In 2012 less than 0.5% of inflows carried oil pollution and in 1.5% sewage or sewage fungus were reported. Nitrate tests carried out by surveyors on inflow water, showed that in just over half of 162 inflows tested, nitrate levels were below 10 mg/l, However traditionally high contamination areas around Rush were high again with readings over 100mg/l in several drains.

8. Surveyors reported threats to their shore in 45% of s.u. and erosion was by far the most common threat reported, followed by water pollution and dumping or infill. The threat of construction in the coastal zone dropped to well down from peak Celtic tiger days.

9. Weather: Some results including the low nitrate levels may have been influenced by the rainy summer. Several surveyors remarked on late seabird fledglings including Sand martins near Shanganagh Co Dublin and Little terns in Baltray Co Louth.

10. Recommendations, on-going and planned follow up action and events will be uploaded regularly on the Coastwatch website www.coastwatch.org.

INTRODUCTION

The 2012 Coastwatch survey marks 25 years since the survey was designed and first run with the Irish Times (Image 1). This autumn also marked the pilot of a next generation survey method using open access software and Google Earth for survey site mapping and displaying results, and Facebook as the main information update channel. The new design was tested in Lough Foyle as a pre survey test run with The Foyle 'Celebrate Water' group and the Foyle Boat Club, who hosted Coastwatchers from Ireland N and S for this purpose. Glitches found with the new questions, the on-line form and guide notes were addressed.

Once launched, further challenges emerged especially for volunteers without broad band. In the end two systems were run: (1) a printed questionnaire and map posted out by central or regional coordination to surveyors who then carried out the fieldwork in survey units marked on the map and (2) as a web based activity where the surveyor chose survey units, downloaded questionnaires and inputted data collected in fieldwork him or herself.


Just how dirty are our shores?

Coastwatch pilot scheme questionnaire

Image 1- **First Survey with the Irish Times.** (Source: The Irish Times) http://www.irishtimes.com/newspaper/archive/1987/0917/Pg011.html#Ar01100

The survey ran from Sept 15th to Oct 15th, with 'Extra Time' provided due to poor weather in the middle of the survey period. An official close was hosted by Tralee Wetlands Centre and performed by Minister Jimmy Deenihan.

Image 2 - **1:** Pre-survey pilot in Lough Foyle, at Donegal; photo by Mathilde Stallegger. **2:** Surveyor team at Sorrento Point, Dun Laoghaire; photo by Mike Mc Govern. **3:** Young surveyors at Carrickfinn, Donegal; photo by Sinéad Ní Dhomhnaill. **4:** Geography class surveying at Dunmore, 6th year Newtown School, Waterford; photo by Andrew Cox.

METHODS

The survey is designed to give an overview of the state of the coast (see questionnaire, Appendix 1). It involves volunteers from all walks of life, checking their chosen 500m stretch of coast once around low tide, and jotting observations down on the survey questionnaire while on the shore.

A survey site or survey unit (s.u.) is a stretch of shore approximately 500m long as measured along mean high tide mark. The width covers the sea shore from start of the hinterland down to shallow water at low tide.

Materials

The Coastwatch Survey 2012 materials were available online, but also distributed through the (regional) coordinators by post on request. The full set comprised of:

- Survey Questionnaire 2012: The international Coastwatch base questionnaire used cross Europe with extra Irish questions and an Irish biodiversity poster for species identification.
- Survey Guide Notes: with detailed instructions how to participate and survey question explanations. Instructions on how to find and chose a survey site and how to share photos and videos were also available. A poster was on line with species description links to help identify biota mentioned in questions (see reprint without species notes -inside back cover)
- Water quality test kits:. Nitrite/nitrate tests with colour charts and instructions for testing fresh water inflows.
- Sample containers: For the micro-litter pilot study. Two coded sample containers along with instructions on how to take the samples.

New System for Identification of Survey Units

In previous years the coast of each county had been divided into 5 km long survey blocks on scaled paper maps from the Ordnance Survey. A map extract was posted out to surveyors who then subdivided their block into 500m survey units and planned the survey together, often with social collating and feedback sessions.

The unique ID code of each survey unit, noted on the map and then the top of the questionnaire was based on the CORINE system: First country code, then county, then 5 km block and finally s.u. code, moving in clockwise direction from Carlingford Lough in Co Louth, to L Foyle in Co Donegal.

This year a pilot system was developed for the identification of the survey units, to provide quicker and more informative access to the survey map for the surveyor. The coast was divided in 500m survey units using open source GIS. As in previous years each s.u. was given a unique code. Due to time constraints island codes were only added on request.

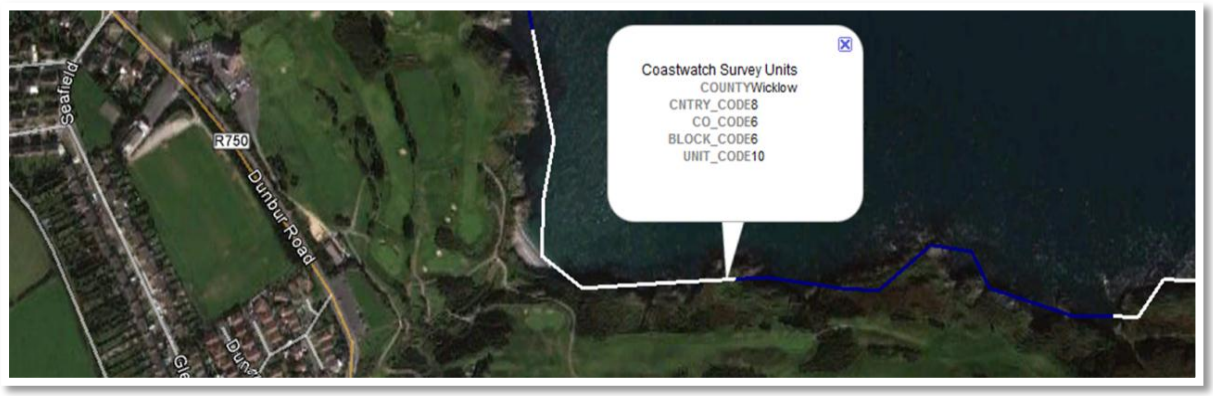


Image 3 - **Use of Google Earth for survey site identification.** Source: Google Earth.

To have access to this information and to be able to identify a suitable survey site the surveyors were asked to download a KML file, to be opened with Google Earth. When the file is opened it displays the coastline of Ireland, coloured alternating blue and white, each one denoting a 500m survey unit. When a line is clicked, the unique ID code pops up. Once using Google Earth the surveyor was able to zoom in and out, to switch the view from satellite image to map, to print off a screenshot, to see historical satellite images, to add place marks, to get directions etc. This also allows an easier identification of the start and end points of the coastal units.

The division was done using a coastline layer from Open Street Maps (OSM). OSM is a collaborative project to create free editable maps of the world. Challenges encountered included an uneven and in places a poor match of the actual coast. The lack of time prevented extensive corrections. Because of the size of the file (over 14,000 features) it was not possible to use an online viewer. Instead we had to ask our surveyors to download the file. This created difficulties where surveyors were not familiar with or did not have the application. As fall back, screen prints of the relevant areas (with the site codes) were posted or emailed out on requested.

In the future we hope to be able to correct the resolution problems on the coastline layer and to have a map viewer embedded in our website.

Finding surveyors, booking areas and monitoring progress

Surveyors were informed via newspaper, Facebook, Conservation Volunteer notices and environmental group networks that the survey was on and their participation was welcome.

To book a survey site, surveyors were asked to inform the regional coordinator (where applicable) or the national coordination team. The monitoring of progress was done using Google Maps, with weekly updates of the booked and surveyed sites.

Coordination and communication

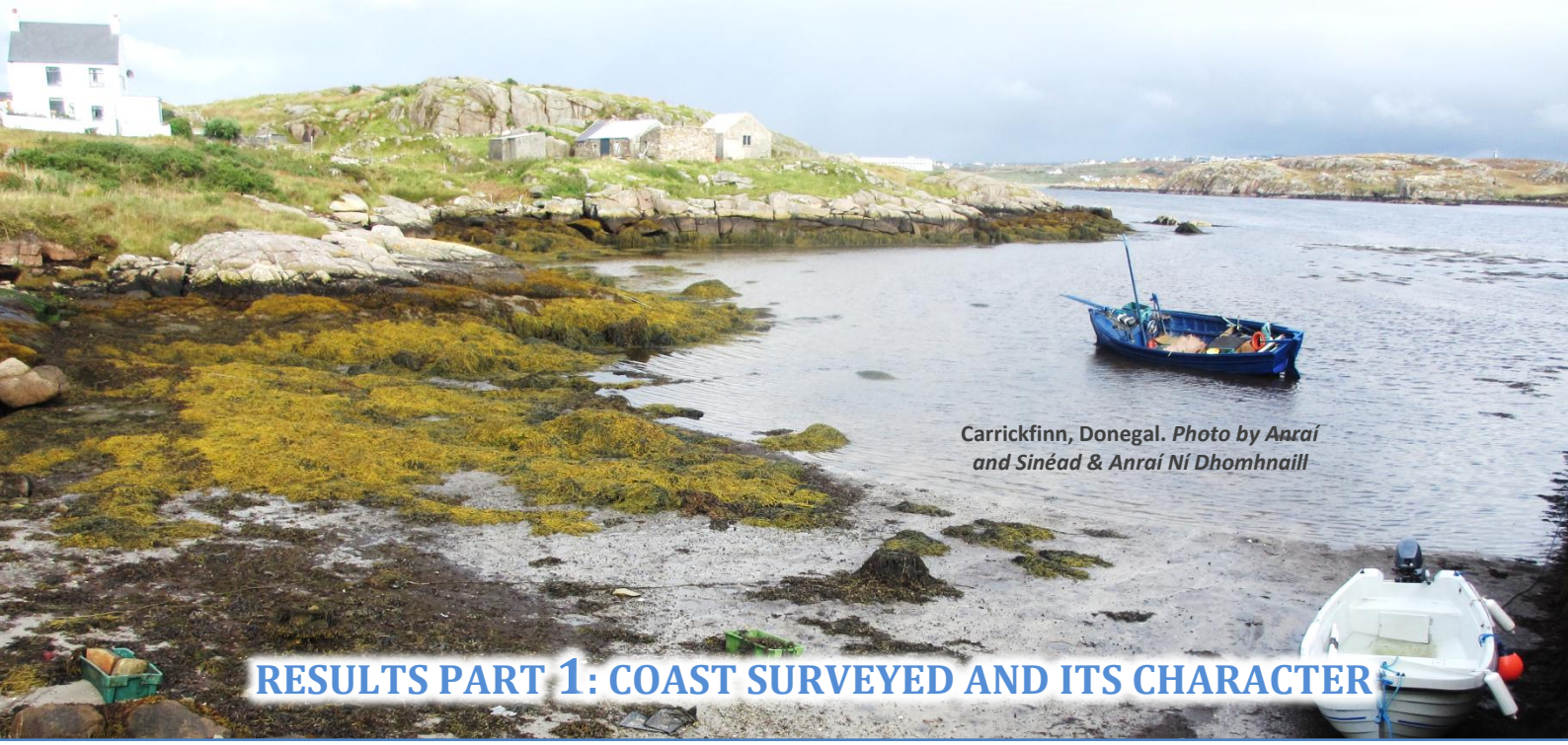
A request for regional coordinators went out to those who had done the task before, but rather late, as initially it was planned to pilot the new system via web and with central coordination only. A small number of regional coordinators were prepared to engage days before the survey started and results show that these counties had the highest participation rate. The main regional coordinator tasks were to inform their network of contacts, answer surveyor questions regarding site allocation, and to carry a stock of test kit and questionnaire materials so surveyors could drop in and collect these. Some training sessions were organised by regional coordinators for groups and individual surveyors, with the national coordination team sending trainers. The limited finance only allowed a small number to be facilitated, with bias toward the easily reached Dublin and East coast region.

Data compilation and analysis

Surveyors were given two options to return the completed questionnaires: to enter the data directly via the online input form on the Coastwatch website, or to post the questionnaire and any sediment samples to TCD, for data input and sediment analyses by Coastwatch volunteers.

Data entered into the online form was received by the national coordination team in a file with coma separated values. This was transformed into an excel spread sheet to be checked and finally aggregated for statistical analyses and mapping. Unusual finds were followed up by contacting the surveyors. Where several surveyors had covered the same survey unit the results were compared and only one, normally the first, was used in the final analysis. If a later survey contained more detail, then that one may have been used instead.

In the case of any fully inaccessible survey sites, only Section A of the questionnaire was filled in. These survey forms were omitted from the result analysis.



RESULTS PART 1: COAST SURVEYED AND ITS CHARACTER

1. Coast Surveyed

In total approx. 480 survey units (s.u.) of 500m length of shore each were returned to Coastwatch HQ. Some of these came too late to be included in this analyses. However they were scanned through and pertinent comments included. Others were duplicates, which were useful to compare results. That left 401 s.u. with some information and 389 s.u. of accessible coast for use in the main analyses. That is approximately 2.8% of the total Irish Republic coastline and ~ 4% of the accessible coast. Almost all counties were represented, but as in previous years there is a bias towards urban areas and the east coast.

Most surveys included were carried out in Wexford, with 77 reports returned in time. Donegal came second with 64 sites (see figure 1 below).

When expressed as percentage of coast covered, Meath was the county with the greatest representation of its coastline at over 60% (see Figure 2 below). Dun Laoghaire Rathdown came next with exactly half of its sites covered.

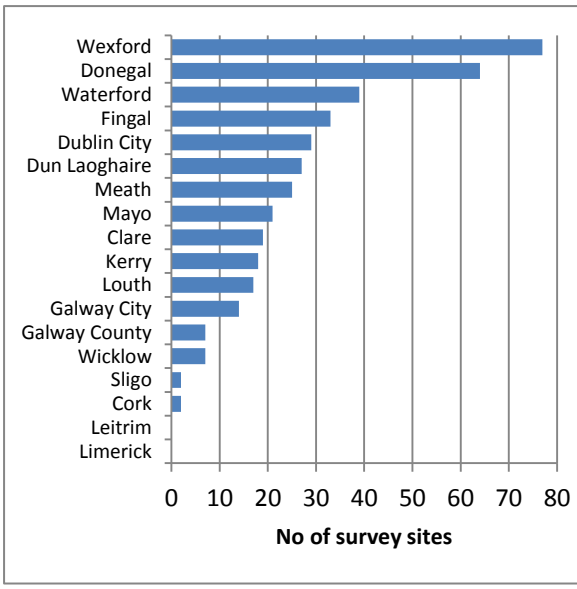


Fig 1 – **Number of survey units per county.** (Total = 401 s.u.)

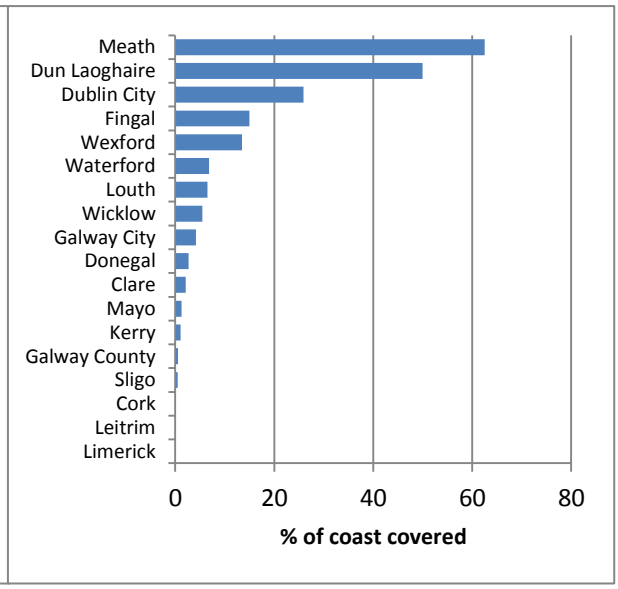


Fig 2- **Percentage of coast surveyed by county.** (Total = 2,75 % of coast)

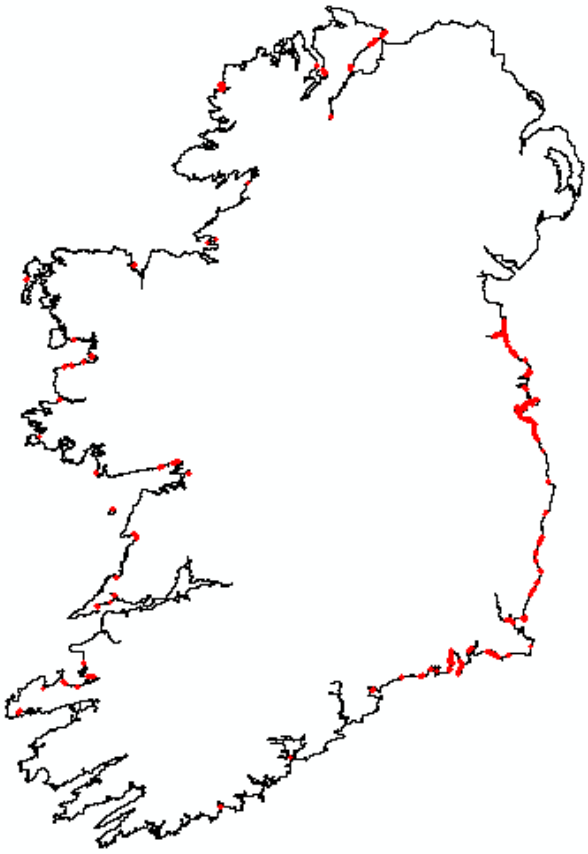


Fig 3 - **Sites covered on the Coastwatch Survey 2012**

Surveying tended to be carried out at the weekend. Figure 4 graphs the number of surveys per 48 hours. Almost a third (128) were carried out between the 12th and 15th October coinciding with good weather in most places and coming into spring tides.

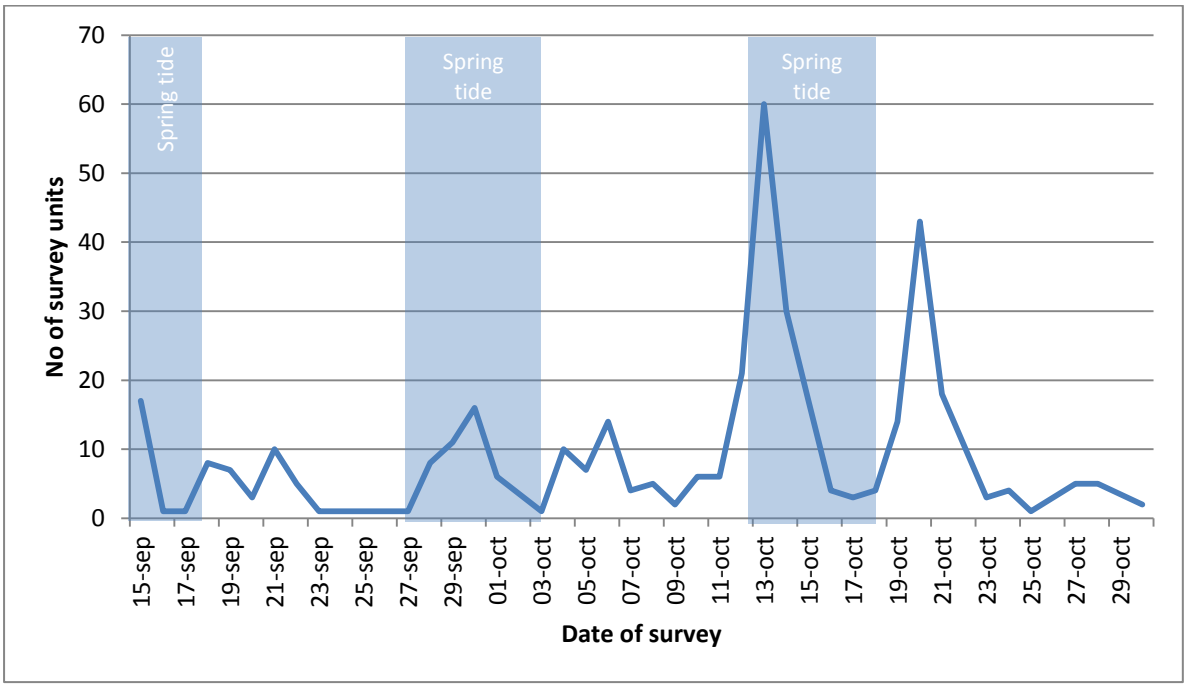


Fig 4 - **Date of the surveys.** (N= 401 s.u.; Source: Question A4). The blue bands indicate the occurrence of spring tides.

2. Access to High Water Mark

Knowledge of access to the coastline in case of emergency, or for wheelchair and paramedic use, is important. Old access routes may no longer exist after erosion or development (photos below) whilst new access points are occasional created.

Image 4 – **1.** Deteriorated access to coast in Louth; photo by Áine Walsh. **2.** "Difficult access" in Dun Laoghaire; photo by Vico Rocks Team. **3.** Can be achieved by locals with good tidal knowledge; photo by Paul Dubsky. **4.** Easy by car as in this Tralee site with regional coordinators from Tralee wetland centre.

The 2012 surveyors reported some survey units in their area which were completely inaccessible, both directly from land and via another s.u. This was mainly cliff coast. Of the total 401 s.u. 315 were directly accessible from the hinterland, at least by foot, while the rest could be accessed via another s.u. Of the 315 s.u. with direct access 106 units had vehicle access and in 40 wheelchair access was reported. Surveyors were also asked to note if part or all of the surveyed area was subject to access prohibition such as signs to stay out: 32 responded that this was the case. That included harbour areas as well as former restoration areas like Stagrennan polder where the signs were still in place.

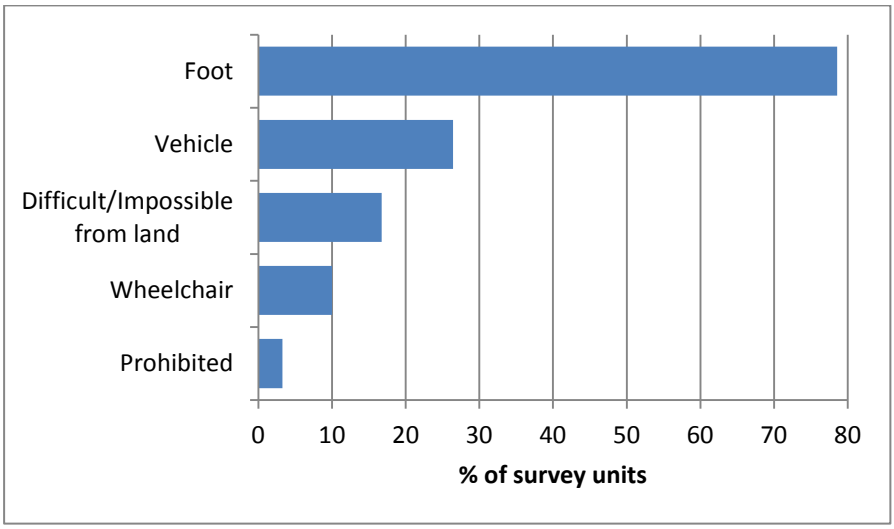


Fig 5 - **Type of access to survey units.** (N=401 s.u.; Source: Question A8). Of the 67 units described as difficult/impossible 12 were completely impossible to access.

3. Hinterland

The immediate hinterland is described (for this survey purposes) as the first ~500m of land, immediately above the splashzone of a s.u. But the exact shore limits are not always clear. As the Foreshore Act is about to be amended a short note of definitions is included in box below.

SHORE DEFINITIONS IN THE FORESHORE ACTS 1933 - 2005

The word "**foreshore"** means the bed and shore, below the line of high water of ordinary or medium tides, of the sea and of every tidal river and tidal estuary and of every channel, creek and bay of the sea or of any such river or estuary (NB - In the Coastwatch survey that is referred to as the intertidal and sub-littoral.)

The word "**seashore"** means the foreshore and additionally every beach bank, and cliff contiguous thereto and includes all sands and rocks contiguous to the foreshore (in the Coastwatch survey that means extending landwards to the upper limit of the splashzone). However in the Irish translation of the act, the landward end of the seashore is defined by where marram grass (if present) ends. Marram grass can extend inland beyond the foredunes. The Foreshore Act 'seashore' is normally equivalent to a Coastwatch 'splashzone', except where fixed dune with marram grass is found when Coastwatch would define it as 'hinterland'.

Finally "**tidal lands"** means the bed and shore, below the line of high water of ordinary spring tides, of the sea and of every tidal river and tidal estuary and of every channel, creek, and bay of the sea or of any such river or estuary – i.e. right up estuaries into the tidal, but already fresh water apex.

Figure 6 below shows the percentage of s.u. where a given hinterland was present, ranked from most to least frequent. Most surveyed areas had a mosaic of several different hinterland types.

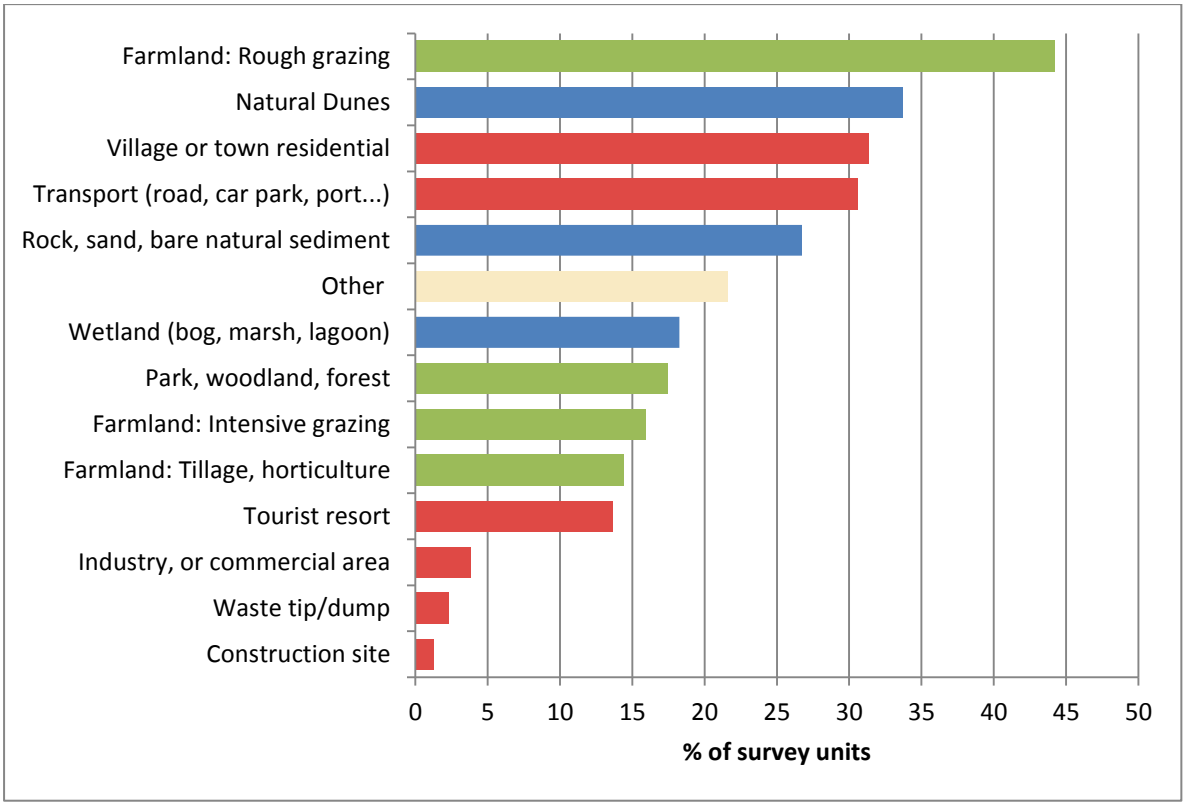


Fig 6 - **Use of the immediate hinterland**. (N=389 s.u.; Source: Question B1). Percentage of survey units with a given use.

Image 5 - **Glassilaun Beach, Co. Galway**; photo by Lucy Dillon

The hinterland can have a direct effect on the shore and vice versa. An unlined dump is likely to cause pollution problems and other negative impacts, whilst low coastal fields or even urban parks may be used by wintering geese and other shore birds as direct extension of the shore at high tide.

'**Rough grazing and scrub'** was the dominant immediate hinterland type and found in almost 45% of all survey units. Natural dunes came second and were part of over 30% of the units surveyed, whilst construction was found in 1% of the units surveyed with only five instances reported.

Natural dunes can provide valuable erosion protection as well as supporting unique biodiversity. Limited farm use for extensive grazing is beneficial. Dunes are a beach visitor attraction and a fresh water filter and storage area. As this soft coast is often in a state of flux - accreting or eroding - the limit of hinterland versus seashore also changes. In some East coast areas, especially north Wexford and Louth, accretion over the last 3 years had created a new broad band of white dune in front of the rocky shore and boulder clay sea banks. Notably in early October - so within the survey month - the sea suddenly eroded this new dune band. In some places up to 12 metres were lost in days, with life buoy rings on poles swimming away in north Wexford and reducing the fringe dunes to very narrow lines with long marram roots trailing onto the shore.

The hinterland units can be further grouped into three clusters:

-Agriculture & Park: farmland (tillage/horticulture, intensive & rough grazing) and woodland/park.

-Natural environment: including dunes, wetland and rock/sediment.

-Man-made or urban: this includes village, tourism, dump, industry, construction and transport.

The clusters are roughly equal size, with approximately one third in each cluster.

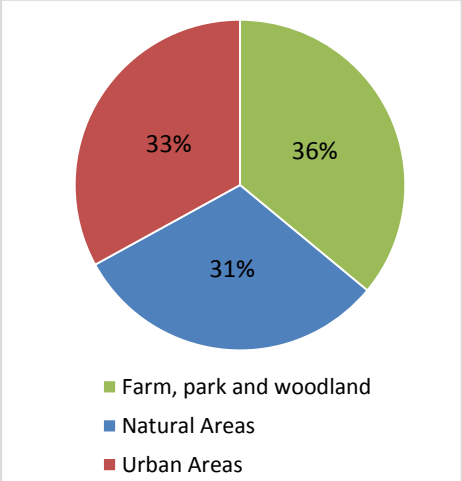


Fig 7 - **Main character of the immediate hinterland.** (N=679 uses noted; Source: Section B1)

4. Inflows

There were 362 inflows (0.8/s.u.) recorded in the survey with small rivers as the most common type of inflow -see figure 8 below. While from past surveys piped discharges are most likely to be polluted, pipes are also used as field drainage and as culverts under roads. Only the small streams/rivers are recorded as inflows in the Coastwatch survey, large rivers are surveyed by walking up the estuary. Small rivers are vital habitats for fish such as eel, flounder and can even host spawning salmon and trout as surveyor Andy Kelly noted in Castletown. Seepage which ranked third in occurrence indicates either limestone shores as in Doonbeg or parts of Mayo, or an overflowing fresh water wetland behind the beach like Toberpatrick dunes in North Wexford. Inflow quality and pollution are described in Part 3.

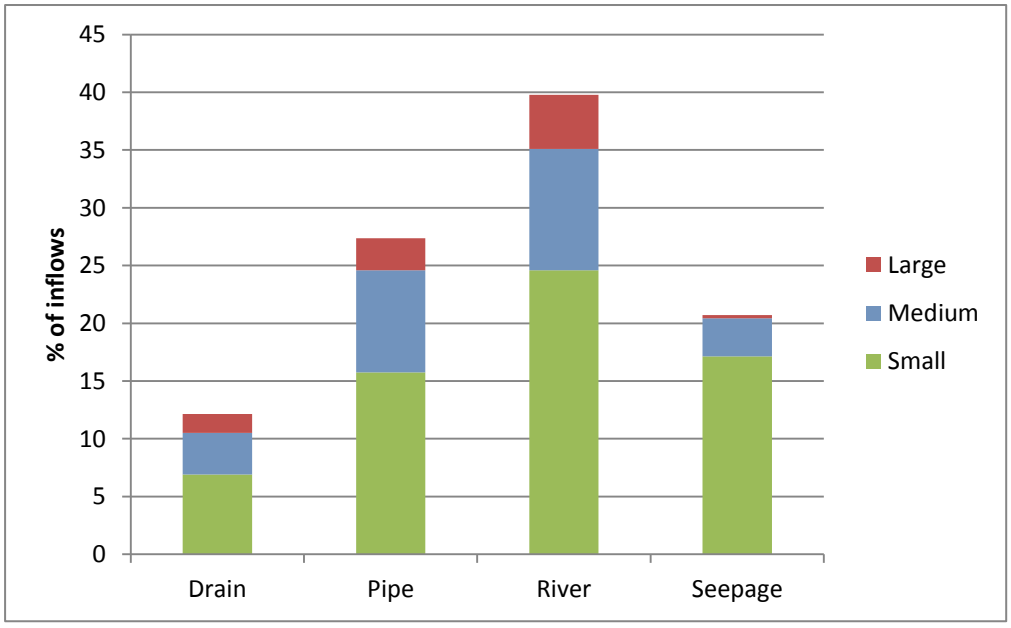


Fig 8- **Type and size of the inflows.** (N=362 inflows; Source: Question B2)

Image 6 - **Different types of inflows found on the Survey 2012.** Photos by **1 & 2** Celebrate Water (Donegal); **3** Mathilde Stallegger (Ballymoney, Wexford); **4** Martin McLoughlin (Tralee Bay, Kerry); **5** Ángel Duarte (Howth, Dublin)

5. Shore: Splashzone & Intertidal

The splash zone is the area between the mean high water mark and the spring or storm tide high water mark. Surveyors were asked to estimate the width and could tick several width bands. In 46 % of the surveys all or part of the splashzone was found to be in the 1m- 5m wide band and in nearly 40% the width was 5- 50 meters. Regarding substrates, in 82 % of the s.u. sand and gravel made up all or part of the splash zone. One third of the splashzones surveyed had hard erosion control present in part of the splash zone, followed by natural rock and different types of vegetation.

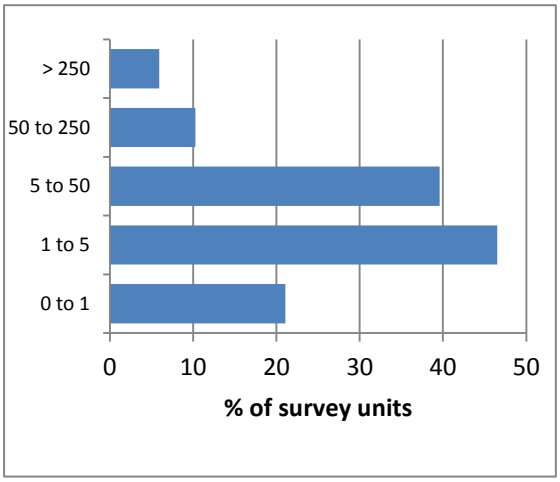


Fig 10-**Width of splash zone.** (N=389; Source: Section C1)

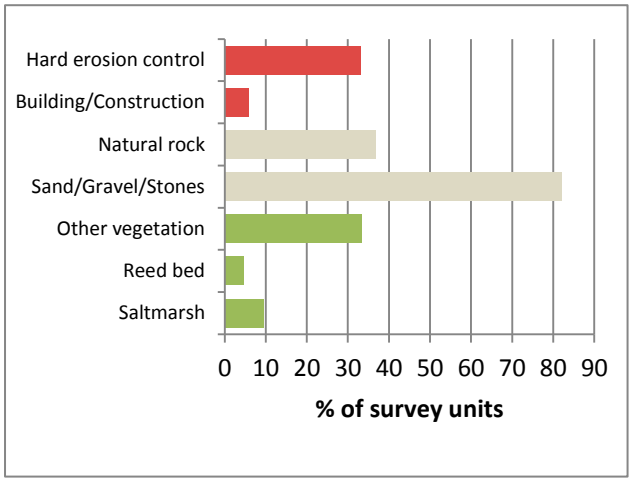


Fig 9-**Make up of the splash zone.** (N=389; Source: Section C2)

The **intertidal** is the area between the low water mark and high water mark, and is generally found to be larger than the splash zone. Returns showed 41% of the survey units had intertidal areas 5-50m wide, 39% were 50- 250m wide, while 20% surveyed were large expanses >250m wide .

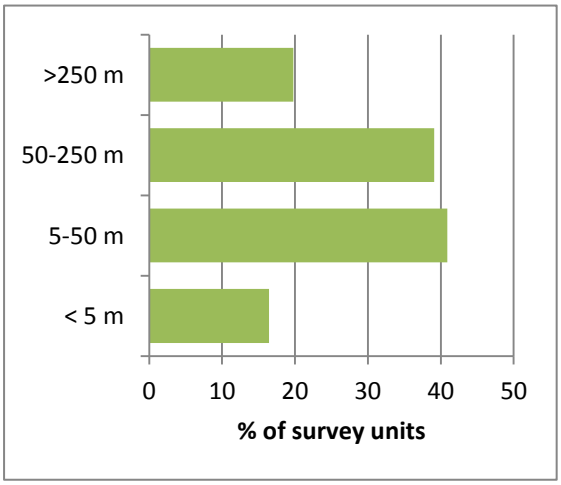


Fig 12 - **Width of intertidal.** (N=389; Source: Section D1)

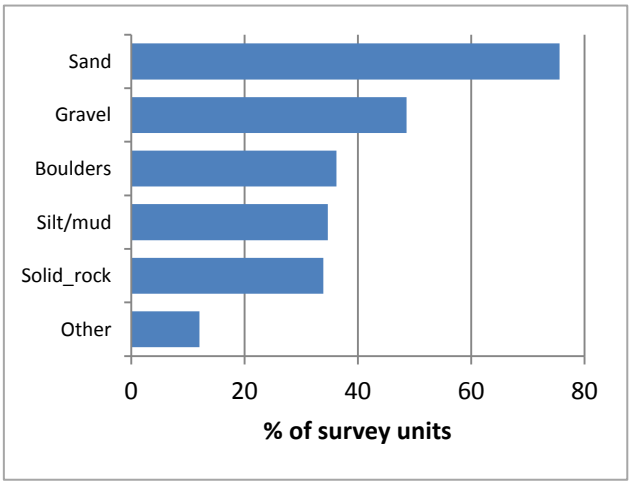


Fig 11 - **Make up of the intertidal.** (N=389; Source: Section D2))

The intertidal mirrors the make up of the splash zones, with sand gravel and stones found in over 75% of s.u.. Again many of the s.u. had more than one sediment type, highlighting the variety of the Irish coastline.

We can conclude that this year most of the surveys included some sandy areas and beaches, followed by extensive mudflats and rocky shores or rocky outcrops.
Width of intertidal. **(N=389; Source: Section D1)**

Bull Island, Co. Dublin.
Photo by Franziska Weißörtel

RESULTS PART 2: BIODIVERSITY

There is lots of life on our shores. Some is very obvious, like seaweeds hanging off rocks when the tide is out and limpets between them sticking up like hats. Hundreds of thousands of seabirds have arrived on our shores, crowding into estuaries for food and shelter. They move, talk to each other and we can't miss them. A seal's head popping up, occasional sightings of a passing pod of harbour porpoises or whales off Hook head around Christmas are also noticed. But the vast majority of sea life – even intertidal sea life we stand on when out on a mudflat – goes unnoticed. That even goes for long lived habitats like Seagrass beds. Segrass Zostera is highly vulnerable to disturbance and pollution. If people do not know of its presence on mudflats or in a tidal channel, they will not take care with activities which may damage it. Also if the presence is not known, the loss will not be missed. Not only are locals often oblivious to the shore's riches, scientists and authorities have far too little information about the majority of our ocean wealth, including easily accessible inshore areas.

Given the acknowledged high rate of species loss in the world today and the UN Biodiversity Convention's firm targets of halting the loss of biodiversity, this lack of knowledge needs to be addressed.

The Coastwatch survey started 25 years ago with focus on shore pollution and waste problems. There was only one question relating to shore life and its harvest. While going international, the Coastwatch coordinators added more nature questions, we noted results from Ireland were too unreliable to use. In contrast those from Sweden, France and the Ukraine were answered more often and identification skills and knowledge were much higher. Marine nature outdoor education was fundamental in those countries. A Heritage Council grant provided Coastwatch Ireland with an opportunity for training and information materials. Later info booklets were made available gratis. This improved matters a little. Still our indicator game, summarized below, never saw seashells beating cars.

Coastwatch indicator game played with pupils: Classes of 12 to 15 year olds were asked to identify a selection of sea shells found around our shores from a real shell display and then, in round 2, to identify different car brands from pictures. The correct ID of cars was generally 3 - 4 times higher than that of the molluscs.

In summer 2012, the Irish government adopted the 'Harnessing Our Ocean Wealth' plan, which foresees doubling the value of 'our ocean wealth' to 2.4% of GPD by 2030, and increasing the turnover from our ocean economy to exceed €6.4bn in just 8 years, a very ambitious plan. See http://www.ouroceanwealth.ie/SiteCollectionDocuments/Executive%20Summary%20Harnessing%20Our%20Ocean%20Wealth%20Report.pdf. Can this be done without accidentally damaging or destroying sensitive components of marine ecosystems? The more we know both as a nation and as local communities how our seas and our decision making processes tick, the more likely that we can have real public participation and make informed wise decisions which benefit the seas and society.

Today the Coastwatch survey Nature related questions have three aims:

- **(i)** to alert surveyors to local shore biodiversity
- **(ii)** to collect citizen science information about select species and habitats which can be useful for subsequent protection, monitoring, wise use and management
- **(iii)** to help strengthen informed citizen participation in shore protection, development, restoration and use.

Regarding the second aim, part of the information gathered is relevant to both EU Nature law and the Marine Strategy Framework Directive (or Marine Directive). The latter is EU legislation passed in 2008 specifically aimed at the protection of the marine environment and natural resources and creating a framework for the sustainable use of our marine waters. By 15 October 2012, the day our Coastwatch survey started, EU Member States were to submit an initial assessment of the state of their marine waters, their definition of 'Good Environmental Status' and the targets they have set to achieve it. Several countries, including Ireland, have not yet delivered (status Nov 30th 2012) or opened drafts for public consultation.

Coastwatch survey questions dealing with nature, cover splashzone and intertidal habitats, some broad species groups - like 'birds' and 'worms' which anyone can answer - and finally extra questions for those who have more detailed knowledge. Survey notes add descriptions and where to look and a poster shows species pictures. Surveyors were also encouraged to 'google' species which they found to confirm identification.

1. Habitats & Select Plants

In Question D3 surveyors were asked to describe the splash zone, including two important wetland habitats: Reed beds and Saltmarsh.

Saltmarsh, reported from 10% of surveyed shores, is a listed EU habitat. It may refer to a large beautifully developed complex area with deep tidal channels and a range of specialised flowering plants turning the marsh pink with sea pinks or purple with sea lavender. It also includes narrow fringe saltmarsh. Saltmarsh is valuable as carbon and nutrient sink, as flood defence and as fish nurseries. Two protected fringe saltmarsh areas on the river Slaney estuary were noted to experience infill with demolition waste, one site old, the other recent. In Tramore back strand a saltmarsh is due to be created by opening of old sea banks and allowing sea water to flood reclaimed land. This is to compensate for saltmarsh lost under the Tramore dump.

Reed bed is an area covered in large wetland grass, usually dominated by the common reed *Phragmites australis*. Surveyors found it in 5% of survey sites, usually sheltered estuarine areas. Although not listed as EU habitat, where it occurs naturally in a protected estuary, bay or other habitat complex, it is protected as a 'typical feature'. Artificially constructed reed beds have become most famous as sewage treatment systems. The Phragmites plants remove nutrients and other matter from already part treated sewage. The same nutrient retention and flood control function is carried out by the natural reed bed. Reed beds are also habitat for many animals including crabs, worms and juvenile fish who live in the reed bed channels to birds like warblers and kingfishers.

Moving down the shore, Questions D4 asks which of a short list of plants and seaweed groups the surveyor saw. The most common were brown and red sea weeds found on 78% of shores. Dislodged seaweeds were swept up on over half the shores surveyed and green seaweed patches were found in 48 %, often associated with fresh water inflows or seepage. Thick green seaweed carpets, which suggest nutrient enrichment, were recorded on 24% of shores. As our description did not give enough detail about size of carpet, this indicator requires further refinement.

After the seaweeds, three plants were recorded: Glasswort (9%), Cordgrass (8%) and Seagrass (6%). While totally different, all of these can grow as dense stands and so form distinct habitats in sheltered areas.

Glasswort *(Salicornia*) is a small fleshy edible plant, which pops up from seeds on the upper mudflats and low saltmarsh in May and was just turning colour like autumn leaves when surveyed. For locations where surveyors noted it, see map 1.

The **Cordgrass** (*Spartina*) we now find in Ireland is a hybrid Spartina species and classed invasive, as it can take over large areas of open mudflat and saltmarsh pans (see IAS section).

Image 7 – **Glasswort Salicornia**

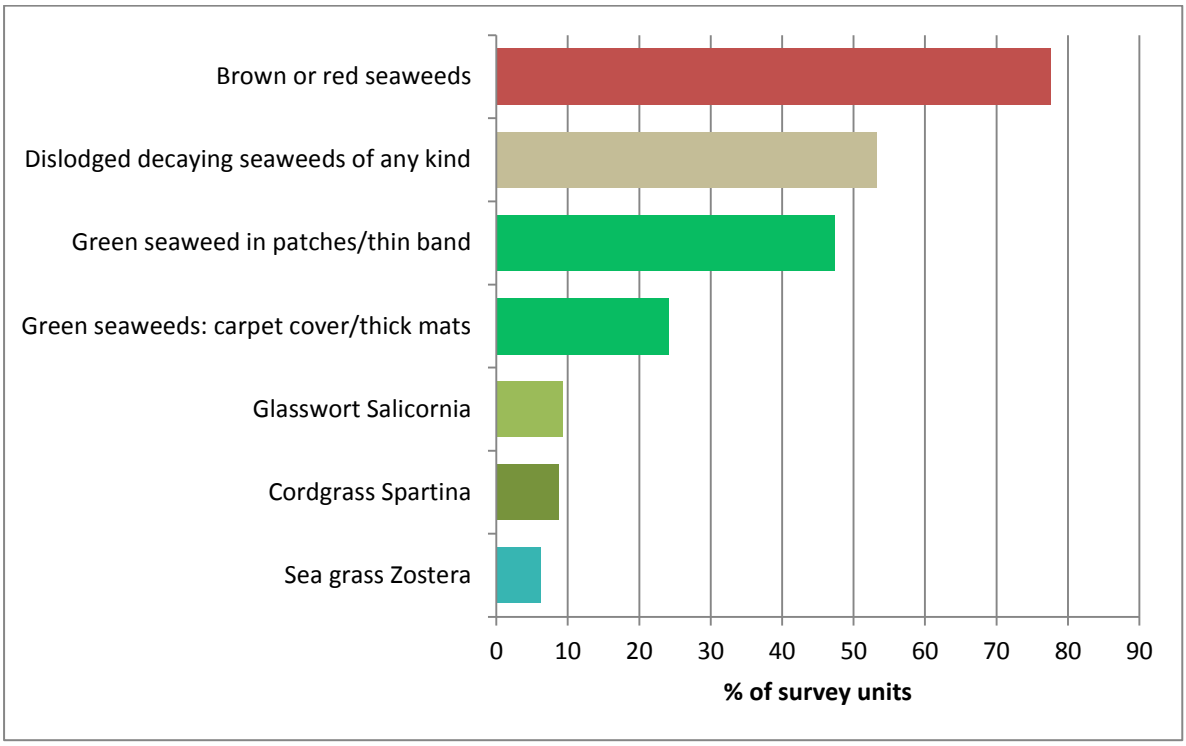


Fig 13 - **Plants and seaweeds in the intertidal.** (N=389; Source: Question D3). Presence of the different kinds of plants/seaweeds at time of survey.

The third plant listed is a grass, which has moved back into the sea, *Zostera* by its Latin name. Like Glasswort and *Spartina*, the **Seagrass** requires shelter but it also requires good water transparency and is very sensitive to disturbance (e.g. trawling or bait digging or trampling). *Zostera* is used as a 'good' and 'high' water quality indicator in EU law - in the water framework directive, the Marine Directive and Natura 2000 site monitoring.

There are two species of Zostera in Ireland: the short, wet uncut lawn look *Z. noltii*, which lives in the mid to high intertidal, where Spartina has encroached on it, and *Z. marina* which can form amazing seagrass meadows in the sublittoral.

Map 1 – **Select species found on 2012 Survey.**

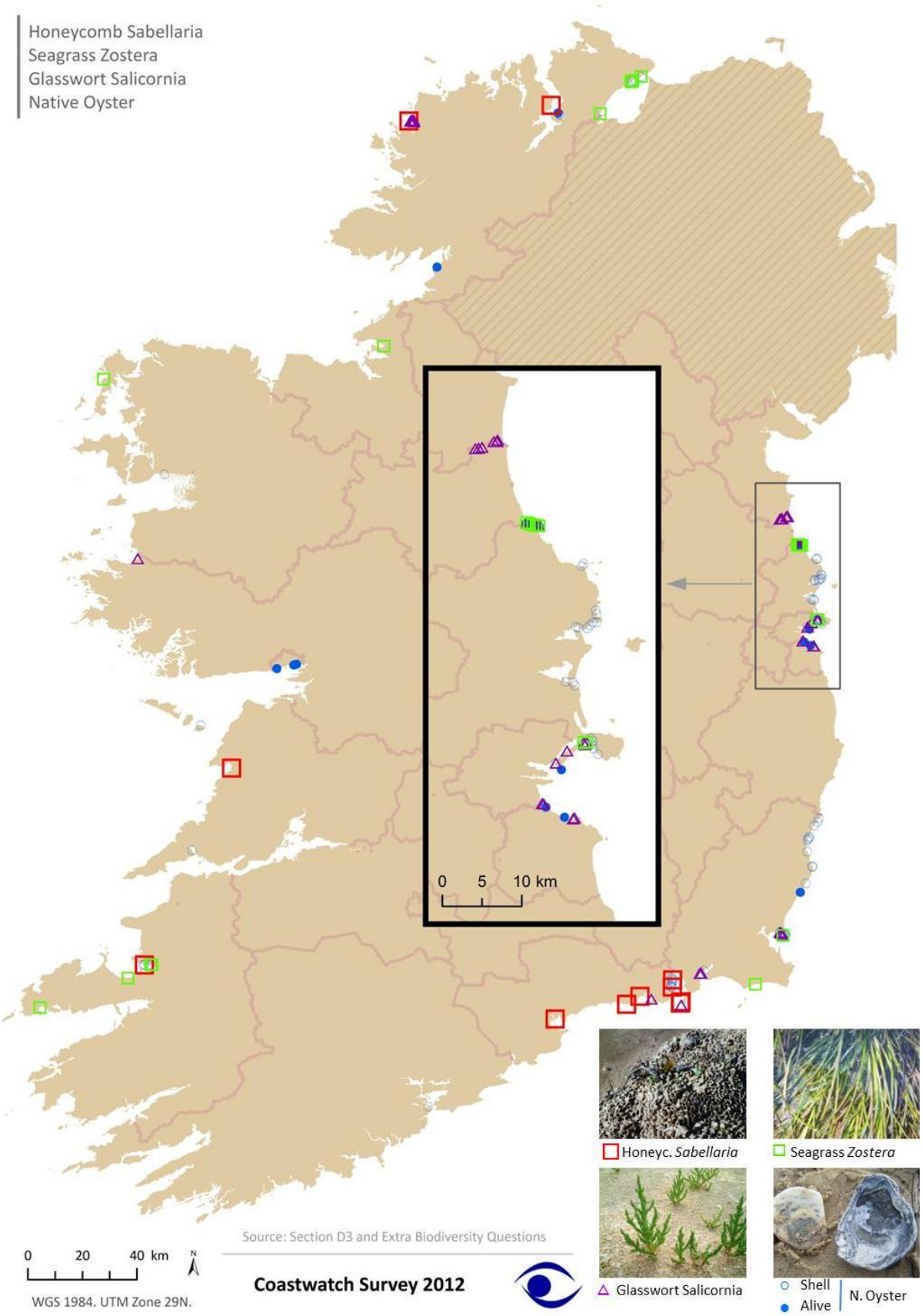


Image 8 -Seagrass Zostera. Photos by Karin Dubsky

A third in between length grass is now thought to be a long phenotype of the intertidal Z. *noltii*. The Z. *marina* was reported from 24 surveyed sites (and more in late data not included in the analyses). This follows several seagrass ID training sessions in the last 2 years where Coastwatchers were first instructed by the EPA's Robert Wilkes, who is in charge of *Z. noltii* monitoring for the water framework directive in Ireland. The EPA methods were adapted for Coastwatch surveyor use.

For the first time not only the intertidal *Z. noltii* was found, but also *Z. marina*. Previously surveyors had occasionally mentioned black tape like material on the shore which is the form which the seagrass takes once it is dislodged and dries on the tideline. In Lough Foyle four seagrass meadows were located in follow up work, which included a most dedicated and growing group of volunteers.

Official records for Ireland as listed on the OSPAR website: Intertidal *Zostera* communities have been recorded on all Irish coasts. Subtidally *Zostera* communities have only been recorded from the south, west and north coasts. The habitat is under threat in Ireland (Kelly, pers.com 2007). Our Tramore and L. Foyle records increase the records of the plant distribution both northeast and south-eastwards and add two inlets.

Subtidal Zostera		
1. Kinsale Harbour	8. Kilkieran Bay	14. Blacksod Bay
2. Roaringwater Bay	9. Greatman's Bay	15. Broadhaven Bay
3. Kenmare Bay	10. Inis Mor	16. Rutland Sound
4. Valentia Harbour	11. Mannin Bay	17. Mulroy Bay
5. Ventry Harbour	12. Kingstown Bay	18. Lough Swilly
6. Tralee Bay	13. Clew Bay	19. Donegal Bay
7. Galway Bay		

Table 1 – **Subtidal Zostera records in Ireland.** Source: OSPAR Nov 2012 http://qsr2010.ospar.org/media/assessments/Species/P00426_Zostera_beds.pdf

2. Animals found

Question D5 of the questionnaire asks surveyors to look for a selection of animals (dead or alive) on the shore. The list is a strange compromise between wanting surveyors to see at least one animal or its remains, no matter what type of shore is surveyed and seeking specific information on others like jellyfish or numbers of seals which might be useful when data is mapped. Surveyors are asked

to just indicate presence of jellyfish, worms (or worm casts), shellfish, crustaceans and fish. But in the case of mammals and birds, surveyors were also asked to count those observed dead and alive.

Results (see Fig 14) show that 77% of survey sites had one or more seabirds present, and 60% seashells (expressed as dead shellfish). Remains of crustaceans, like crabs, were reported from over half the survey areas and live ones in over 31 % - likely to be crabs and barnacles in most cases.

Live shellfish were found in 44%, followed closely by worms and worm casts in 42%. Dead seabirds were found in 11% of s.u. which is slightly higher than in most years. Live fish, seals and jellyfish were found in 6-8% of survey sites, while dead fish were found in 5%.

Among the most exciting happy accounts was this one sent by surveyor Joe Brady**:**

"Just to let you know that this evening 20.10.12 at about 18:30h I saw whales blowing water into the air off the coast at Bonmahon in Waterford around the Tankardstown area".

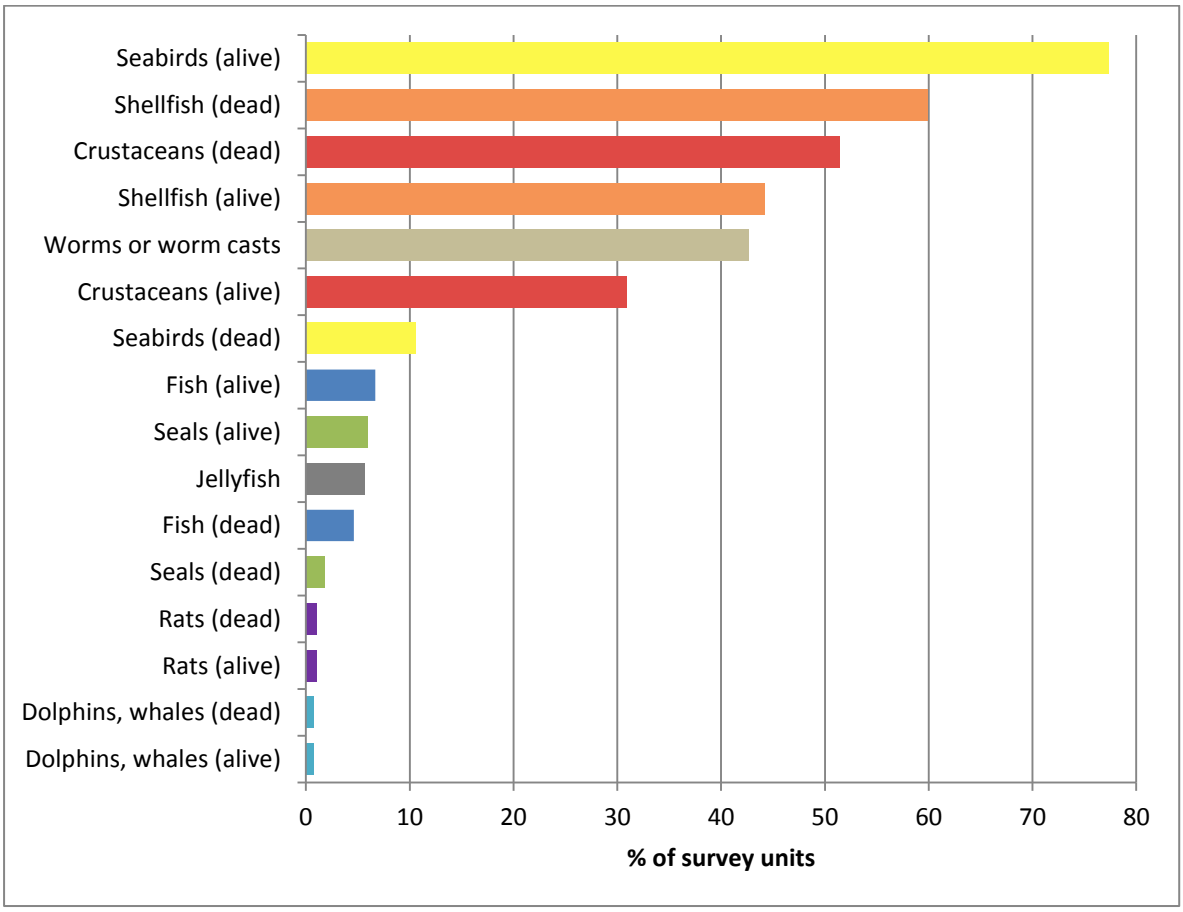


Fig 14 - **Presence of animals in the intertidal/sea at the time of survey.** (N=389; Source: Question D5) Presence of select animals at time of survey

Counts

As in previous years seabirds were not only reported most frequently, but also were by far the most numerous of the animals counted with 9,550 live seabirds reported (see figure 15) and 32 dead. The seabird counts were estimates of birds in the survey unit on arrival or while surveying. In contrast to a Birdwatcher count there is no attempt to identify species.

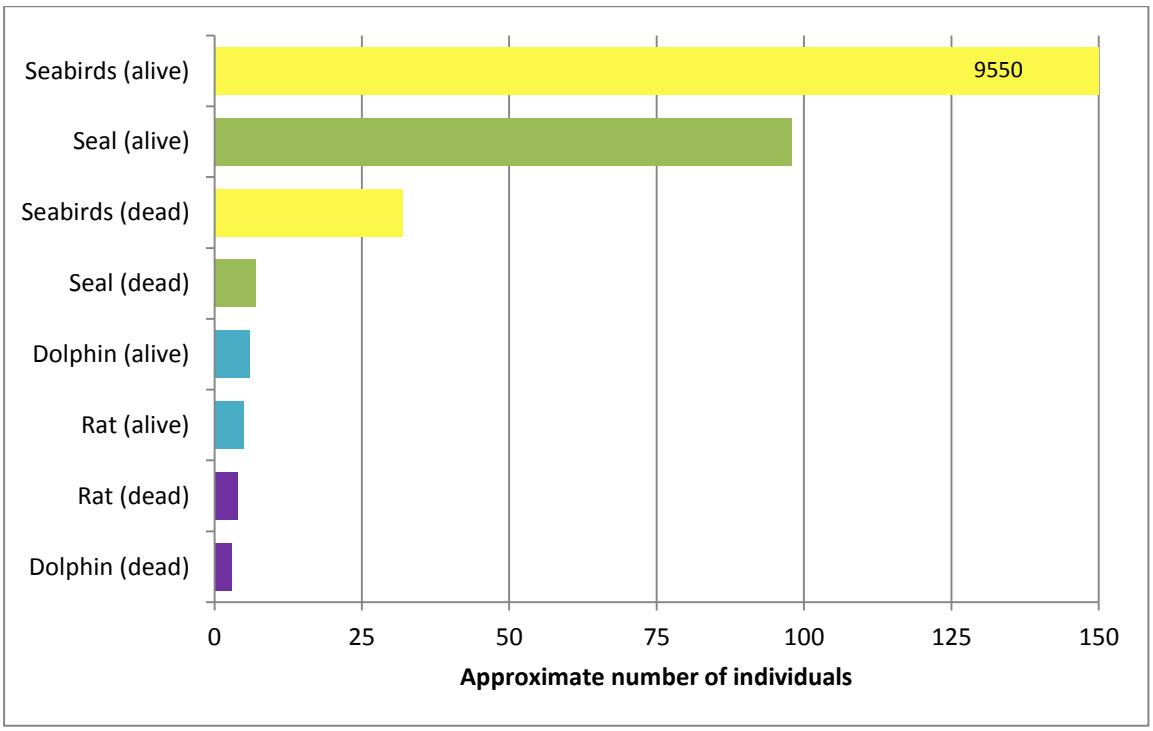


Fig 15 - **Animal counts in the intertidal/sea at the time of survey.** (Approximate number; Source: Question D5. Count of select animals at time of survey)

Marine mammal counts

Most live **seals** were found as singles or small groups with only one seal colony at the Raven Head mouth of Wexford harbour included. Surveyor comments show local knowledge and inspire visits to the shore:

- *'snorkeling through kelp. Seals commonly found on rocks'* said Brian Wingham about his Stroove head Co. Donegal site.
- *'Often one solitary seal swims in at high tide' noted* Eileen Connolly and Karen Colgan on Silver Strand beach.

The number of live **cetaceans** was low this year with only 6 live individual reported and all in the Dublin area. Four were described as dolphins and spotted jumping together close to shore at Howth Head. While a harbour porpoise was seen off Vico road by Diane Orr and team, in two adjacent survey units. This may have been the same animal.

Surveyors found 7 dead seals, 4 dead rats and 2 dead cetaceans.

One dead cetacean, too far decomposed to be identified, was found on the Ballyteigue Burrow, Co Wexford. The same surveyor Harm Deenen also found a dead leatherbacked turtle – which he photographed - in the Ballyteigue South Wexford area. In previous years, surveyors found dead cetaceans including very small calves in the wider Waterford estuary area.

As the leatherbacked turtle is so rare we hoped it might be possible to either stuff it or take the skeleton to the museum, but apart from the museum having no budget and the turtle being dead for too long for taxidermy it disappeared within days, possibly taken by a spring tide.

Looking up records it was found that this turtle had been discovered freshly stranded during the summer by local coastguard and well known naturalist Jim Hurley, who had made a detailed record.

Image 9 – **Leatherback turtle, Ballyteigue, Co. Wexford;** photo by Harm R. Deenen.

3. Extra Biodiversity Questions

Surveyors who had an interest in biodiversity or stumbled across a particularly rich shore were asked to complete extra Nature questions at the end of the questionnaire. Nature questions centred on fish, seven sea shells and three select worms.

- Fish

Fish are used as biological indicators of water quality and an abundance of fish can indicate a healthy habitat. Spotting fish during an intertidal survey relies on seeing the fish unaided by nets or other equipment, and therefore yields only a tiny unspecified fraction of what might be milling around. Previously Coastwatchers in some areas have carried out follow up netting studies in tidal channels. In Tramore Backstrand for example a wealth of > 20 species including juvenile sea bass were found while the observations from walking through the channel picked up only two.

There are a few species for which a Coastwatch intertidal survey could be useful both to increase local biodiversity knowledge and to contribute to the MSFD biodiversity and fish descriptors. The fish section is still being developed and comment from readers for future use would be very welcome.

Rock pools can be a good place to find fish with a little patience. Some species such as **butterfish** are found under boulders in the intertidal. Tiny **eels** might be found by poking into silty sediment at the mouth of streams and juvenile **plaice** may be seen in shallow mudflat depressions - occasionally in their hundreds of thousands. These commercially important plaice have a peculiar life cycle which makes one look at intertidal sand and mudflats and their value with new eyes.

Image 10 – **1** Juvenile herring washed up on Connemara beach; **p**hoto by Rory Keatinge. **2** Tiny eel in Doonbeg river mouth; photo Kathy Gorman

The **European plaice**, *Pleuronectes platessa* from egg laid in winter to young adult.

Adapted from the Irish Stock book: produced by the Marine Institute.

The eggs hatch after approximately two weeks and drift passively in the plankton. The larvae drift in the plankton and metamorphose after about 8 to 10 weeks, dependent on temperature, at which time they settle in the intertidal zone of sandy beaches. When the larvae have reached a suitable site for settlement, which according to Boyne fishermen might also be in an estuary on mudflats - the metamorphosis to the asymmetric body shape takes place. This can take up to 10 days.

Recently transformed juveniles settle onto shallow intertidal beaches. The very youngest juveniles will, for a period of up to a week, strand themselves in very shallow pools on the intertidal once the tide has receded. The reasons for this behaviour are not clear. During the first year of life (when the fish are called 0+ group), the juveniles will stay in these shallow intertidal habitats for up to 7 months (depending on latitude and/or temperature), before migrating to deeper waters. Some of these fish will return the next year and even fewer when they are the group.

Plaice can grow up to 1 m long and 50 years old, with adults living on sandy bottoms of the European shelf. The picture from an exhibition in the Waddenzee shows maximum size and our fishing size. The *Nephrops* trawl fishery in the Irish Sea takes bycatch of other species, especially plaice but also whiting and cod. Most of that plaice is undersize - i.e. below that of the inner fish in the exhibition panel. These are just discarded. However 2013 may bring major change for the better in the new Common Fisheries Policy (CFP) proposal to be adopted by EU member states.

Image 11 - **Fish catch and by catch in an Irish sea trawl net.** Photo by Johnny Woodlock.

Fish survey results

In the 2012 Coastwatch survey 26 live fish on the shore/in the sea records were returned, see graph below. Fish were found in pools in the intertidal or immediate sublittoral.

In 18 survey units dead fish were recorded. From survey notes and comments dead dogfish and undersized flat fish were among the dead fish found. No high concentration of any species was flagged.

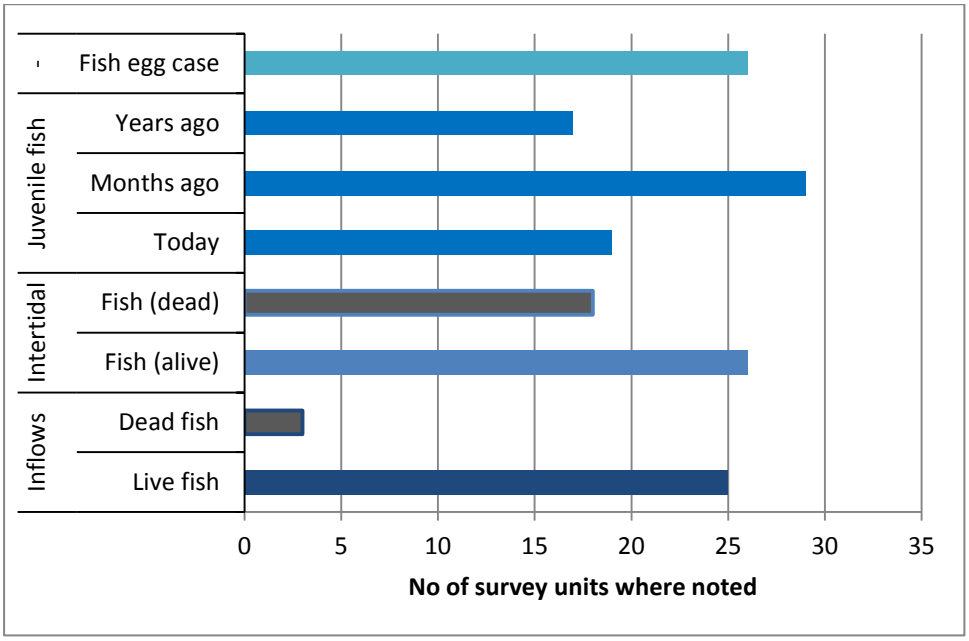


Fig 16 - **Number of survey units with information on live and dead fish, juvenile fish and fish egg cases in the 2012 survey.** (Source: Questions B2, D5, EQ Biodiversity III)

In 25 inflows live fish were spotted and dead fish were seen in 3 inflows.

In the biodiversity extra question section, some species of juvenile fish were recorded during the survey. The pie chart shows species found. The largest number was 'unknown' showing the difficulty surveyors have in identifying juveniles in particular.

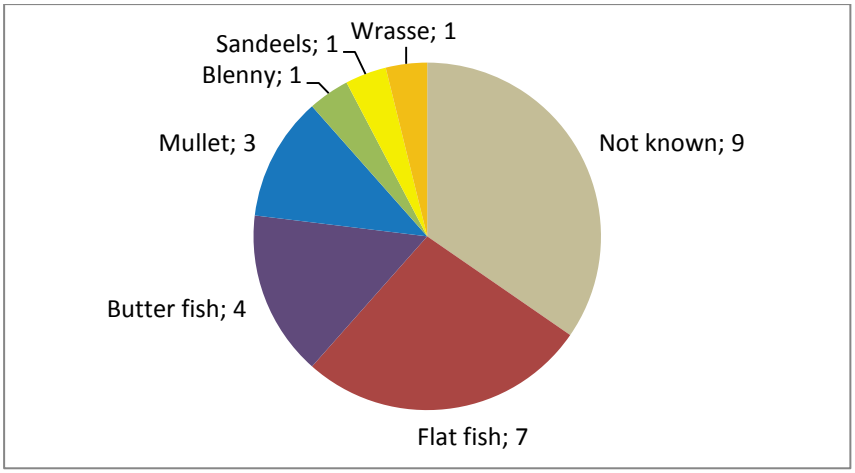


Fig 17 - **Number of fish found in nursery sites, by type.** (Total=26; Source: Section Biodiversity III) Number of survey units where each type was found.

Surveyors from 20 survey units also reported knowing of - though not necessarily seeing on the day - fish nurseries in their area, that is just over 6% of s.u. These were found in Meath (Morningtown river inner estuary), Dublin Bay (Seapoint), Wexford (Kilgorman stream bed, Bannow Bay Kieran's

saltmarsh tidal channels, and inshore around Hook head), Kerry (Tralee Bay including rare rays), Clare (Poulnasherry Bay and Lahinch), Galway (Aran Islands at Inis Oirr), Mayo (Bertra Thornhill, Rosturk, Bunnahowna & Cross Beach) and Donegal (Durnesh, Stroove Head and Lough Foyle including the endemic Foyle herring).

One dedicated Coastwatcher, David Gorman, questioned whether small fish make an area a fish nursery. He then supplied the photo below after he had moved a small net along the side of the Doonbeg lough as it enters to sea to find eel elvers and a small un-identified fish.

Image 12 – **Juvenile fish at Doonbeg lough, Co Clare.** Photo Kathy Gorman.

The fish nursery information in Galway Bay is being followed up on in relation to the proposal by BIM for a large salmon farm here. Like others, Coastwatch is studying the EIS for this farm at present, including the evidence presented that it will not impact on wild salmon and any vulnerable fish stocks.

Traditional Boyne mussel fishermen noted that the Boyne river estuary between Co. Meath and Louth used to be a flat fish (especially plaice) nursery, where every three to five years the numbers peaked and at low tide flat fish would be seen to cover acres of depressions and pools in the flats, as far as the eye could see. Leo Boyle who observed this phenomenon all his life also wrote that it has not occurred now for approximately at least a decade.

In Lough Foyle surveyors who included fishermen noted that ray and dogfish were often seen. They also recorded the area was a fish nursery and that small fish favoured crowding into and around the edge of the seagrass (*Zostera)* beds.

A survey unfortunately returned too late to be included in the analyses reported a good eel nursery at Courtown Harbour. In this Wexford site young anglers caught eels and immediately released them along the harbour walls last summer.

After reflecting on the pilot fish biodiversity question it was concluded to retain it but to research and provide more information for surveyors in future years.

- Molluscs - Shellfish

Extra questions on seven seashells were drafted to both help increase surveyor knowledge and record some common live and dead shellfish separately. Simple ID pictures were provided to surveyors (see back cover of this report) and Google research encouraged. This was a scoping question.

Empty mussel shells were found in over 72% of survey sites, followed by cockles, limpet and dog-whelk. Native oyster shells were found in 28% of survey sites, but we know that all those recorded

along the Irish Sea belong to huge oyster beds which were heavily fished and where the population totally collapsed.

Gigas oysters loose on the ground, or stuck onto rocks as invasive alien species were recorded in 7% of survey sites. Slipper limpets have never been recorded in a Coastwatch survey in Ireland but as found on the continent surveyors were to be on the alert. This time 2 occurrences were reported, both of which still being followed up but have not yet been verified as samples cannot be found.

In follow up work the potential connection between a large mussel population and fish size is being researched: there is concern regarding a reduction in the size of mature plaice in recent years. The Marine Institute in it's Stock Book 2012 notes that the "mean length (of plaice in the Irish Sea)... has generally declined since the 1990's. Mussels form an important source of food for plaice. Irish sea mussel beds and seabanks appear to be declining significantly in recent years, as reported in surveys from the All Ireland bottom mussel industry, which incidentally has mushroomed in that period.

In the Boyne estuary a large sustainably fished mussel bed was largely destroyed in a capital dredging scheme for Drogheda Port and never recovered. Could the decrease in size of plaice also be related to the reduction in one of its favourite food soures? Perhaps there are many other reasons. An EPA Strive research programme on juvenile plaice habitat requirements started in 2007 and is still in progress.

Eggs and egg cases of Fish and shellfish

Image 13 - **A range of ray, skate and dogfish egg cases on Clones beach, Co Wexford.** Photo: Coastwatch archive.

In Ireland we associate the very beginning of the Coastwatch survey period with finding the last empty Dog whelk (*Nucellus*) egg cases stuck like tiny skittles to sheltered rock crevices. The October spring tides can mark the start of 'mermaids purse season', when freshly hatched bunches of eggs of our smallest shark the dogfish and a few single dark ray eggs are swept up into the tide line. This contrasts with the bright rounded honeycomb effect of Common whelk cases, which also roll in on the tide, or stick out of dislodged seaweeds. The main mermaids purse and common whelk egg case season however is not until Christmas and into spring. So survey results are only indicative of possible areas where to search for egg cases later and as an indication of breeding presence if a particular rare species of ray or skate egg case is found.

Marine biologist Sarah Varien runs Purse Search Ireland, an online facility for recording the distribution of shark, skate and ray egg cases. This involves members of the public recording any findings of mermaid's purses in an effort to better understand the spawning grounds in Irish coastal waters. (http://marinedimensions.ie/730.0.html)

The bullhuss (*Scyliorhinus stellaris*), also known as the large-spotted dogfish or nursehound, belongs to the cat shark family. It lives amongst rocks and seaweeds at a depth of 20–60 m, growing up to adult human size! It shares its range with the more common and closely related common dogfish

also known as small spotted cat shark (*S. canicula*) with much lighter, transparent egg case. In the Coastwatch survey 2012 one bull huss egg case was found in Wexford and one north of Wicklow head on the shore at Newcastle train station. Subsequently in Dec. 2012 the surveyor found dozens more at the Wicklow site.

The tough egg-cases have long tendrils at each end which the female ties onto seaweeds where the embryo grows for months until a baby shark hatches.

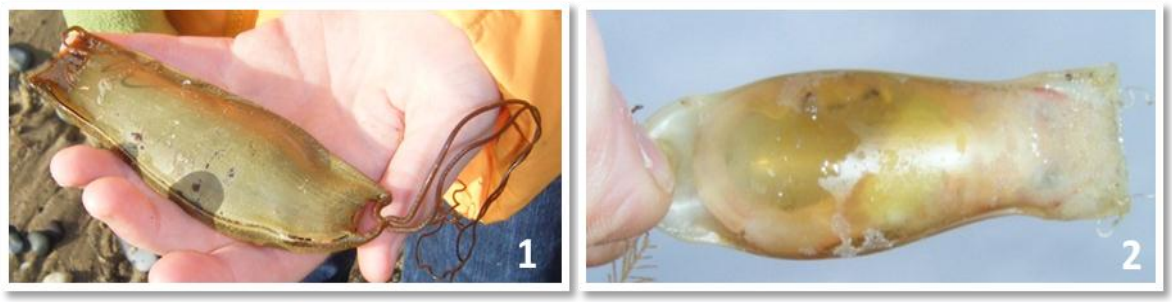


Image 14 - **1** Large mermaid's purse found by the Spencer family on Ballymoney North beach (also found north of Wicklow head). **2** Common dogfish egg case with life young, photo Karin Dubsky.

- Mollusc Eggs

Two species of shellfish widely distributed on Irish shores have egg cases which are easily recognised, the dog whelk and the much larger common whelk.

Image 15 – **1** The common whelk (Bucchinum undatum) and whelk egg case; **2** young live whelk just under official catch size as swept up near Cahore, Co Wexford. Photo Karin Dubsky

Shellfish eggs including the beige Common whelk egg case balls and dog-whelk egg capsules glued onto rocks were found in 8% of survey sites. Whelk egg cases are widespread on the South and SE coast, but whelks may be susceptible to local depletion as the active fisheries legally includes whelk down to 45mm length which is below the average first spawning size for those growing in our waters.

Some research work on this species was initiated by Coastwatch after Waterford surveyors remarked on stocks declining and the need for action. Unfortunately the biodiversity extra question in the Coastwatch survey is new and we do not have comparative data, except for isolated photos and remarks from surveyors in earlier years. Personal observations on the Wexford (Bannow Bay and Courtown) coast suggest that whelk balls are still common in North Wexford but over the years

the occurrence of very large egg balls with multiple spawning females contributing has become rare.

- Worms

Three worm species were of interest. The Lugworm (*Arenicola marina)*, which lives well hidden in mud and sandflats in a U shaped burrow but with characteristic worm like casts which are very easy to identify. The number of beautiful worm cast photos of this species received this year could make the hearts of many shore birds jump. It was most common, found in 42% of shores where surveyors had tried extra Nature questions.

The next most frequently reported were Honeycomb worm reefs *Sabellaria*. Coastwatch had done some publicity for this biogenic reef building species which is likely to account for greater volunteer awareness and more sightings. Sand mason patches were only reported from 3% of shores. Due to difficulty in finding these small worms alive and less publicity we expect that this species has been seriously under reported.

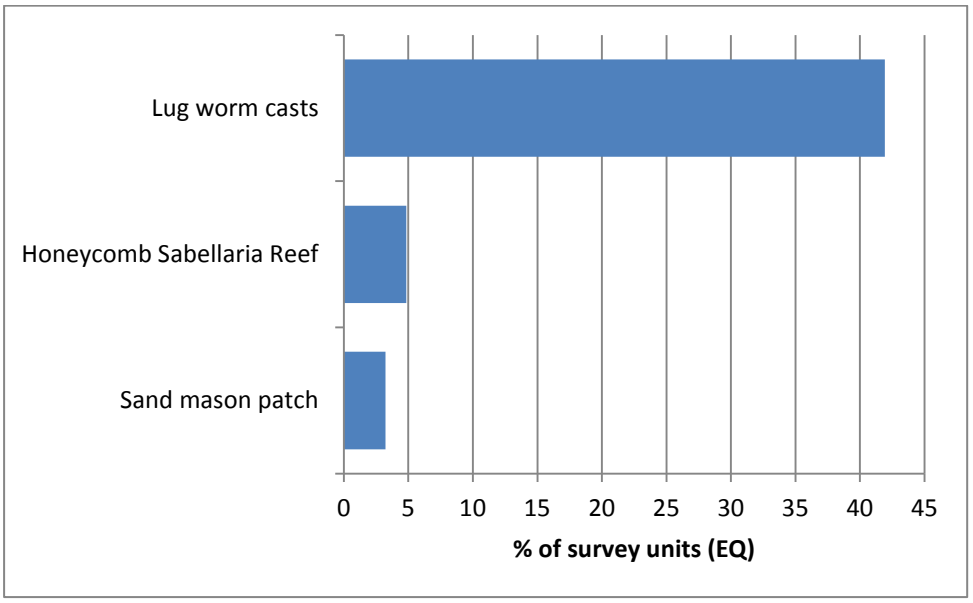


Fig 18 - **Worms.** (N=310 s.u. [Extra Questions]; Source: Question Biodiversity I. Presence of the different types of worms at time of survey)

Image 16 – **1** Sand Mason cast, Poulshone, Co.Wexford. Photo by Ángel Duarte **2** Lug worm cast, Crosshaven, Co. Cork. Photo by Mary Mahony.

Honeycomb worms: *Sabellaria*

These worms build tubes from sand, fine gravel and shell material. When they occur in very large numbers, the tubes clump together and form mounds which rise from the seabed or protrude from rocky outcrops.
In Irish waters this worm normally constructs reefs on intertidal rocks, in areas subject to some sand scour. The NPWS describes such reefs 'as widespread but uncommon'.

There is very little information about these biogenic reefs in Ireland. The Marine Directive has Sea-floor integrity (Descriptor 6) as one area which member states must assess and monitor to control harmful human activities.

Among the substrate types, biogenic reefs are the most sensitive to physical disturbance and need to be maintained in type, abundance, biomass and areal extent.

Sabellaria was found in nine locations throughout Ireland, as far north as Donegal (see map above). Surveyors were asked to follow up finds with photos and some stunning reef fomations pictures are included here.

When compared to the National Biodiversity Data Centre maps only one location in Co Waterford is common to both. As the other NBDC sites were not covered in our 2012 survey we cannot say anything about their status today, but can confirm that our volunteers have found some new locations in Waterford, Kerry, Clare, Galway and Donegal.

Interestingly, we found no *Sabellaria* in the Irish Sea - yet the only Special Area of Conservation specially designated due to this feature - is just north of Wicklow head (SITE CODE: 002274) where it is a sub-littoral feature constructed by the honeycomb worm *Sabellaria alveolata*.

Image 17 - **Honeycomb Sabellaria Reefs at Drillistown (Waterford) and Tralee Bay (Kerry), and example of an eroding part of a reef in Lough Swilly.** Photos by **1** Patrick Houlihan, **2 & 3** Martin McLoughlin and Ángel Duarte, **4** Mary Butler

- Special Finds

Lesser Octopus (*Eledone cirrhosa)*. Poulshone beach (Wexford); photo by Justin and Attracta Byrne

Leatherback Turtle (Dermochelys coriacea). Ballyteige Burrow (Wexford)*; photo by Harm R. Deenen*

Red Tube Worm *(Serpula vermicularis)*. Glassilaun beach (Galway)*; photo by Rory Keatinge*

Undulate Ray egg *(Raja undulata)*. Carrickfinn (Donegal)*; photo by Grainne & Roise Ní Dhomnaill*

Under a rock… (Littorina littorea). Tralee Bay (Kerry)*; photo by David McCormick & Ángel Duarte*

Chiton *(Polyplacophora)*. Moville (Donegal)*; photo by Ángel Duarte*

4. New Species and Invasive Alien Species

Surveyors were asked to indicate whether there were any new species which they have noticed arriving in their waters or on the shore in the last few years in question D4. Results indicated they had observed such new arrival on 31 sites. Depending on comment we then planned to divide new arrivals into invasive alien species as listed on the official IAS data base, unofficial IAS - that is species which are IAS as in fully fitting the definition but not officially declared IAS in Ireland - and finally new arrivals which are most likely related to climate change and extend of southern species northwards like Little Egret.

Unfortunately an input programme glitch eliminated the comments on any survey forms entered by surveyors on line. So results are restricted to a few comments and findings.

Invasive species are herein defined as plants or animals which did not originally occur in Ireland before human colonisation of the country and which are also expanding their numbers and distribution so as to cause a competitive threat to native fauna and flora. Invasive species have been introduced to Ireland from other countries or continents by human beings, either intentionally or accidentally. In the absence of their natural predators or parasites, such introduced invasive species are increasing in number and spreading "out of control" and are colonising and monopolising habitats vital to the survival of native Irish wildlife. Such species are seen to be a threat to native biodiversity and warrant corrective action to prevent their further spread and the consequent loss of native biodiversity which is seen as having "more of a right to be here" in that Ireland provides its natural habitat. We do not however include economically important commercial crops (e.g. cereals or conifers) or domesticated animals (man, cattle, sheep, goats, cats etc) unless these have formed wild-breeding, feral populations.

Invasive Alien Species threaten biodiversity and are a descriptor under the new EC Marine Strategy Framework Directive. From photo and note records surveyors found: Giant Hog weed (*Heracleum mantegazzianum*), Himalayans balsam (*Impatiens glandulifera*), Japanese Knotweed (*Polygonum cuspidatum*) and Cordgrass (*Spartina*) growing at the edge of more sheltered areas. New Zealand flax (*Phormium tenax*), Giant rhubarb (*Gunnera tinctorial*) and Sea buckthorn grew in more exposed areas. Fronds of Japanese Seaweed (*Sargassum muiticum*) were recorded swept up on Templetown and Tramore beach, where a large bed has established.

Image 18 - **Japanese Knotweed.** Photo by Elaine (Galway)

The Marine Directive Descriptor for IAS sets the bar as present '*at levels that do not adversely alter the ecosystems'.* In future Coastwatch work, a question on new species will seek to capture more

quantitative data to feed into this and any IAS law which may be passed. Most importantly it will be added to raise awareness locally and plan action. Here just an impression of spread for one plant:

In County Wexford **New Zealand Flax** is spreading noticeably in the north of the county. It is establishing from seed and discarded plants and new plants are seen on pristine vegetated sea bank shores with no housing within miles as midway between Clones and Ballymoney. In a 2 km stretch between Polshone and Ardamine the plant was introduced as shelter around holiday homes, but has spread into a flax thicket right down to the foot of the seabank from where it can be carried to other coastal sites. In the high value Natura 2000 site grey dune at Tinnaberna where a few plants were set and just grew taller decades ago, a significant spread has been noticed in the last 4 years.

Image 19 – **New Zealand Flax:** sliding down an eroding sea bank at Ardamine Co Wexford (left) and establishing on remote beach at the ship wreck Ballymoney (right); photos by Karin Dubsky

Giant rhubarb –*Gunnera tinctoria*

Giant rhubarb was noted in an inflow to Glassilaun beach just south of Killary Harbour in Galway. It is a well-known invasive in the area and has been a serious problem north of here on Achill Island. It can survive and spread through its rhizomes making it difficult to eradicate. Due to the size of its leaf it can leave other plants in the shade making it very difficult to compete with. Although common in parts of Connemara it is new to this survey unit.

Image 20 - ***Gunnera tinctoria*** at Glassilaun beach, Connemara. Photo by Rory Keatinge

Invasive alien Animal records included the Gigas oyster and one Asian clam *Corbicula fluminea* found in one Foyle estuary site which is being followed up locally by fishermen and the Loughs Agency.

While Gigas oysters are spreading in L. Swilly and L. Foyle, there is a removal by fishing initiative which has been started by L. Swilly fishermen. The difficulty with increased dredging and doing so year round is that it affects the sea floor of this outstanding Natura 2000 site estuary and is likely to affect native oyster stocks. There is no official effort to control Gigas in the intertidal, though Coastwatch and local fishermen and community undertook a successful trial of intertidal oyster removal especially from rocks and drafted a protocol. The problem is now widespread in the Natura 2000 site area and beyond and action is overdue.

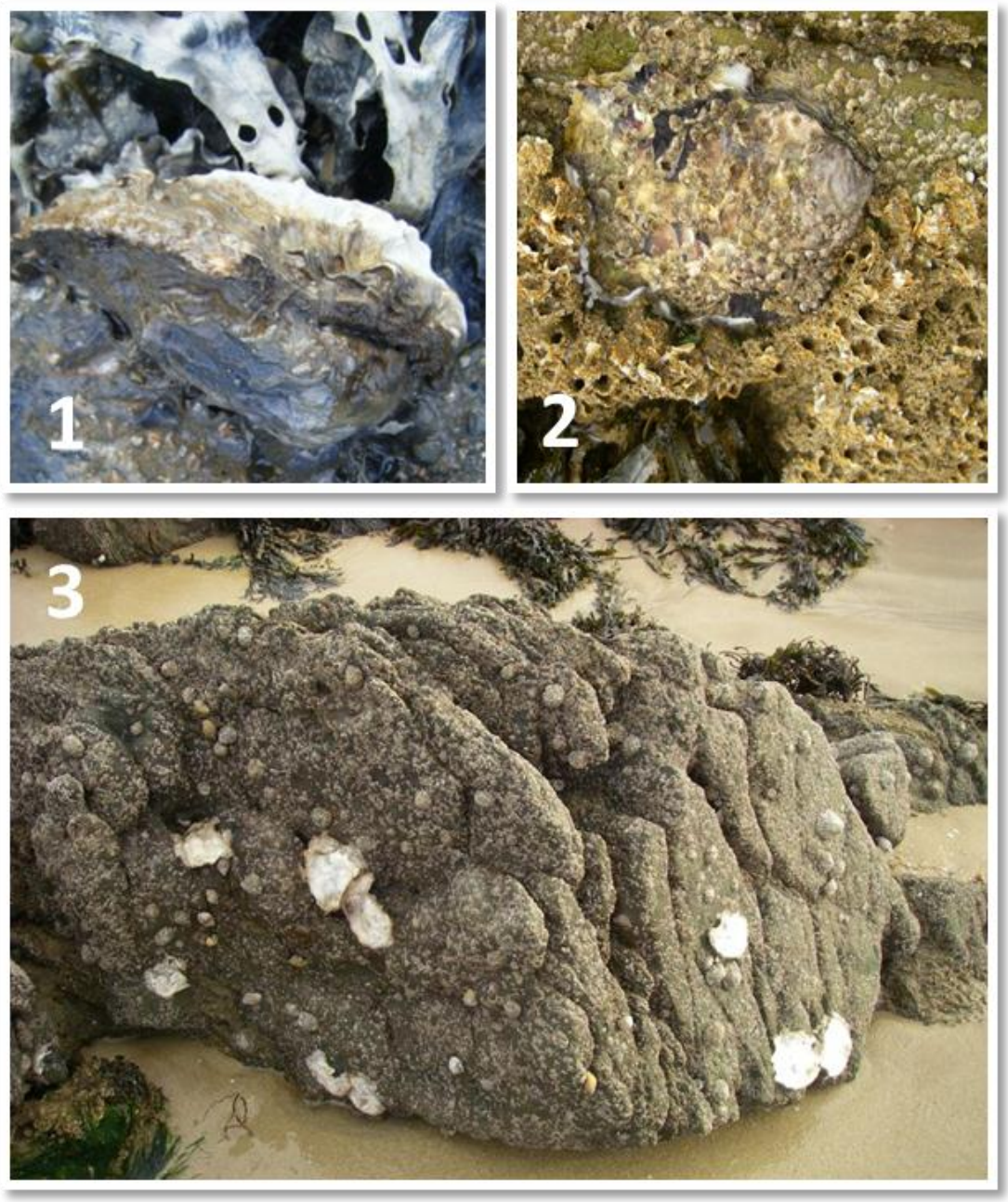


Image 21 – **Gigas Oyster.** L. Swilly SAC (**1**) Old Gigas Oyster from aquaculture site now acting as spat source, by Karin Dubsky, (**2**) Gigas oyster which has settled in a Sabellaria reef West shore L Swilly, by Mary Butler (**3**) shiny white lower shell half of dead Gigas oysters are easier to see than the camouflaged live oysters. They remain on rocks and are difficult for other organisms to settle on, by Mary Butler.

Ballymoney, Co. Wexford.
Photo by Mathilde Stallegger

RESULTS PART 3: WASTE, LITTER AND POLLUTION

The 2012 survey included 5 waste and litter questions. The first three are comparable with previous years and form the core traditional Coastwatch base questionnaire: in E1 surveyors look out for large waste. If an item is found, the surveyors decide what category of large waste it belongs to and then tick the appropriate category box. While the amount is not quantified, extensive waste can be mentioned in extra notes. In question E2 a selection of drinks container packaging, plastic shopping bags and tyres are counted. In question E3 presence/absence of 14 smaller litter items, as well as oil or tar is sought. Surveyors are also asked to flag any notable other litter not covered in that list. A new Irish pilot question 'E3 part 2' examines micro-litter and finally question 'E3 part 3' asks surveyors to look back over the shore and note which area was most littered.

The waste and litter questions are the oldest in the Coastwatch survey and formed the core of the first 1987 Irish survey. As Coastwatch spread, some adaptations and counts were introduced. Coastwatch predates both UNEP and the OSPAR marine litter monitoring methods. They part overlap and are part complementary as Appendix 2 shows.

OSPAR records the amount and type of litter found in great detail on 4 reference beaches in Ireland. The survey unit is 100m and all items are picked up and counted. While together these 4 are not quite one full Coastwatch survey unit the detail and further strength of 4 surveys per annum have made the OSPAR work an important extra dimension to monitoring marine litter in the NE Atlantic over the last few years. Coastwatch presence/absence data over large stretches of accessible shores records how common and widespread given waste and types of marine litter are, as well as providing a count for selected common consumer goods and tyres once per year. There is clearly scope for synchronizing the 2 to maximize the value of the data collected.

The combined result should provide sound support for the implementation of the Marine Strategy Framework Directive litter descriptor.

Image 22 – **A lid, hard plastic pellets and polystyrene bead – typical small and micro-litter.** Photo Karin Dubsky

1. Large Waste

Volunteers were asked to look out for six categories of large waste on the shore. The results graphed below show that 'landfill materials' and 'large metal objects' were most common, both recorded on 19% of the surveyed shores.

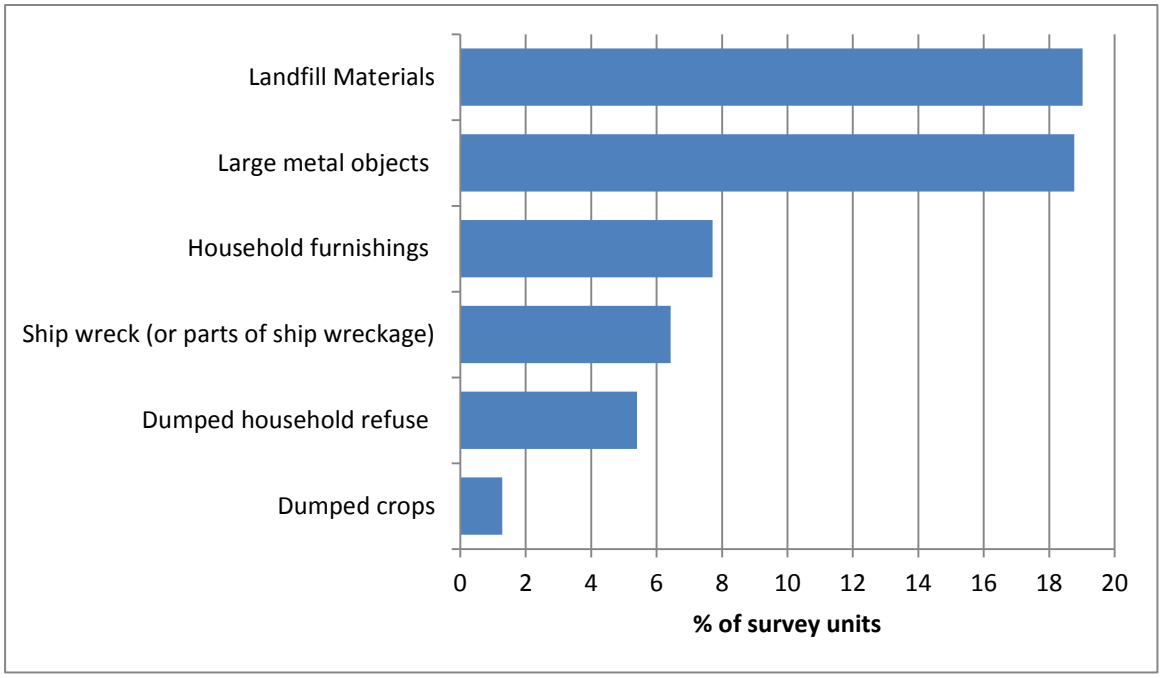


Fig 19 - **Percentage of survey units where large litter items were recorded**. (N=389 s.u. Question E1)

On 8% of shores household furnishings like beds and carpets were found, sometimes dumped, sometimes just on the edge of the splashzone like a flood deposit, as the scenic mattress below.

Image 23 – **Mattress found in the Boyne estuary at Stagrennan Polder. Photo by** Boyne Coastwatcher

On 6% of s.u. ship wreckage including the occasional abandoned boat was recorded. Dumped household refuse in heaps, bags or boxes was observed in 5% of surveyed sites. The 'dumped crops' category was rare and only seen on 4 survey sites (1%).

Results show a significant improvement over time. All categories of large waste except for dumped crops, which were always very low in Ireland are now reported less frequently than a decade ago. Dead farm animals, included sheep and calves which in the first survey in 1987 were reported from 6.6 % of surveyed sites, were not mentioned once in the 2012 returns.

Landfill is a waste category which Coastwatch coordination prioritises for further examination. Even if the coastal landfill consist of earth and stones, if these are dumped into a wetland, as found in two Donegal sites (see follow up chapter) and one in Cork, wetland loss will result. From 19 survey sites presence of landfill materials and threats of erosion were reported. An embankment may be placed on low coastal land to keep floodwaters out, but that may cause floodplain changes and waters to rise higher elsewhere. Even where an old dyke is being reinforced, if construction and demolition waste is used, storms may pull it apart and strew waste over a larger area. Those depositing landfill materials may be disposing of waste cheaply, as well as gaining land and/or creating make shift erosion control.

Image 24 – **1** Construction waste dumped at the tidal channel edge, beside Booterstown station, Co. Dun Laoghaire; **2** Dungarvan town coastal infill (Natura 2000 site); **3** Tarmac and other waste land claim at Whitecastle, Lough Foyle.

All of the above landfill activities are subject to a permit, license and/or planning permission. That was different when the Coastwatch surveys started. In 1987 there were more than 20 active coastal landfill sites, most run by local authorities. In some waste was still being dumped directly into the intertidal and splash zone.

Coastal dumps also referred to as 'landfill sites' may now be closed, but apart from any leachate issues seaward edges need attention. Most were located in sheltered inner estuaries or bays. Their seaward edge has been fitted with hard erosion control which sticks out as misfit feature due to height, material or both. Very little effort has been made to lessen the impact or create a buffer zone. The worst two caught in this autumn's survey were:

- The former Dublin City dump bordering South Dublin Bay SAC and SPA at Ringsend. Here the erosion control is a 5 m wide band of tarmac-concrete-construction waste.
- The eroding Bray dump, described by surveyor Lucy Dillon: "*Large metal objects make up the foot of the exposed Bray town dump cliff*". It is not surprising that her response to question F3 - *Is there something you really like or love about this survey unit?* - was simply "*NO!*"

The '**Large metal objects'** category included dumped material such as old gates, defunct objects like broken iron discharge pipes barely held in situ and metal associated with work on or near the shore.

Image 25 – **So close to the water's edge - metal crushers. Ringsend, Liffey estuary.**

Photos and comments suggest this large metal waste category also has some specific rural and urban differences. In rural areas the highest concentrations appear to be abandoned shellfish farm trestles. Examples were found in Dundalk Bay, Bannow Bay, Dungarvan harbour, Lough Swilly and Lough Foyle. Trestles are erected in the intertidal to hold netlon oyster grow bags. Over time they rust, weaken, bend or break. Many become part buried in silt as pseudo faeces built up and currents are slowed down. This in turn creates low mounts which are a further impediment to currents. Storms may reorganize the metal junk which can also pose a risk to other shore users like canoeists. Aquaculture trestles could be tracked to current or former shore users, as aquaculture requires a license.

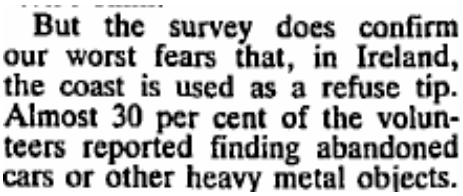
Image 26 - **1** Silting around empty iron oyster aquaculture trestles in Bannow Bay; **2** Supermarket trolleys in the Liffey.

The source of the urban heavy metal load appears to be a combination of accidental loss and vandalism - seeing that good bikes, crash barriers and super market trolleys found during the Coastwatch survey are unlikely to have been abandoned or lost by their owners.

The difference in sources should inform future prevention, monitoring and cleaning up plans. Regarding waste removal from sensitive sites, it is vital that guidance and supervision are provided to minimize habitat and archaeological damage.

Image 27 - **Large waste items found by surveyors during the Coastwatch Survey 2012. 1** Eroding Bray town landfill site, photo by Lucy Dillon, **2** Aquaculture farm trestle, **3** A new use for silage wrap? Household refuse at L. Foyle, photo by Trish Murphy and **4** Tarmac or asphalt at Sandymount, Co. Dublin; photo by Ángel Duarte

Looking back to the first Coastwatch survey in 1987, heavy metal waste was twice as common then. Among items mentioned, the abandoned car was a frequent contributor. In contrast, the 2012 survey results included only one large car part and the possible remains of a car at Bull Island.



But the survey does confirm our worst fears that, in Ireland, the coast is used as a refuse tip. Almost 30 per cent of the volunteers reported finding abandoned cars or other heavy metal objects.

Fig 20 - **The Irish Times, October 1987**

Household Rubbish in sacks and heaps: The most positive result in the large waste (survey question E1) is the decrease in sacks and heaps of household refuse. This waste category 'scored' higher in Ireland than in other North European countries when international survey comparisons commenced in 1989. In the first Irish survey (1987) such dumped rubbish was reported from a quarter of surveyed shores. This reduced to 20% over the next 4 years. In 1992 however the problem worsened significantly and volunteers reported 31% of the surveyed Irish shores with dumped household refuse. Comments linked this large increase to the 'pay by the bag' refuse charge which had been introduced in the months prior to the autumn survey.

The drop of this large waste category to 5.4 % of shores is the lowest recorded in the Republic in 25 years!

The strangest way of presenting household waste to the shore was as a large rubbish bail wrapped in silage plastic reported by Trish Murphy – see photo above. Dr Murphy followed up promptly by asking Donegal county council to remove the bailed lump before it would totally unravel.

It should be noted that several small active near shore rubbish burn sites were reported - like this one behind houses at Ringnasilloge, just beside Dungarvan bay SAC. The dumpsite was excluded as just above the survey area, but the windblown remainders on the saltmarsh and shore were included.

Image 28 - **Dump and burn site at the edge of the saltmarsh Ringnasilloge, Dungarvan, Co Waterford.**

2. General Shore Littering and Shore Cleaning

Surveyors were asked which shore area was most littered in question E3, part 3. The pooled responses in Figure 21 below show that on 68% of shores most litter was concentrated in the splashzone. Depending on the shore this deposit can be a composite of spring tides carrying litter up into that zone, litter blown or washed in from land, as well as recent litter dropped by those using the splashzone. The next highest litter concentration was on the last tide mark (27%) with only 5% of the intertidal deemed to be most littered.

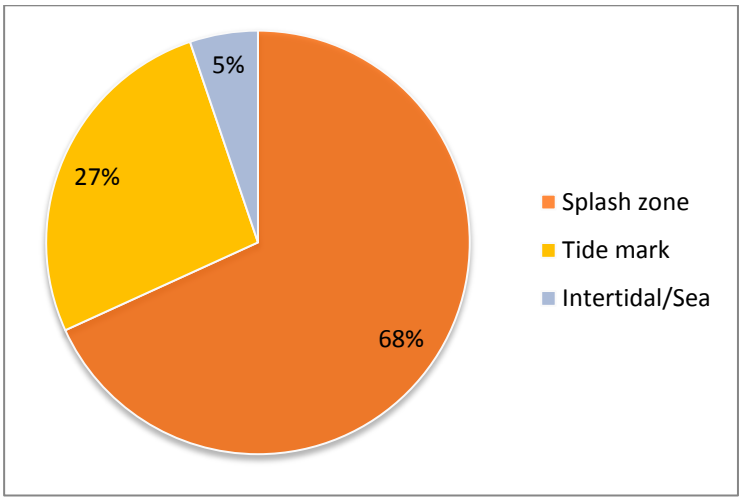


Fig 21 - **Most littered area.** (N=327; Source: Question E3, part 3)

While large waste tends to stay in situ until a major planned removal event takes place, smaller litter items can be removed by local authority, community or individual volunteers. Question F2 was included in the survey to inform us whether there had been a recent cleaning event.

Approximately 4% of s.u. were known to have been cleaned in the week before the survey (see Fig 22). That result is at the upper end of the 2-4% range reported in other years. In bathing areas it may have included the last beach clean before the new extended end to the bathing season. It also included some known very heavily littered sites like the North side of the Boyne estuary where polder walls appear to form perfect litter traps. Here local surveyors noted that approximately four tonnes of litter had been removed in mid September by volunteers supported by Coca-Cola sponsorship.

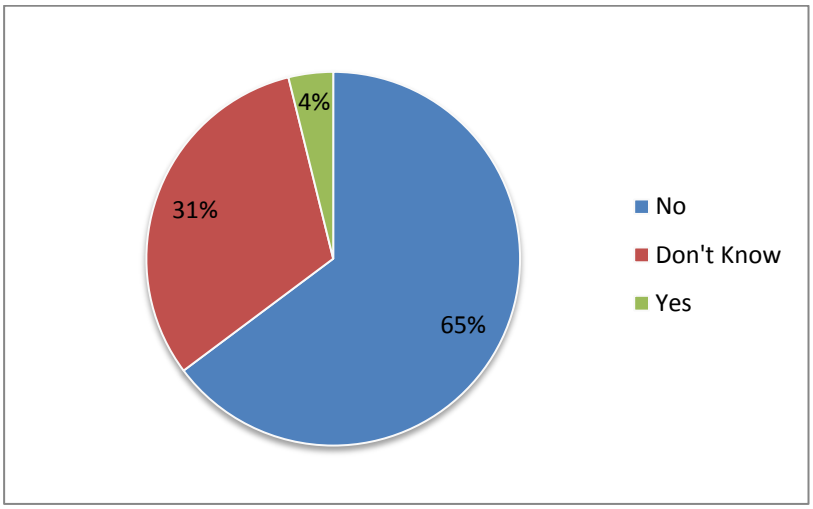


Fig 22 - **Was the shore cleaned?** (N=389 s.u.; Source: Question F2). Answers of the surveyors to the question "Was the shore cleaned within the week before the survey?"

3. Litter Counts: drink containers, plastic bags, tyres and other

Surveyors were asked to count seven types of litter - that is 5 drinks packaging items described by material, as well as plastic bags and tyres. The Coastwatch counts have a historic base and are closely linked to national and EU waste policy. They are agreed internationally. Additionally surveyors were invited to either count or estimate one other common litter item found in their s.u. The 'Other' result can lead to addition or substitution of a new item in the litter count in subsequent years.

Results show that 87% of shores had one or more counted litter item at time of survey. Fig 23 below displays the litter counts from highest to lowest, without the 'Other' category which is covered only in text.

As in previous years, there were more plastic drinks containers on the shores surveyed than all other counted litter added together. With exception of waste tyres (which were more numerous than paper tetra packs, but concentrated in a smaller area, the item count ranking also matched the spread, down to can holders which had the lowest count and most restricted occurrence (Fig 24).

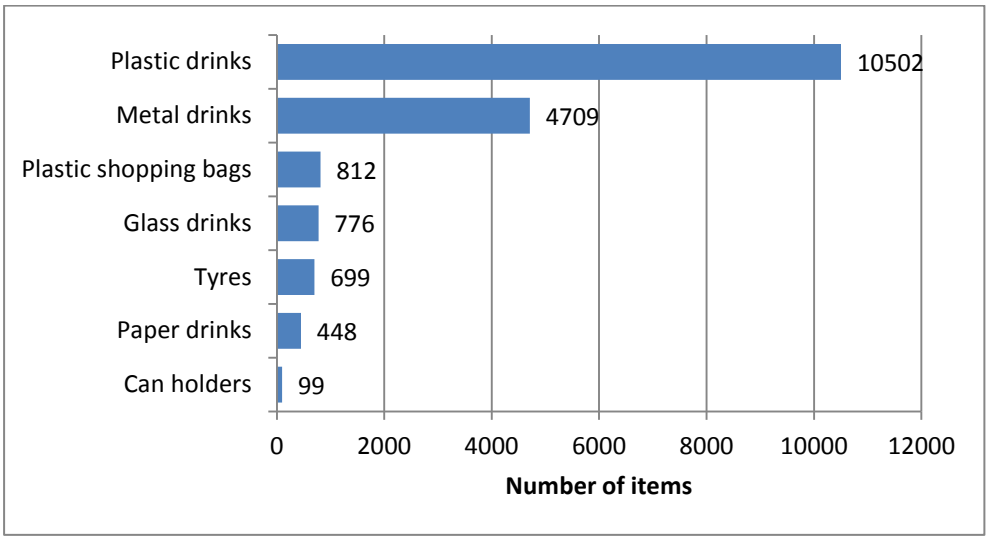


Fig 23 - **Litter counts.** (Approximate number; Source: Question E2) Count of drink containers, can holders, plastic shopping bags and tyres found anywhere on the shore.

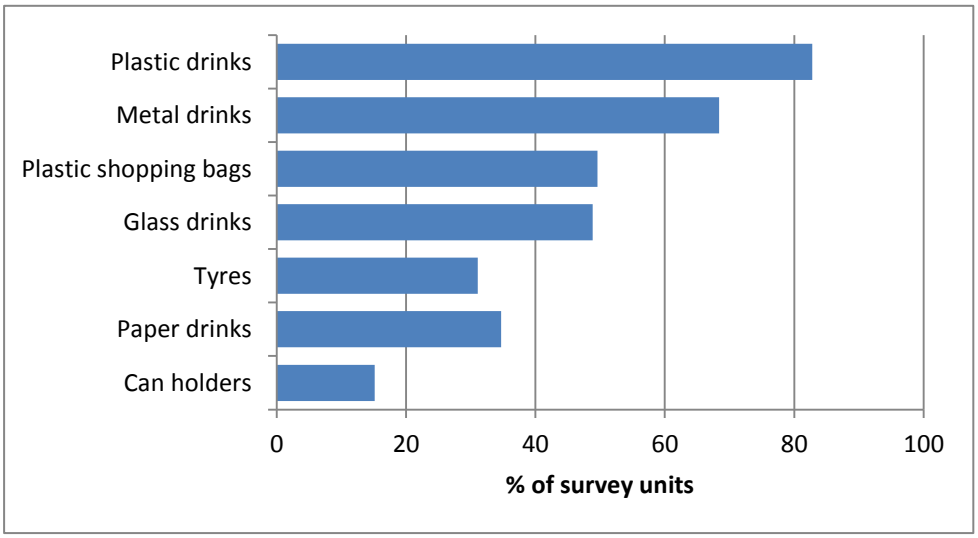


Fig 24 - **Drinks container and other litter.** (N=389; Source: Section E2) Presence of drink containers, can holders, plastic shoping bags and tyres found anywhere on the shore.

Drinks Containers

At least 16,800 drinks containers were found in the 389 survey units. This would be a crop of 43.2 bottles, cans, and/or tetra packs per 500m of shore, if spread out equally, or if imagined lined up along the tide mark there would be one drinks container every 10.8m of shore.

> A Note on Coastwatch Drinks Container Counts
>
> In some areas surveyed after spring tides, volunteers noted that the litter load was swept right up into hinterland vegetation which made it either very difficult to count in case of reeds, or it was deemed to be outside the survey area.
>
> When surveyors got tired of counting they noted 'more than' a given figure (e.g. 100+) we took the count as that figure plus 1.
>
> Several surveyors noted a load of dislodged seaweed with litter caught in and under it, while others observed recent heavy shore accretion with new sand burying everything including litter. Taking all these factors together we believe the counts can be considered conservative.

Putting this in the context of the OSPAR method litter surveys, the Coastwatch count is likely to be lower than the OSPAR count on a given littered beach, as in the OSPAR method the volunteer concentrates on only 100m and only on litter. Some even rake back tideline seaweed to find hidden litter. While this Coastwatch underestimate is recognized, the same error as incurred every year.

Mapping level of drinks container and plastic shopping bag littering

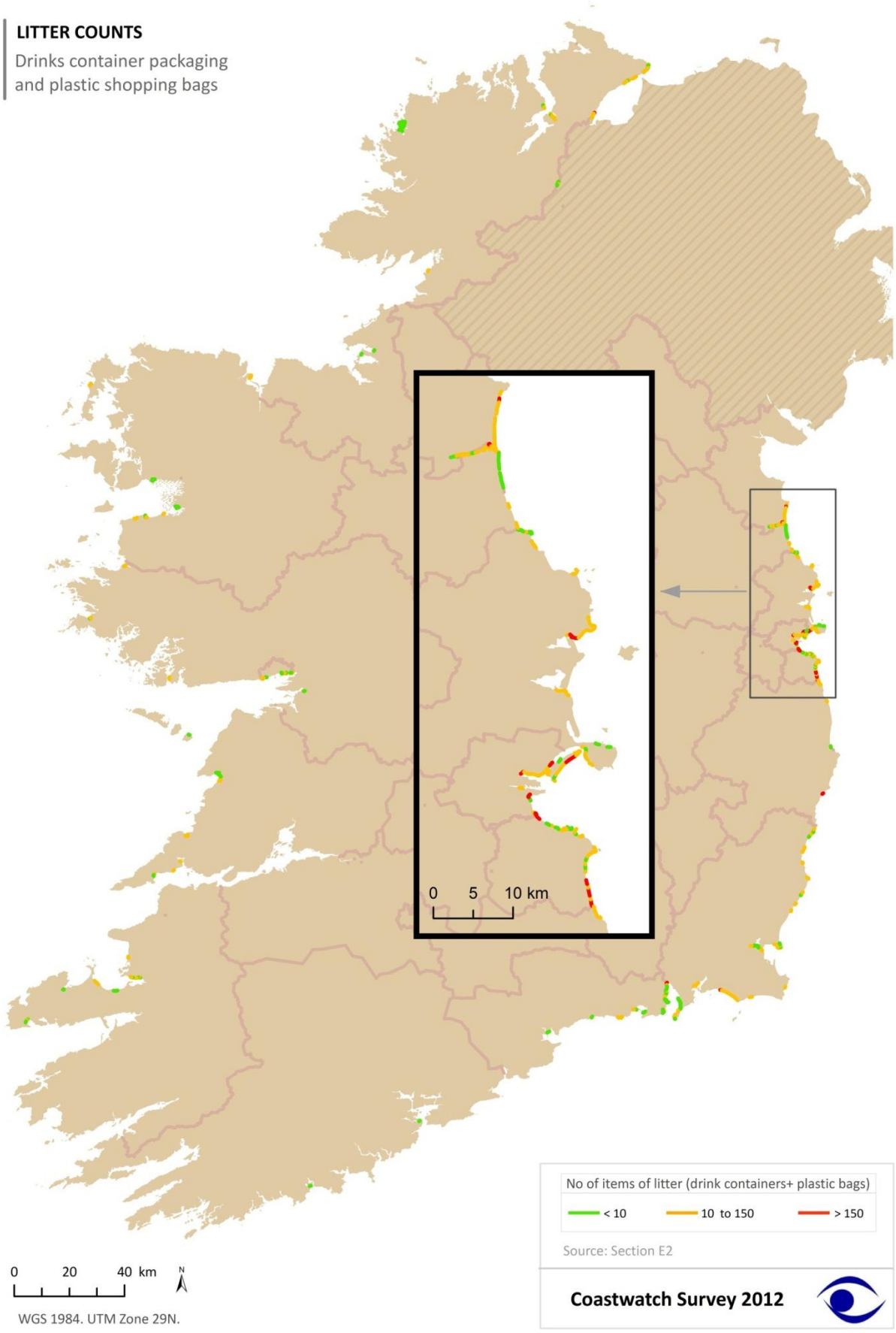
In an effort to visualize levels of littering with counted consumer waste, survey units were divided into three cleanliness groups: less than 10 items counted, 10 to 150 items and more than 150 counted items. The level of littering was then mapped - see map 2 overleaf. The categories are somewhat arbitrary but based on earlier pilot work where core group Coastwatchers were asked to describe shores as clean, a little littered or seriously littered.

The map shows red colour littering is worst in urban areas and in estuaries where the highest population densities would be predicted to produce the highest drinks container load.

This result also highlights that the areas where most people walk and use the shore and shallow waters for recreational activities year round are actually most likely to be worst affected by litter.

Image 29 – **Littered area in Killiney, Co. Dun Laoghaire Rathdown; photo by Ester Moncho**

Map 2 – **Level of littering**



A closer look at the drinks containers load in the 2012 Survey

Plastic bottles stood out as the most common drinks litter by far, with 10,502 counted and one or more found in 83% of s.u. (see Fig 23 & 24). The 4,709 **cans** counted as next most frequent drinks litter were spread over 266 s.u. (68% of shores). The 776 **glass bottles** and 448 paper cover **tetra-packs** were found in 49% and 35% of surveyed areas. **Can holders**, which bundle the cans and may pose a wildlife entanglement risk, were noted 99 times and spread over 59 s.u. (15%). Given that they are now made from biodegradable plastic and disintegrate within weeks, this suggests recent on shore drinking and/or dumping.

The count distribution and surveyor comments show that these drinks containers are not equally distributed but come in clusters. In 23 of our 401 s.u. more than 100 plastic bottles were found. In 11 of these high bottle count sites the can count was also high (50+ cans). At least some of these sites are known drinking spots. For example an area of Meath shore around the Yacht club at the outer Boyne estuary, where Jimmy Clinch found 87 plastic bottles, 212 cans, 10 tetra packs, 3 can holders and 2 plastic bags. A sack full of dumped glass added to the drinks litter but wasn't counted. South of this however Chris Reynolds surveying the Meath dunes noted the shore to be "*cleaner than ever, due to local school's clean-up"*. These clean-ups happened in the first days of the Coastwatch survey.

Currents and winds can carry light litter from a wide area and dump it on a given stretch of shore almost as though a sweeping brush had been at sea with the shore as the dustpan. The difference between the drinking spots and sweep deposit areas tends to be in the other wastes recorded and the high prevalence of closed bottles on the sweep beaches, suggesting that containers without lids fill with water and are less likely to be swept up. A lid count might be a proxy for bottles in the sea.

Drinks Litter counts over time

Drinks container counts rose steadily in the early 1990s in Ireland. Then cans stabilised while bottles continued to rise throughout the early 21st century in line with arrival of the 'shore (wo)man' phenomenon, with phone in one hand and water or energy drink held in the other.

The average shore litter load of 26 **plastic bottles** per s.u. this year is a drop from 2010 and puts results into the low end of the 24 - 35 bottles/s.u. count range obtained over the last 12 years. However, this is in the context of very poor summer weather, which reduces recreational shore use and clean-up of some very littered Louth and Meath survey sites.

The **can count** has improved over the years and is now down to just under 12 cans/s.u. Apart from lower sales of drinks in cans than in bottles, a contributing factor may also be the use of a lighter tin like material which breaks apart in the centre. The can pieces, while sharp and dangerous for bare feet sink into sediment much faster than the old whole cans and may not be noticed as can litter. Some follow up studies would be needed to clarify the new can's life cycle on the shore and fate of the pieces.

Image 30 – **Accumulation of cans in Sandymount, Co.Dublin.** Photo by Ángel Duarte.

Discussion and Conclusions for Drinks Container and Plastic Bag litter

From Coastwatch survey results across Europe, our drinks containers load is consistently in the group of high litter countries. There is a significant link between deposit on return systems and reduction/low numbers of drinks container litter in all countries where this economic instrument was introduced or maintained.

http://www.zerowasteeurope.eu/2010/09/beverage-packaging-and-zero-waste

There are three main ways currently in use to deal with beverage packaging across Europe:

1. Refilling (normally with deposit) - bottles are used by the customer, transported back to the filler (producer), rinsed, refilled and transported back to the customer for use. Glass bottles can be refilled over 50 times and as we see in the pub trade where the relic of our old refill system is still maintained. Where this loop covers a small area – as our milk bottle refill system did – the result is near zero litter, minimum environmental impact and considerable cost savings for those in charge of waste management. A refillable PET-bottle can be used up to 15 times. The consumer can return it with weekly shopping and the bottle is so light that any litter which does arise can be carried for some distance.

2. One-way deposit – bottles/cans are used only once, the producer can get back the materials or they will go directly to the recycling company which produces new bottles or cans which then need to be refilled and transported back to the customer. Zero litter but usually a higher environmental impact.

3. One-way without deposit – bottles/cans are used by the customer, the producer may pay a fee to an organization to handle the waste or wash his hands of it once it becomes waste. Tax payers and authorities bear the disposal costs and only a fraction of the material is recycled. The empties have 'no value' and thus there is neither an incentive to avoid littering nor to pick such containers up. This is the option we have now in place in Ireland. It is the perfect model for high litter and high environmental impact. It was introduced when speed, mechanization and obsolescence stood for 'modern', it was the cheapest option for producers and retailers like it.

When 25 years ago our Coastwatch surveys started, oil prices were low, carbon emissions were academic concerns and no one predicted the litter problems which were developing. The same happened right across Europe. By 2000 the national reviews started, litter and waste of raw materials, rising raw material costs and rising Greenhouse gas emission concerns led to the reintroduction of many deposit on return systems in EU member states over the following decade. While we in Ireland have not gone that way yet, it does have the advantage that we can look at those different systems now in place elsewhere and perhaps use a combination of best practices to rebuild our own.

Looking back to the drinks container and plastic bag count (see map 2), the economic instrument solution enticing consumers to return empty drinks containers in return for payment would have several supporting factors here. A deposit on return is easiest to implement in urban areas as shops to return the bottle or can are close by. Our highest litter counts were mostly from urban areas. The chance of someone picking up stray drinks containers is also high due to the number of shore users in urban areas. At the same time the maximum number of people would notice the improvement in shore cleanliness.

Plastic Bag Counts

From half the sites surveyed one or more plastic shopping bags were reported and the total count came to 812 bags, or 2/s.u. This litter count was introduced in 1997 when the count in the Republic was 14/s.u. It then rose every year until the plastic bag tax was introduced in the Waste Management (Amendment) Act 2001. The next - autumn 2002 – Coastwatch survey showed a sharp drop and then stayed at 2/s.u. ± 0.5 for every survey. The bag levy has been increased twice since

then. This year's plastic shopping bag count again yielded an average of 2/s.u. but were a little more dispersed than in recent years.

Image 31 – **Remains of a plastic bag.**

The remaining shopping bag litter appears to be either unidentifiable or associated with two sources – drinking locations and angling spots. Cans bought in off licenses and supermarkets for outdoor drinking appear to be carried to the shore in plastic bags. Some users diligently collect the empty drinks containers, put them back into those same plastic bags but then leave them on the shore. Angling bait is sold in plastic boxes which are then placed into plastic bags, some of which are branded as seen in the photo above from a Dublin shop bag. Inspiration how to address this might come from those who sell the tackle?

Tyre Counts

Waste tyres were found in almost a third of survey unit (31%) but were very much clustered with nearly half of the 699 counted in Bannow Bay. This is one of several known Natura 2000 sites where the car tyres are placed into the intertidal to catch peeler crabs. As the crab gets ready to shed its old shell and grow a new one it appears to favour the shelter of the warm dark tyre over rocks and seaweed. The lines of tyres then become a magnet for crabs and may reduce the local crab population significantly if the traps are worked over a large area and emptied often enough. The effort also reduces mudflat habitat and frequent checking adds to bird disturbance in winter.

Image 32 - **Tyres set in Bannow Bay to catch peeler crabs;** photo by Paul Dubsky.

Car tyres are a priority waste stream under EU waste law and are to be kept out of landfill sites. The free delivery of the tyres to the shore by some garages incentivizes addition of more tyres as old ones silt up. It is strongly recommended that this unregulated practice be scrutinized and regulated, especially as it is found in Natura 2000 sites.

Other noteworthy litter with some count data

The 'Other' category includes both items listed as notable because they are unusual and notable due to high numbers. It's a category which makes interesting and even entertaining reading and suggests a rural urban divide.

Erosion control measures were mentioned twice in adjacent survey units by the Kelly family in North Wexford. There was official 'soft erosion control' dune fencing at Kilpatrick dunes which the sea rolled up in its own way and left ready but no one picked it up for over 2 years, though the tyre marks show how accessible the shore is. There was also 'home made erosion control' for a single house at the beach entrance, which the sea was pulling apart in the picture provided below..

Image 33 – **Other Waste and litter included 1** Official sand fencing remains on Kilpatrick beach Co Wexford and **2** private sea bank erosion control in the next survey unit (photos by Kelly family); **3** an oven ready chicken on Dollymount beach, Co. Dublin; Photo by Ángel Duarte.

Ángel Duarte surveying Dublin's Dollymount island bridge area found '*traffic cones, an oven ready chicken, balls, a bike and a microwave'*. Another urban surveyor listed *'cones, shopping trolley and parts of mobile phone'*. In contrast *feeding buckets and abandoned lobster pots* were noted in several rural areas.

Rope litter was mentioned most frequently. Of the 22su where it was noted, six surveyors also provided a count, adding up to 157 ropes in 6 s.u. **Traffic cones** were mentioned in 11s.u. and were the most frequently listed urban litter. In follow up work Coastwatchers saw these associated with urban streams and rivers. In Dublin there were >30 such cones at one arch of O'Connell Bridge alone. They could form serious flood water impediments especially if they joined with bikes and plastic sheeting which are other urban litter categories. **Gloves** were noted in 9 s.u. crisp packets and balloons were only mentioned as notable in 5 survey units and **golf balls** in 2. Several mobile phones were found during the survey – something not yet invented when the Coastwatch survey started in 1987. From more detailed work on a small number of shores, bottle **screw caps** and **lids** are far more prevalent but due to their size and familiarity are usually overlooked.

Image 34 - A Ballymoney shore surveyor photographed **rat poison boxes** including this one, which had been kept behind the lifeguard hut, but forgotten when that was moved at the end of the bathing season.

4. Presence of Small Litter

Apart from the litter counts above, surveyors were asked in question E3 to look for 14 categories of smaller litter items, as well as oil/tar and an open field 'other' on their chosen 500m shore from splashzone down to the water's edge and note their presence on their survey form. Fig 25 below shows the ranked percentage of survey units in which a given litter category occurred. Fishing and aquaculture gear was the most widespread, to medical waste which was found on 9 s.u. (2%). Bars are coloured blue if virtually all comes from the sea or is used in marine related activity in the intertidal or in a harbour or boat. Bars are coloured green where the source is virtually all from an activity on land and yellow where the source may come from a mix of both. It should be noted that both plastic drinks bottles and drinks cans were even more widespread than the fishing gear.

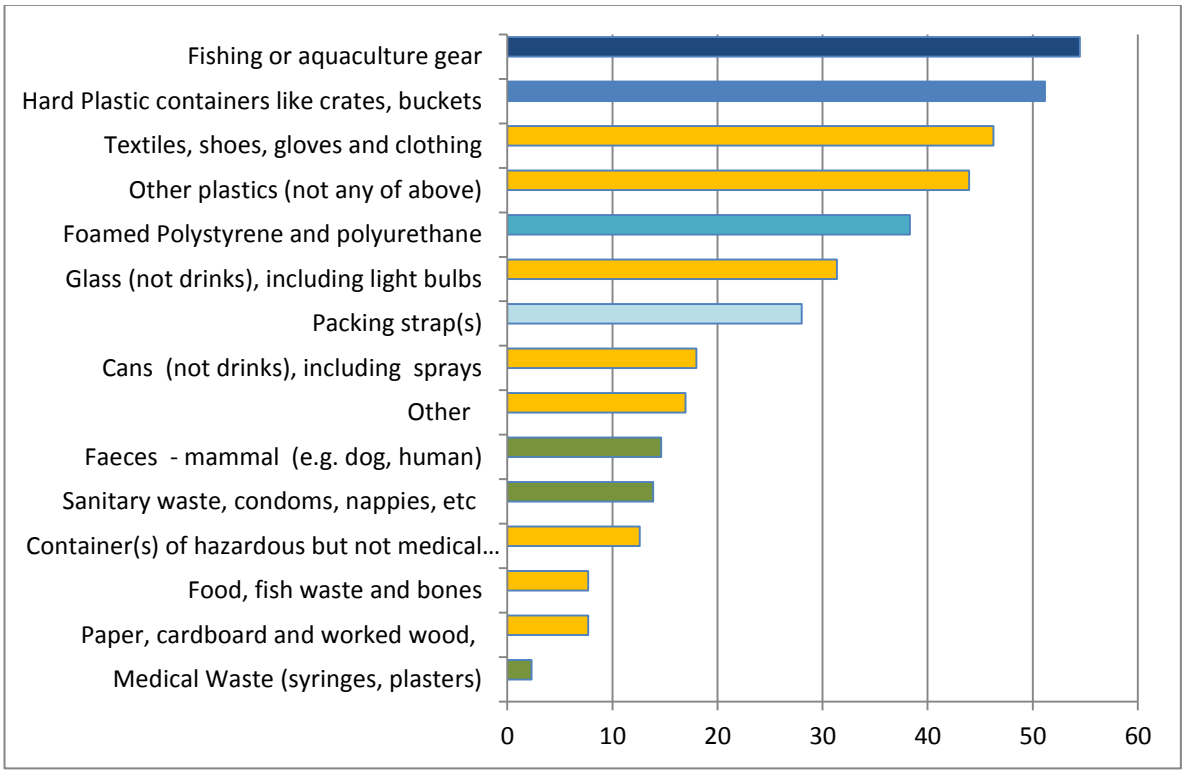


Fig 25 - **Presence of different types of general litter and pollution.** (N=389 s.u.; Source: Question E3) Tick which of these items of litter you found in your survey unit.

Image 35 – **1** Netlon oyster bag at Woodstown, Co. Waterford, photo by Andrew Cox **2** Lobster pot at Drillistown, Co. Waterford, photo by Patrick Houlihan

Of the smaller litter and excluding drinks bottles, **fishing gear** and **hard plastic containers** like crates, fish boxes and buckets were most widespread and present on more than half of the survey sites each.

A recent extra question was inserted to ask surveyors if they could identify the source of the fishing gear as fishing, aquaculture or angling. The result presented in figure 26 shows surveyors who could identify the waste judged that in 80% of their survey sites, the objects found the waste came from fishing, 15% from aquaculture and 5% from angling.

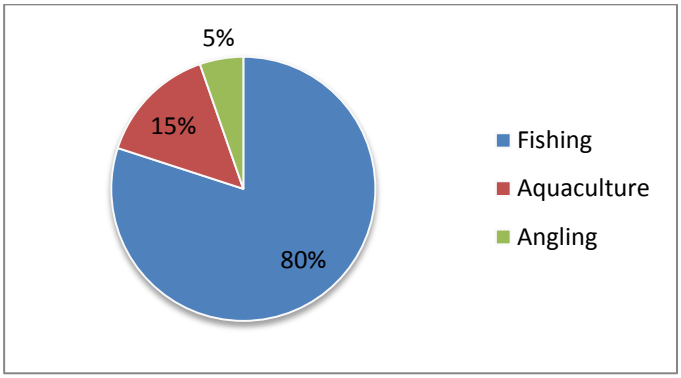


Fig 26 - **Source of fishing/aquaculture litter.** (N=225 ; Source: Question E3). Fishing and aquaculture litter was found in 212 survey units, 23 of which had fishing litter for several sources and 10 with no specified source.

Looked at over time, fishing gear has increased while 'other plastics', fish crates and buckets, polystyrene and textiles as well as packing straps are in the general range of previous years. Sanitary waste has halved over the last 14 years and medical waste which is now rare are both the welcome result of widespread functioning sewage treatment systems. The remaining sanitary waste may be attributed to some poorly or untreated sewage entering in a few areas, as well as some courting spots and nappies buried by parents and dug out by the wind and sea. As previously for drinks container waste, our survey picked up both local litter sources and sweep - deposit shores. The photo overleaf from François Gunning, an artist working with beach litter and drift wood, illustrates that the sea and wind can sweep the sea and funnel waste into small deposit areas.

Image 36 - 'A picture of Aghleam beach Mayo, my biggest supply of plastic', by François Gunning.

Comparisons of Coastwatch and OSPAR results

UNEP and OSPAR beach litter results 2001-2006 are constant for the most numerous marine litter categories. Taking the top 10 marine litter items found in the Coastwatch survey 2012 and those on the OSPAR references beaches - see in table 2 - highlights common features:

COASTWATCH (CW) TOP 10 LITTER ITEMS - MOST WIDESPREAD ON OUR SHORES.	**OSPAR TOP 10 LITTER ITEMS -** MOST NUMEROUS ON REFERENCE SHORES	**COMMENT re OSPAR groups** Key NCC = NOT COASTWATCH CATEGORY
Plastic drinks bottles	Plastic/polystyrene pieces <50cm	CW has no size distinction in polystyrene
Drinks cans	Rope/cord/net <50cm	CW classifies as fishing and aquaculture gear
Fishing and Aquaculture gear	Cotton bud sticks	Cotton buds are included in sanitary litter in CW
Hard Plastic containers	Plastic caps/lids	NCC for caps/lids in CW, so ->other plastic.
Plastic shopping bags	Crisp/sweet packets	NCC for crisps > other
Glass bottles	Plastic/polystyrene pieces >50cm	CW has no size distinction
Textiles, shoes, clothing	Plastic drink bottles	Identical
Other plastics	Rope/cord/net >50cm	CW classifies as Fishing and aquaculture gear
Foamed Polystyrene and polyurethane	Plastic food containers (incl. fast food)	NCC for food containers. Food buckets -> hard plastic containers, others -> to 'other plastic'.
Tetra pack drinks containers	Ind. packaging, plastic sheeting	NCC for pl sheet. > other

Table 2 – **Comparison between Coastwatch and OSPAR results regarding marine litter.**

The top nine Coastwatch marine litter categories and top ten of the OSPAR ranking were made part or fully from plastic.

In terms of products **Plastic drinks bottles** ranked highest in CW survey in terms of how widely it was distributed among the 389 survey sites and 7th in count on OSPAR reference beaches. **Polyurethane and polystyrene pieces** ranked 1st and 6th in count of items (divided by size in OSPAR surveys) and were also noted as 9th most widespread litter in the Coastwatch surveys. **Fishing and aquaculture gear** ranked 3rd in spread and 2nd in number of items on reference beaches.

5. Micro-litter Pilot Study

INTRODUCTION

This pilot study on micro-litter was carried out to increase surveyor awareness of very small easily overlooked litter and highlights that materials have particular breakdown problems. Coastwatch is also trying to find a cheap effective method of collecting micro-litter information for the new Marine Directive. Marine litter is one of 11 descriptors which member states have to monitor to implement this EU law.

The EU taskforce working on this descriptor have set the context as follows:

"Quantities, composition and distribution of litter, including the distribution and concentrations of degradation products of litter (micro particles in sediments and the water column) as well as impact rates on organisms and the potential chemical pollution resulting from plastics are good trend indicators of degradation through marine litter and monitor direct harm in the marine environment. Monitoring the quantities and distribution of litter in the different compartments of the marine environment will give a basis for actual and potential assessment of socio-economic and ecological impacts of litter. Impacts on organisms, distribution and concentrations of micro particles and chemical burdens monitor direct harm to the marine ecosystem."

MARINE STRATEGY FRAMEWORK DIRECTIVE. Task Group 10 Report. Marine litter.

To raise awareness surveyors were asked to collect sediment samples in areas where they saw micro-litter. The main objective once samples were collected was quantification and basic characterization of the micro-litter found.

METHODS

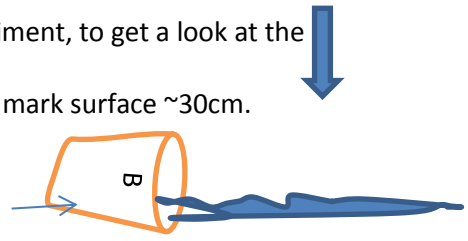
- Materials and design

There was no budget for this pilot study and methods had to be improvised. A search for standardized sampling containers yielded 100 used 10ml plastic containers in TCD zoology department, which were cleaned and matching lids fitted. While training of volunteers was restricted to 5 sites, the first 2 training sessions were used to write and edit instructions (see methods box below) which were then copied and handed out with sample containers and Nitrate test kits. Samples were pre-sorted with simple magnifying glasses and only final checks carried out with a microscope. Lack of budget and equipment did prevent chemical composition analyses of the micro-litter found.

- Sampling method

Surveyors were provided with two sample containers (A and B) and with instruction on how to take the samples. They were asked to find a spot on the tide line with visible pieces of tiny litter:

- Container A was used as a corer, pushed vertically into the sediment, to get a look at the litter in layers of sediment.
- Container B was used for surface samples, by scraping the tide mark surface ~30cm.



The labelled containers were then posted back to the national coordination for analysis.

- **Sample processing and analysis**

Each sample container was emptied into a petri dish and weighed, moisture content estimated and sediment type (mineral -gravel, sand, silt, mud-, and organic). In order to have a record of all the samples a picture was taken of each.

The sorting of the samples and extraction of litter was done by visual inspection, first with the naked eye and magnifying glass, looking for the bigger pieces of litter, then the binocular microscope (using a spatula to move the sediment in front of the lens and inspect litter pieces). In a ~30 min./sample inspection effort shell fragments, mineral sediment, seaweeds, natural wood, etc. were discarded and litter picked out. The criteria used for the visual identification were:

- Material
- Thickness
- Colour (homogeneity, brightness)
- Texture
- Behaviour when pulled and cut

The litter was divided in 5 material categories: general plastics, polystyrene/polyurethane, glass, tar and metal paint coatings. Plastics were then further divided into 3 sub-categories according to their physical characteristics: Plastic filaments, hard plastics and plastic sheets.

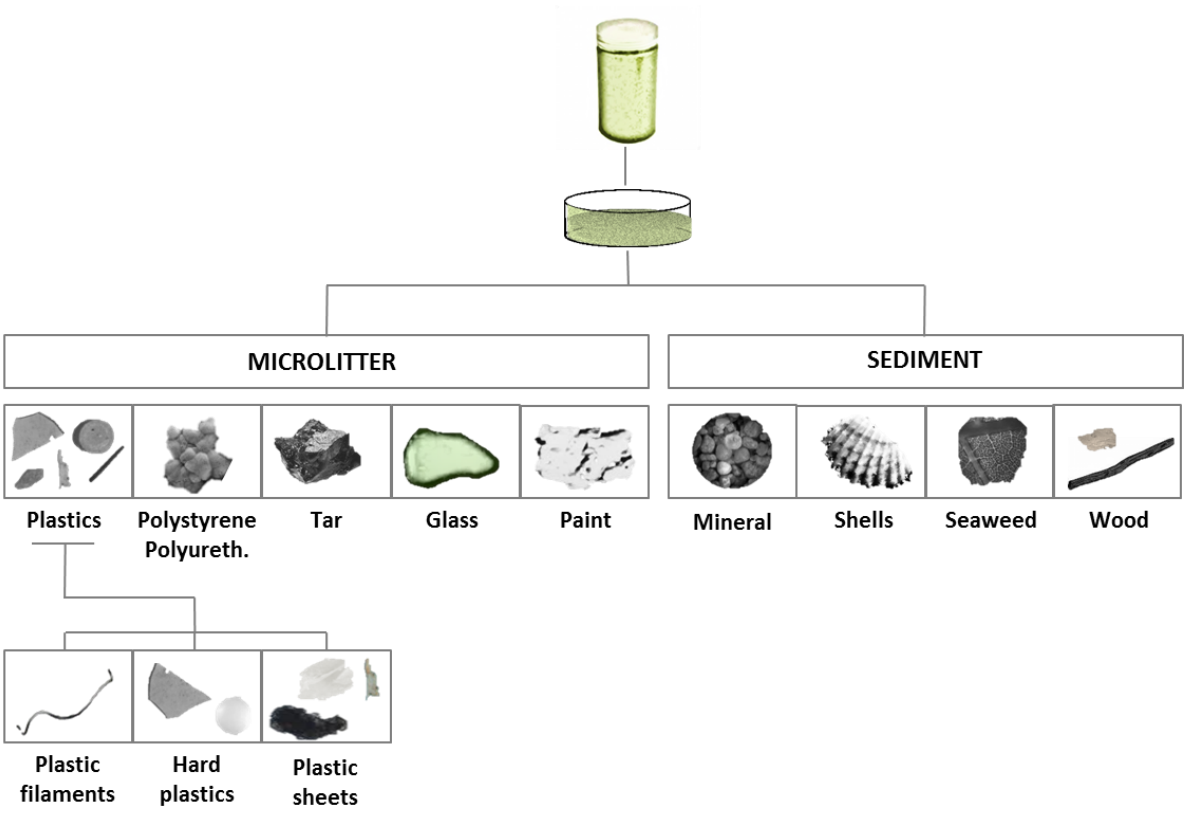


Fig 27 – **Sorting of the samples.**

A second characterization was done by size. The size range of the selected pieces was from slightly smaller than 1 mm (visible with binocular microscope) to 5mm, which is considered in most studies as the upper limit of micro-litter. We also considered plastic filament pieces up to 10 mm in length. The final size division was done in 5 categories: <1 mm; ≥1-2 mm; ≥2-3 mm; ≥3-4 mm; ≥4-5 mm; ≥5mm-10 mm.

RESULTS

By the end of the survey 83 micro-litter samples had been submitted (for 42 sites – one of the A samples was lost).

Micro-litter Count: There were 126 litter pieces in the 0.1 to 10mm size range found. These were concentrated in 24 of the 83 sediment samples. Two thirds of core samples were deemed to be free of micro-litter in this size range, while three quarters of surface samples were litter free.

Of the 126 litter pieces, 80% were found in the surface samples and only 20% in core samples (see figure 28). However, most of the 101 litter pieces in the surface samples were found in two very heavily contaminated samples. If these are discarded, sediment cores were more contaminated than surface scrape samples.

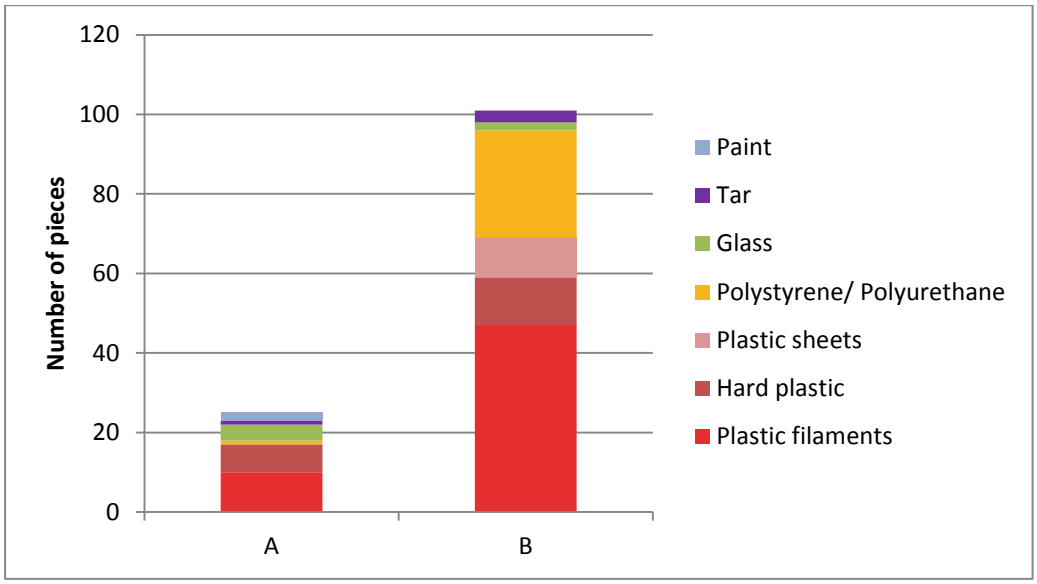


Fig 28 – **Number of micro-litter pieces in core samples (A) and surface samples (B) by type of material.** (N=126)

Micro-litter Material and Shape: The most numerous and widespread micro-litter was plastic. In both core and surface samples 90% of the litter pieces were plastic. The most common type of plastic was fine filaments (45%), followed by polystyrene/polyurethane pieces (22%), other hard plastics made up 15% of the litter pieces and plastic sheet pieces 8%. Glass, tar and paint together only represented only 10%.

The greatest part of the litter found in this pilot was derived from the breakdown of larger items. A "primary source" raw hard plastic pellet was only found in one sample.

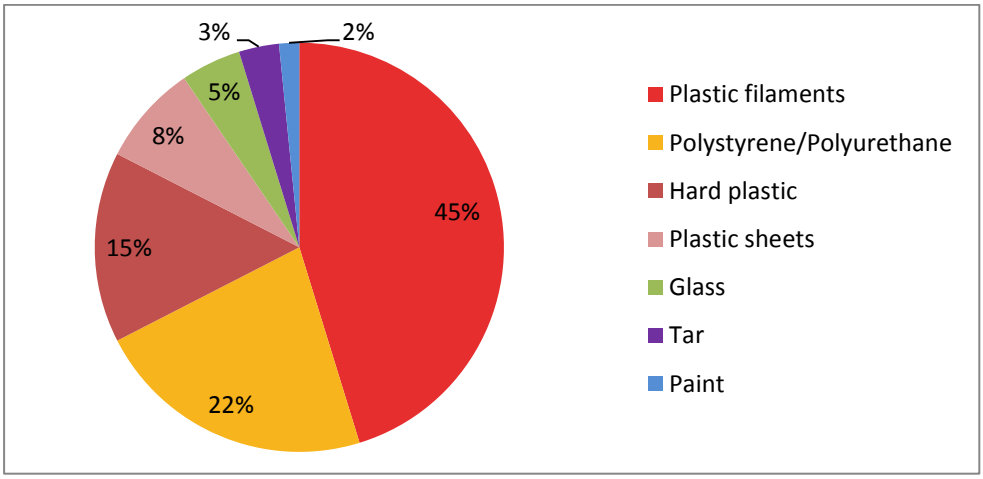


Fig 29 – **Percentage of each type of micro-litter.**(N=126)

Micro-litter Size: Table 3 and figure 30 below show the percentage of litter pieces of a given material and size.

%	<1 mm	≥1 to 2 mm	≥2 to 3 mm	≥3 to 4 mm	≥4 to 5 mm	≥5 to 10 mm	TOTAL
P. filaments	3,17	8,73	4,76	7,14	17,46	3,97	**45,24**
Polystyrene	7,94	4,76	7,94	0,00	1,59	0,00	**22,22**
Hard plastic	0,00	4,76	1,59	1,59	3,17	3,97	**15,08**
Plastic sheets	2,38	2,38	1,59	1,59	0,00	0,00	**7,94**
Glass	1,59	0,79	1,59	0,00	0,00	0,79	**4,76**
Tar	0,79	2,38	0,00	0,00	0,00	0,00	**3,17**
Paint	0,00	0,00	1,59	0,00	0,00	0,00	**1,59**
TOTAL	**15,87**	**23,81**	**19,05**	**10,32**	**22,22**	**8,73**	

Table 3 – **Percentage of litter pieces of a given size and material.** (N=126)

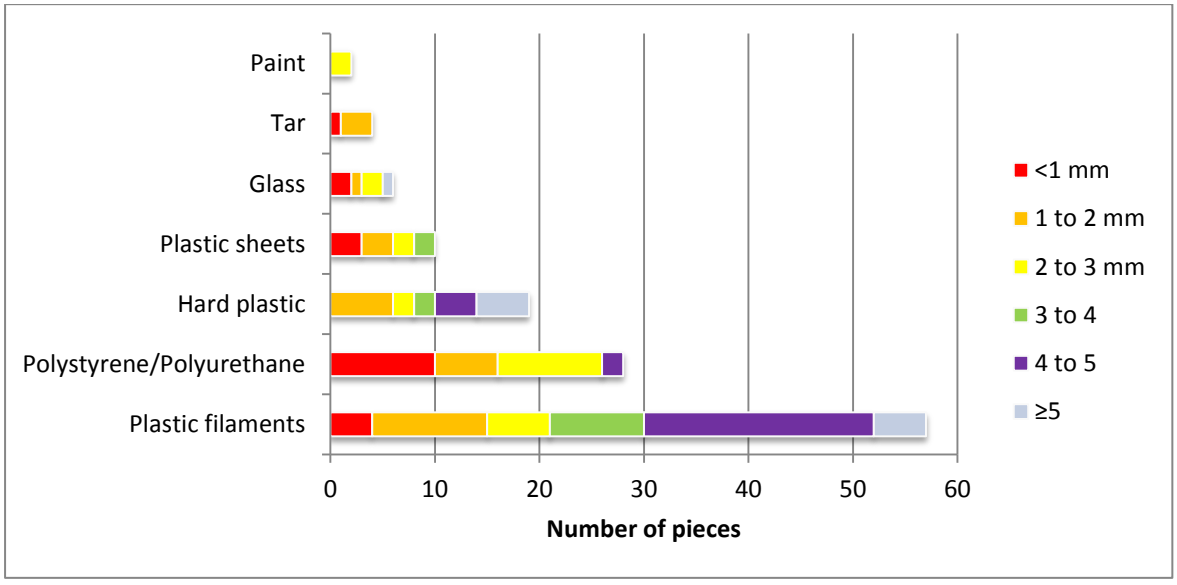


Fig 30 – **Number of pieces by type and size**

There are no big differences in the amount of litter for each size. The most common litter size ≥1 to 2mm and the less common is > 5mm. Examining size distribution by material, one can see that of the pieces greater than 3mm 69 % were plastic filaments (long but thin).

Polystyrene/polyurethane and hard plastic are distributed quite evenly between the different sizes. On the other hand plastic sheets, glass, tar and paint were mostly small sizes (<3mm).

CONCLUSIONS

The results of this pilot study suggest that it should be possible to include micro-litter sampling and that indeed it would be a good extra to the survey for school classes where standardised laboratory analyses could bring useful results and have educational value. While most of the micro-litter was found on the surface it was surprising how many core samples contained litter. In harbour corners one can see that litter can accumulate in different layers when digging into the sediment, but our assumption had been that on a sandy beach tideline the light litter would be kept at the top by wave and wind, so the core samples would not contain such litter. This suggests that future studies might continue the practise of taking surface and core samples.

The large amount of plastic filaments was noteworthy and links back to degradation of fishing gear and other rope and twine. In the case of Polystyrene, degradation of bigger pieces of the foamed material found in 35.7 % of the survey units and observed as second most common micro-litter in this pilot project points to the need for material substitution.

Marine Litter prevention and reduction – from global efforts to local action

Marine litter is a global concern affecting all the oceans of the world. It poses environmental, economic, health and aesthetic problems that are rooted in poor solid waste management practices, lack of infrastructure, indiscriminate human activities and behaviours and an inadequate understanding on the part of the public of the potential consequences of their actions.

(UNEP, 2009. *Marine Litter: A Global Challenge.* Nairobi: UNEP. 232 pp.)

In 2005, the UN General Assembly:

- encouraged States to develop partnerships with industry and civil society to raise the awareness of the extent of the impact of marine debris;
- urged States to integrate the issue of marine debris within national strategies dealing with waste management;
- encouraged the development of appropriate economic incentives to address this issue;
- and encouraged States to cooperate regionally and sub-regionally to develop and implement joint prevention and recovery programmes for marine debris.

We believe that there is a lot of information on marine litter and waste out there, but (i) it is not organised in an accessible format, (ii) there is no formal update (iii) and stakeholders have too little opportunity to add their observations, or solutions. The Marine Directive (MSFD) is trying to address that but leaves much scope to member states as to how to deliver.

We now have a platter of legislation and agreements to tackle marine litter and everyone knows that littering is bad. Examining Coastwatch data over the years, some things are improving in our own backyard as waste management practises improve on point sources such as the closure of coastal landfill sites. Other point sources of solid waste like intertidal aquaculture have not been tackled and could get significantly worse if aquaculture expands with the new CFP.

Diffuse source litter from old nets to plastic bottles and polystyrene materials are only improving where a material is being replaced – like bailer twine being replaced in agriculture by silage wrap, or where we see specific well thought - out economic instruments applied - like the plastic bag tax.

Small litter is moved by wind and water around our seas so one community or county council cannot achieve much without the cooperation of others. As the public becomes more litter aware, economic drivers such as tourism organisations are calling for more preventative action rather than relying on clean ups.

More and more research is showing how long life plastic litter is being broken down and entering the food chain. While wildlife ingesting plastic pellets, perhaps mistaken for fish eggs is of concern to few in the general public, the fact that it is getting back to our food is likely to be a more effective way to increase public and political will for more action. The recent paper by Murray and Cowie (2011) showed that plastic filaments are ingested and can accumulate in prawn gut really brought that home. [1]

Image 37 – **Micro-plastics found during Coastwathc micro-litter pilot study.**

[1] Murray, F., Cowie, P.R. Plastic contamination in the decapod crustacean Nephrops norvegicus (Linnaeus, 1758). Mar. Pollut. Bull. (2011), doi:10.1016/j.marpolbul.2011.03.032

6. Inflow Pollution

Surveyors reported seeing 362 inflows with 40% of these described as streams or rivers. The survey questions ask the volunteer to record simple visual and smell observations. One observation is positive - 'signs of animal life?' -, while the others are indicators of recent weather or pollution problems.

Results

The responses were graphed by type of inflow and ranked from most common problem, that is discolouration/scum/froth, to the least frequent, which was oil pollution - see Figure 31 below.

Surveyors found signs of animal life in 6% of inflows, which were mainly streams and rivers. At time of survey volunteers saw more discoloration, scum or froth than animal life. While discoloration can be a bad sign, it may also be an indication of recent heavy rain draining out to sea and could also have contributed to not seeing animal life.

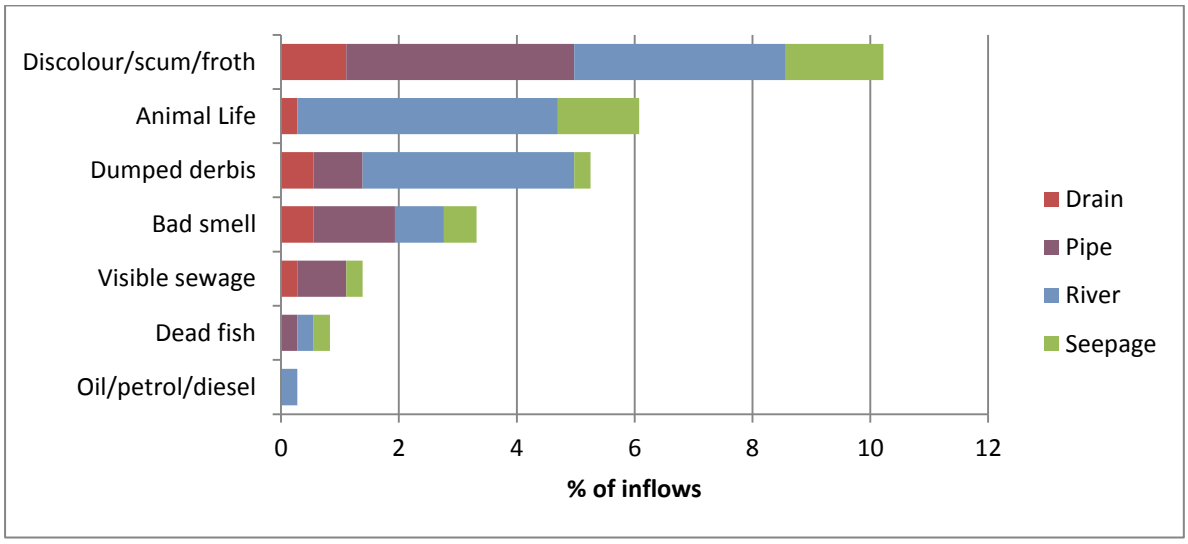


Fig 31 **Quality indicatores of the inflows, by type of inflow.** (N=362 inflows; Source: Question B2) Overview of the different quality markers indicating the type of inflow where they were described.

Dumped debris was found in 5% of inflows. This tends to be a mix of actual dumping and material washed down the river, drain or pipe. The least common problems of a bad smell (3%), visible sewage or sewage fungus (1.5%), oil and dead fish (found in 3 inflows) are all being followed up individually.

While the ranking of (potential) bad signs has remained the same as in previous years the percentage of inflows affected has reduced in all but the scum and dead fish categories. The presence of sewage has halved when compared to 1998 data. The sewage discharge in this survey involved three pipes, one seepage, one drain and one inflow where type was not determined.

Nitrates

Nitrates and phosphates are the key nutrients which are needed for life, but become a problem when present in oversupply causing eutrophication. Simple field detection kits are produced by several companies including Merck, who also produce an individually wrapped version of nitrate/nitrite tests which are affordable and robust for widespread use.

Apart from visual and smell information surveyors who sent a request were also furnished with individually wrapped Merck Nitrate/nitrite test kits, colour charts and instructions to test their inflow once during the survey. As test kits could not always reach surveyors in time for their

planned survey dates, only 162 of the 362 inflows were tested. However more have undertaken tests since then. Fig 32 below shows results reported as a pie chart, with inflow nitrate levels (NO_3 in milligrams per litre) from below detection to seriously nutrient enriched.

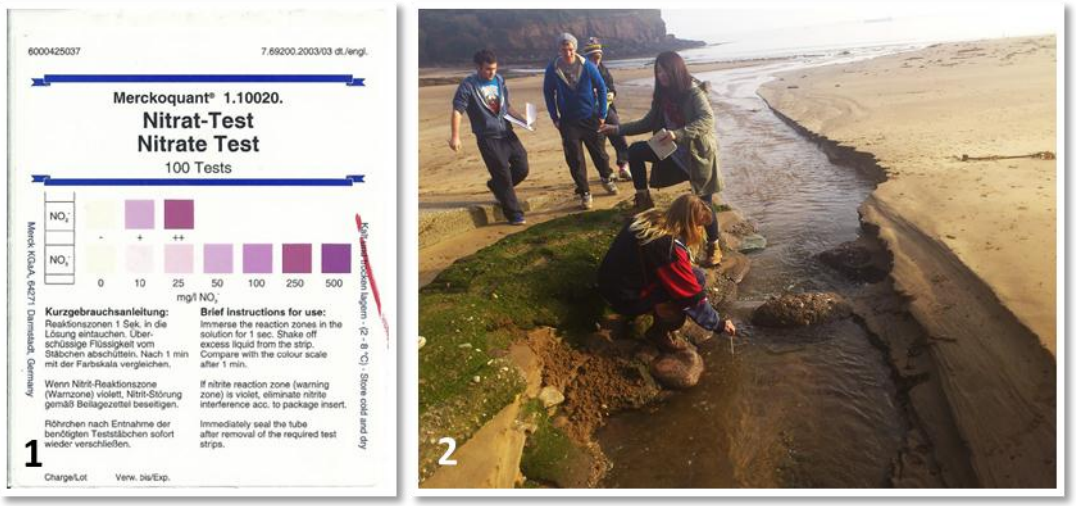


Image 38 – **1** Color chart for nitrate/nitrite testing **2** Geography students (Newtown School) testing an inflow, photo by Andrew Cox.

Results

There were no reports of nitrites (NO_2) detection as in most previous surveys. This form of nitrogen quickly reverts to the more stable nitrate (NO_3).

In just over half of all tested inflows nitrate levels were below detection – that is below 10mg/l NO_3. This is a very encouraging result, not achieved since 1993. Looking back the results vary with worst results reported for 1997, when only 29% of inflow waters sampled were below detection and 31% in 1998.

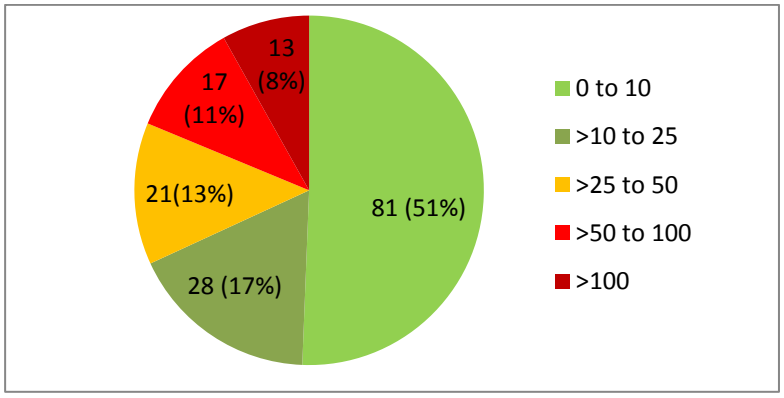


Fig 32 **Nitrate level of inflows, by type of inflow** (N=162 inflows; Source: Question B2)

However taking the two first categories - 'below detection' and 'just detected' (10 to 25mg/l) together, we see the 309 inflows tested in 1998, 74% fell into this this clean to low-medium pollution level, as against 68% this time in autumn 2012. As in previous surveys, wet summers appear to be associated with lower nitrate levels.

The highest nitrate pollution levels were found in the Rush area where readings up > 250mg/l were reported. Similar extremely high nutrients in inflows were observed in 2 previous surveys and require a follow up investigation.

Displaying inflow type against nitrate levels (see Fig 33 below) shows that all types of inflows contribute to the detected nitrate levels so in terms of volume these are not trickles of nutrients but large volumes entering the marine environment.

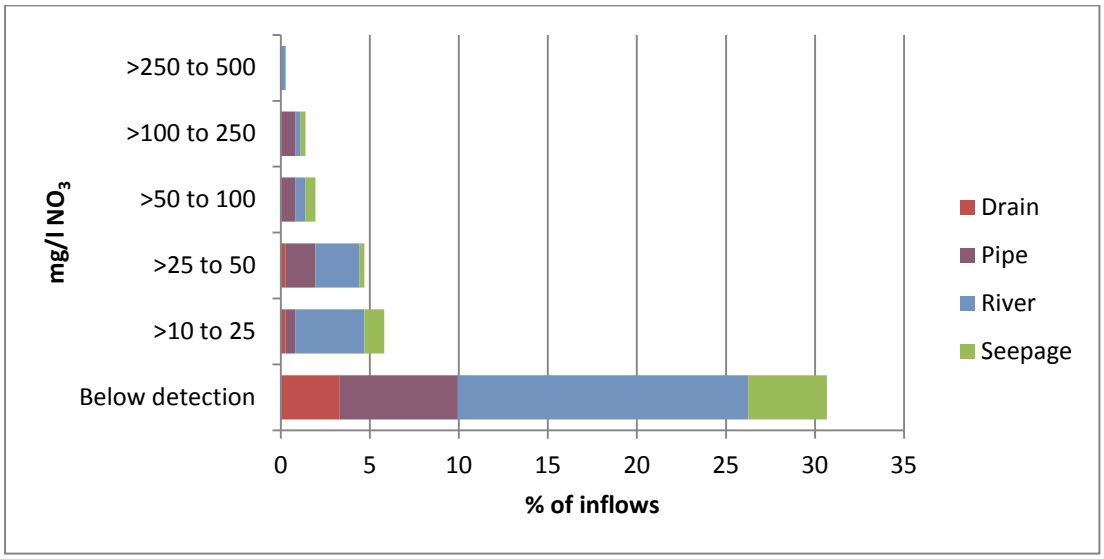


Fig 33 **Nitrate level of inflows, by type of inflow** (N=362 inflows; Source: Question B2) Overview of the nitrate level indicating the type of inlow where it was detected. A total of 162 inflows were tested for nitrate.

Looking at effects of pollution we see seagrass in L. Foyle struggling with the opportunistic seaweed growths on its blades typical of high nutrient inputs. In this case they are likely to arise from the untreated sewage entering from Moville and Greencastle.

Image 39 - ***Zostera marina*** **growing in the shallow sublittoral of Carnagarve beach Moville.** Photo by Mathilde Stallegger

7. Oil, Tar and Oiled Birds

Observations on oil, tar and oiled birds show one of the biggest differences to survey results in the 1980s.

In the first survey in 1987, 8.7 % of the survey units were reported to be polluted with oil. On this occasion we had 0.5%. That is only 2 sites, with another 4 survey sites where tar was noted. On two of these it was tar due to foreshore infill, which is being followed up. Two inflows carried oil at time of survey.

RESULTS PART 4: SURVEYOR VIEWS AND KNOWLEDGE

1. Familiarity with the Area

The following graphic shows how well the surveyors knew the sites undertaken. Almost two thirds of sites chosen were well known, suggesting that there could be some background knowledge to the surveys.

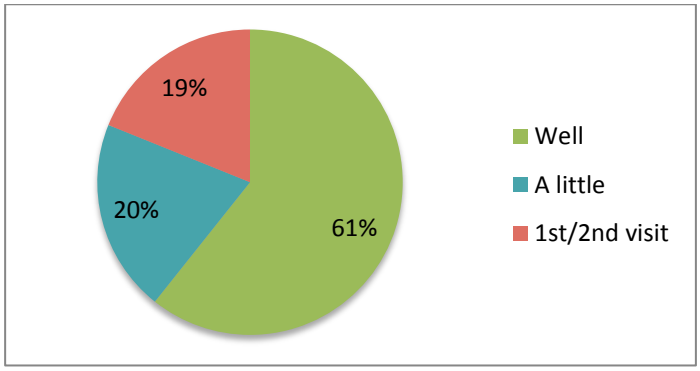


Fig 34. **How well do you know the site?** (N=397 s.u.; Source: Question A5). Surveyors familiarity with survey area.

Almost 20% said that they knew their survey site a little. The majority of people (81%) that had some previous knowledge of the surveyed areas adds value to these results. This means that they are able to note changes, therefore to identify possible problems and also that they know what to look for and where.

2. Designations: Type of Designations and Awareness

Surveyors were asked in question A6 if they knew whether the survey site was designated or not.

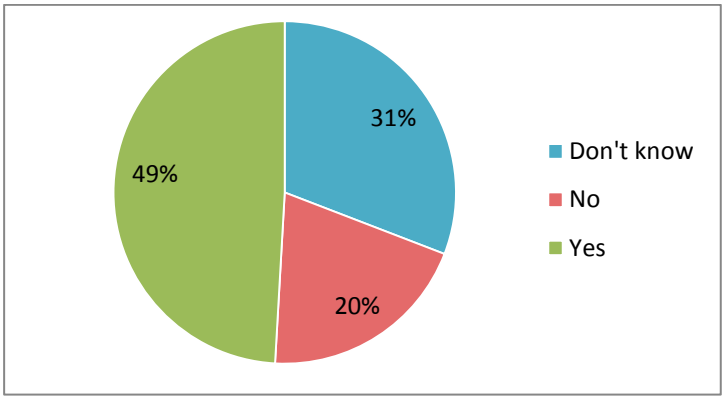


Fig 35 – **Surveyors answer to the question "Is this unit an officially designated area?"** (N=389; Source: Question A6)

In 31% of the s.u. surveyors indicated that they did not know if the area was designated or not, in 49 % they thought the area was designated and 20% did not complete this question.

In question **A7** a range of international and national Nature, as well as select EC law linked human use designations were included - see table below. Guide notes explained the meaning of the designations and where to get information.

Additionally the volunteers who could see evidence of, or knew the site well, were requested to indicate if their s.u. was used but not designated for bathing or aquaculture. Another noteworthy use or designation could also be entered.

UNESCO - Biosphere Reserve	Designated 'Bathing Water' - or used as
Ramsar Site	Designated 'Shellfish Water' - or used as
Natura 2000 site (SPA &/or SAC)	Other use, or use designation.
National Park	
NHA or pNHA	
Other Nature designation	

Table 4 - **Designations and uses which surveyyors could chose in question A7 if they applied to their s.u.**

When results were returned, the location of the surveyed sites were mapped and compared with maps of the official designations. The following sources were consulted:

- NPWS: Natura 2000 (SAC,SPA), Natural Heritage Areas (and pNHA), and National Parks.
  www.npws.ie
- EPA: Bathing waters
  www.bathingwater.ie
- Department of Agriculture, Food & the Marine: Shellfish waters
  www.agriculture.gov.ie
- Irish Ramsar Wetlands Committee and Marine Irish Digital Atlas: RAMSAR sites
  www.irishwetlands.ie / www.mida.ucc.ie
- UNESCO: Biosphere Reserve
  www.unesco.org

Some problems had to be overcome when checking the official boundaries of the designations, in particular the bathing water designations. While the position of the bathing water sampling point can be found on the web, the extent of bathing waters is only given by a few local authorities (Fingal, Wicklow, Wexford) on their websites. To have access to the actual extent of each bathing water area, we asked the EPA to provide us with a master copy of the official boundaries, which they kindly did.

Image 40 – **Designated bathing area at Rosslare.** (Source: Wexford County Council)

Our results suggest that surveyors assume that when part of a beach is designated as bathing water, then the whole beach is designated bathing water. But this is often not the case, for example on long beaches like Dollymount or Rosslare Strand, Co. Wexford (image 40).

A similar problem was presented when trying to check the RAMSAR sites, were no official boundaries were found. To overcome this problem we applied a 1km buffer around the geographic units of listed coastal Ramsar sites.

Figure 36 shows the number of survey units that were in, or part of designated areas under the different designation categories considered. Results show that 2/3 of survey sites were in, or part of a protected area - most likely pNHA, followed by the Habitat Directive SAC designation and the Bird Directive SPA.

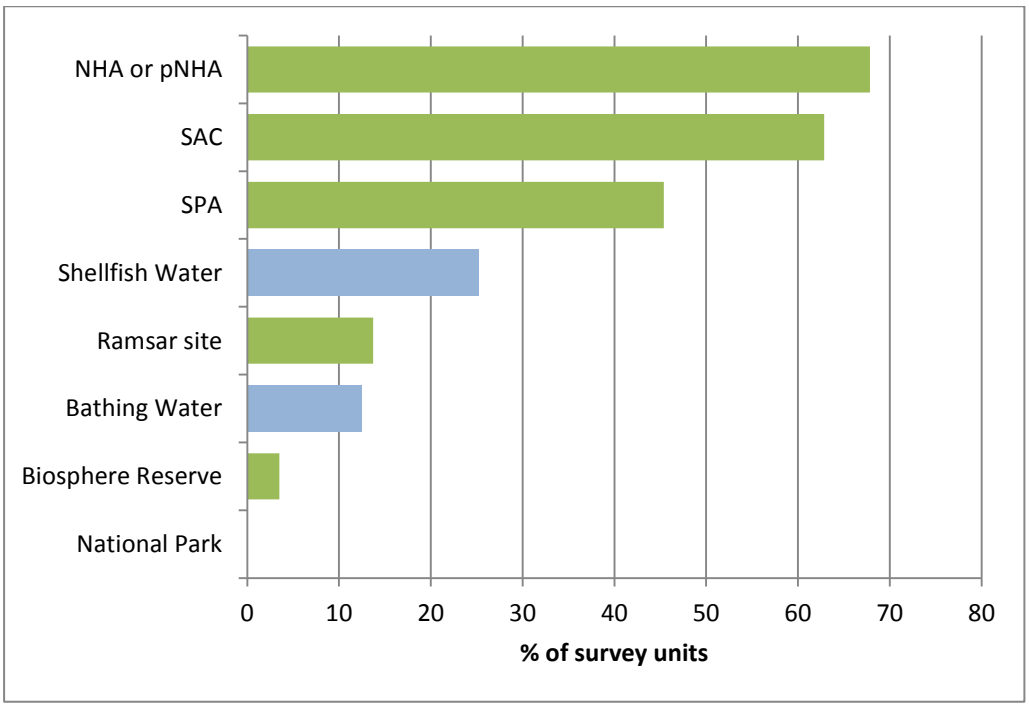


Fig 36. **Percentage of survey units which were designated or part designated by type of designation.** (N=389;

The results were compared with the answers given by the surveyors. Figure 37 below shows the percentage of s.u. that were designated but not noted by the surveyors, ranked by designation.

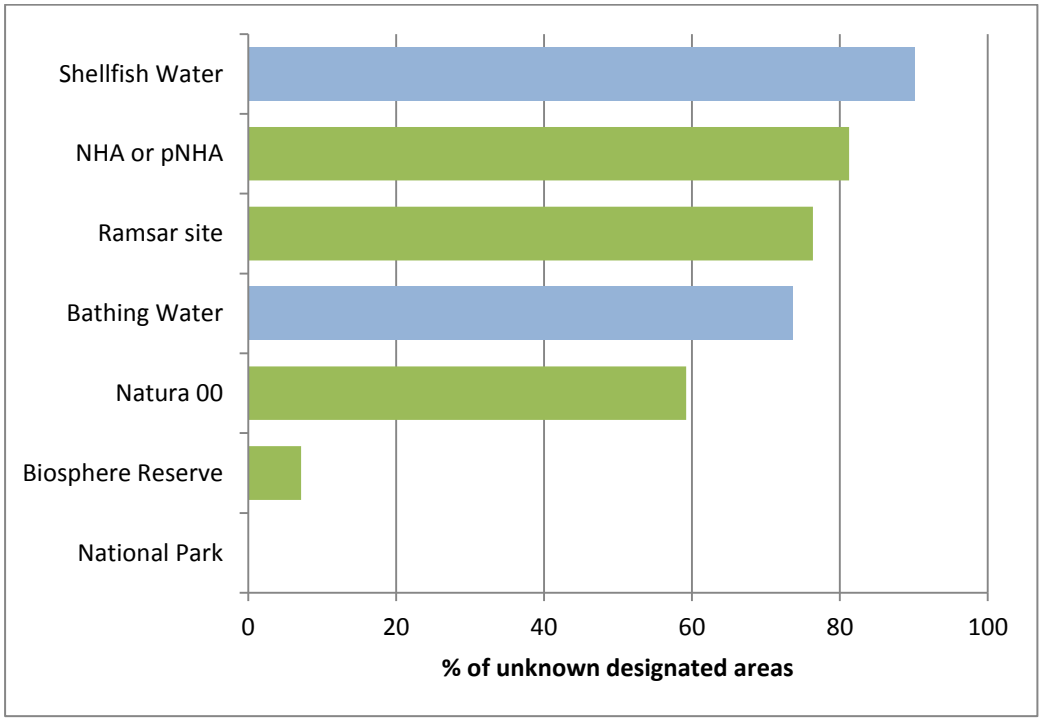
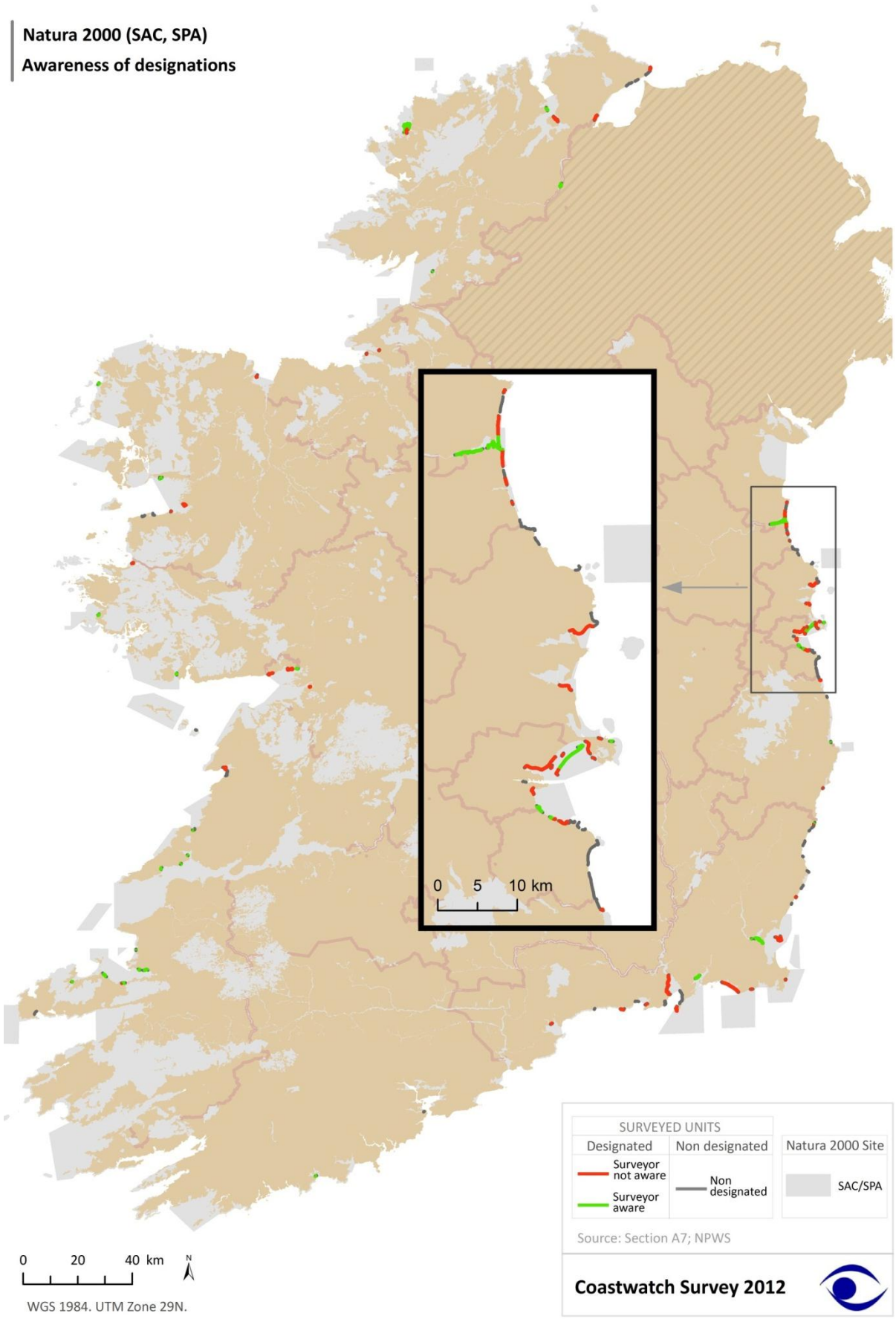


Fig 37. **Unawareness of designations.** (N=number of actual designated sites; Source: Questions A6/A7;NPWS; Department of Agriculture, Food & the Marine; EPA; Irish Ramsar Wetlands Committee;Unesco). Percentage of survey units that were designated but not noted as designated by surveyors.

Finally a map was produced showing Natura 2000 sites and surveyed areas. The surveyed coast is colour coded to indicate whether surveyors correctly identified the designation, or either didn't know or had indicated that it was not designated – see map 3.

Map 3 – **Awareness of Natura 00 designations**



To conclude, public awareness of which areas are designated is poor. Natura 2000 sites form a network to protect the most threatened habitats and species across Europe. In coastal areas that network is wide open to both damage and help in implementation.

The level of awareness may have looked encouraging with 41% of surveyors correctly identifying their survey site to be in or part in a Natura 2000 site. However when we re-examined the correct SPA and SAC responses, the surveyors were largely known to the core Coastwatch team as either scientists working in this area or volunteers who had participated in an activity which involved Natura 2000 site information. Once these are removed from the data set, the figure is likely to be higher for the interested public willing to do the Coastwatch survey without prior training. On most coastal Natura 2000 sites there is no public notice showing the designation and it is not an integral part of school education, so children will not be pulling their parents forward. There is no coastal award for habitats in good conservation status or any other positive talking point around this.

The level of unawareness is similar for the NHA/pNHA and the RAMSAR sites (81% and 78%).

It is necessary to improve knowledge about designated sites amongst the people who live within or surrounding these areas, as they can play a vital role in their use and management.

It is also important to make information about designated sites easily available to the public. This will result in a better understanding of the ecological, economic and sociocultural values, a critical way to identify any problems in an area whilst also promoting greater respect from day to day use. The same thing applies to visitors, a better knowledge will encourage them to make use of the site more responsibly. This should result in better conservation of the designated sites, with the consequent economic benefits that this can bring.

Use Designations

Shellfish Water: Just 10% of surveyors knew that designated shellfish water formed part of their survey area. However, as these water designations are concerned with water quality testing, aquaculture and harvesting of edible shellfish for commercial purposes it does not affect most surveyors and if 90% of surveyors failed to identify the designation it is unlikely to lead to problems.

Bathing waters are in a much higher profile position with the annual media alert linked to the Blue Flag, which is awarded to designated bathing waters which have ‘added extras’.

Also designated bathing waters should, and generally do, have a sign showing water quality monitoring data and the beach profile with a lot of shore and hinterland including possible pollution discharge point information. As our survey is carried out after the bathing season the signs may be removed in some areas.

Only 18% of surveyed sites in autumn 2012 included bathing waters. Of the 73 sites which were designated, 38 % of surveyors got it right.

Additionally, 27 s.u. were described as used for bathing but not designated. While in some cases this might refer to a small number of bathers, it raises the question whether the sites should in fact be designated. Also, 23 s.u. were thought to be a designated bathing site but were not actually designated.

This information produced a list of 28 areas (table 5) used for bathing or thought to be designated but were not. These results are also shown on map 4, along with the public awareness of which sites are designated as bathing areas.

Map 4 - **Awareness of Bathing Waters designations**

COUNTY	SITE	COUNTY	SITE
Meath	Delvin River towards Gormanstwon	Wexford	Ballyhealy Beach
Fingal	Bremore	Waterford	Dromina
Fingal	Balbriggan Martello tower to Bell\'s hare	Waterford	Woodstown
Fingal	Rush South Beach	Waterford	Drillistown
Dublin City	Sandymount Strand	Kerry	Ventry Beach
Dun Laoghaire	Sandycove Harbour	Kerry	Castlegregory strand
Dun Laoghaire	Killiney Beach	Galway City	Ballyloughane Strand
Wicklow	Bray Seafront	Galway County	Glassillaun Beach
Wexford	Kilpatrick Beach	Galway County	Tra Inis oirr
Wexford	Ballymoney near beach	Mayo	Cross Beach
Wexford	Dodds Rocks	Donegal	Sludden
Wexford	Poulshone	Donegal	BallyBrack Moville
Wexford	Cahore harbour and beach	Donegal	Anchor Steps to St. Colombs Well
Wexford	Ballyvaldon, Blackwater	Donegal	Bredagh river to Thompson's shed

Table 5 – **List of areas used as bathing water** (purple) **or thought to be bathing water** (red)**.**

From surveyor questions, remarks and results there may be confusion between Blue Flag beaches and designated bathing waters. If a beach does not have a blue flag, surveyors may be inclined to think it is not designated, unless they come across the beach information sign which tells them.

It is important that the public is informed about the boundaries, the reasons and objectives for the designation. The better the knowledge about a designated sites, the better the chance of obtaining public's support. Local knowledge about a designated site is the first step to more efficient management.

3. Views on Sewage Pollution Incidents

Surveyors who knew their area well were asked to respond to question E4 on frequency of sewage pollution incidents. Of the 217 sites for which this question was answered 111 (51%) were 'never' polluted by sewage and 34% of the surveyors thought it was rare. However the other 217 sites still included 24 where surveyors had noted occasional sewage pollution bleeps and finally there was a hard core of 8 problem areas where sewage was either frequent, usual or seasonal. In 6 of these we already saw sewage discharges from inflows and comments such as "Over 100 sanitary items on this shore today in Rush where a raw sewage outfall still affects a bathing beach". Similarly in Moville the town sewage is still ejected from the harbour and via the nearby river.

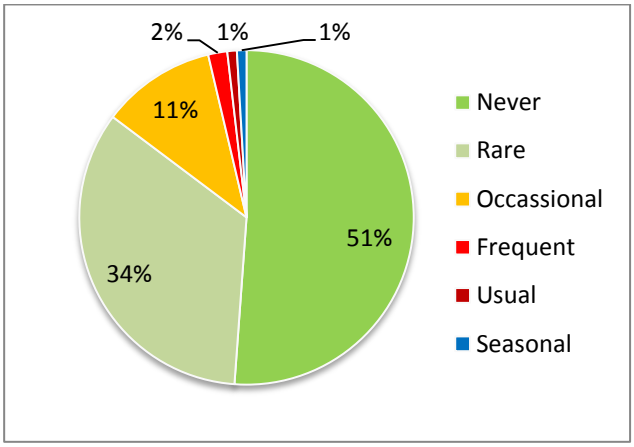


Fig 38 **Frequency of sewage pollution incidents according to surveyors.** (N= 217 s.u.; Source: Question E4)

While the sample is small with only 217 sites, the observations are showing a significant improvement. Observations like 'tideline full of sewage pollution indicators' are now rare. For reference here are the first survey results:

When it came to the question about what was the usual situation regarding sewage pollution in the areas surveyed, over a third of the volunteers admitted that they didn't know. Slightly more than 38 per cent reported that there was no sewage problem at all and, of the rest, 15 per cent said there were "occasional sightings", 4.5 per cent said the sightings were "frequent" while 6.7 per cent described the condition of the coast in their areas as "usually contaminated." Even more disturbingly, some of these areas correlate with the availability of edible shellfish.

Fig 39 – **1** Oct 1987; The Irish Times. **2** Sanitary litter, significantly reduced but still found; photo by Marlene Bean.

4. Threats to the Shore

Surveyors were asked to record if they had seen **evidence** of any **serious risk** and/or **imminent planned change for the worse** to their survey units. Eight common threats were given to assist with this task as well as an "other" option. Water Pollution was further subdivided into five categories; Sewage, Radioactivity, Oil, Industrial Pollution, and Agriculture or Industrial Farming. Unfortunately due to a technical problem with our new input programme we have not been able to include the individual water pollution types and therefore Water Pollution is the total of these five categories.

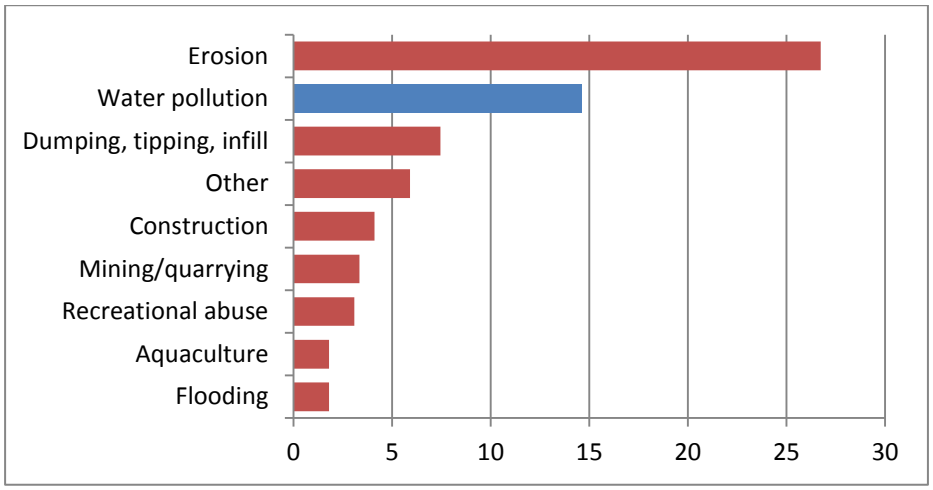


Fig 40 **Evidence of serious risk &/or planned change for the worse.** (N=389 s.u.; Source: Question F4)

There were 268 threats reported in 176 s.u. or 45% of all survey units included in the 2012 survey. If water pollution was disaggregated as in other years, the number of threats would be even higher. The most frequently listed threat was erosion, reported from 104 s.u.. That is 27% of s.u., including the 55% which either were deemed not threatened or where surveyors felt they did not know the site well enough to record threats. This was followed by the pooled water pollution threats in 14% of sites and dumping/infill in 7% of surveyed sites. Invasive Alien Species (IAS) were noted as a

threat in 6 sites as part of the “other” category. All other threats were noted in less than 5% of the surveyed coast. Construction is down to its lowest level for over a decade despite of planned coastal wind farm developments. The proposed gas pumping off Dalkey and Killiney was registered as a threat, while the Galway bay sites noted the BIM salmon farm application.

The results confirm erosion as the leading threat, as in all previous Irish coast surveys. Of the 104 s.u. where surveyors indicated that erosion was a threat 35 already had hard erosion control measures in place. In 46 of the 104 units where erosion was considered a threat the immediate hinterland was dunes. The erosion threat results and issues arising have been highlighted and discussed previously, with priority actions identified as summarised here:

1. **An erosion policy is needed.** Despite of the fear of erosion, there is no national erosion management or CZM policy in Ireland. When erosion schemes are approved it is seldom clear who should monitor the result and where such information is to be stored.

2. There is a need to **appreciate natural erosion as a process** where eroding sediment feeds the shore elsewhere. Species like sand martins depend on eroding cliffs for nesting, as seen in two Shankill survey sites, described with sand martin chicks by Marlene Bean and her survey team.

3. There are **enormous costs associated with hard erosion control**. It isn’t just the finance to put rock armour or other schemes in place, and the associated maintenance. There is the loss of the natural coast, the sight of ad hoc erosion control measures and associated waste, and the danger of highly piled rock armour when people try to access the shore.

4. Development and **infrastructures should not be set into dunes**. These sandhills generally have high biodiversity value and are naturally mobile, eroding and accreting in cycles. Once they are pinned down by development, erosion control will follow to protect that infrastructure.

5. Erosion **risk assessments** are needed when planning development which may interfere in coastal hydrology. This should be mandatory with binding agreements of who pays for erosion damage or loss and on who the burden of proof falls.

6. **Old seawalls need to be valued and maintained**. These are historic features which often have outstanding engineering and aesthetic qualities, but nobody responsible for their maintenance. When repair is finally carried out it tends to be an emergency knee jerk reaction to a wall collapse, with no time for lime putty and carefully chosen rock.

Image 41. **1** Local people ready to participate in sea wall restoration and maintenance at St Kierans, Co Wexford; photo Karin Dubsky. **2** Erosion control at Kilpatrick beach; photo by Breda & Andy. **3** Old sea walls at Shanganagh (Co. Dublin); photo by Rory Keatinge.

5. Surveyors Perceptions and Value of the Coast

A new Irish question F5 was included asking surveyors: "is there something you really like or love about this survey unit? What is it?"

The purpose of this question was twofold – to round the survey off with something positive and reflective as well as satisfying curiosity as to what people value about their shore. There were only 197 responses to the question, which leaves it open whether surveyors in half the sites felt there wasn't anything they really liked. After observing the reaction to Minister Deenihan's posing of this question to scouts in Tralee Wetlands Centre when closing the survey – we believe that one partial explanation is that it required reflection. Several scouts answered: they had never thought about it.

Image 42 - **Coastwatch Results presentation with the minister Jimmy Deenihan.**

In some cases surveyors mentioned a number of attributes – e.g. Adam Mulvihill & Karen Muldoon said "*This is a sandy beach, which has rocks and rock pools on either side. Pools have much interesting life. It is a very scenic area with high lookout areas above the beach. It is a clean beach that is popular with bathers in good weather and popular with walkers all year round"*

Taking out one clear *"No!"* from the eroding Bray dump surveyor, answers can be grouped into 5 categories with a residue group 6.

Landscape: the visual element including natural features mountains, rivers, sea, vegetation and the built environment in the hinterland and out to sea. It appears that both beauty of some landscapes and identity are important as the attachment to the Pigeon House towers in Dublin Bay was

remarked upon by a visiting volunteer surveying with a Dubliner around Blackrock. Human activities change the natural landscapes over the time, producing unique landscapes for each culture, region and society. This is reflected in the comments of the volunteers. Some people described the natural side of the landscape:

Karen Conroy: *"The river is nice to observe as it flows into the sea[…]"*
Mary Butler: *"Nice views across the Swilly[…] Woodland behind this unit adds to the views."*
Linda O'Dwyer *"Lovely rock formations and beach, great views[…]"*

Others liked the combination of the natural and human elements.

Paul Dubsky: *"The old sea wall and shore with stream entering at Kehoe's; the ship wreck[…]"*
Leo Boyle: *"The beautiful Beaulieu House across the river, and comforted by the magnificent Beaulieu woods"*

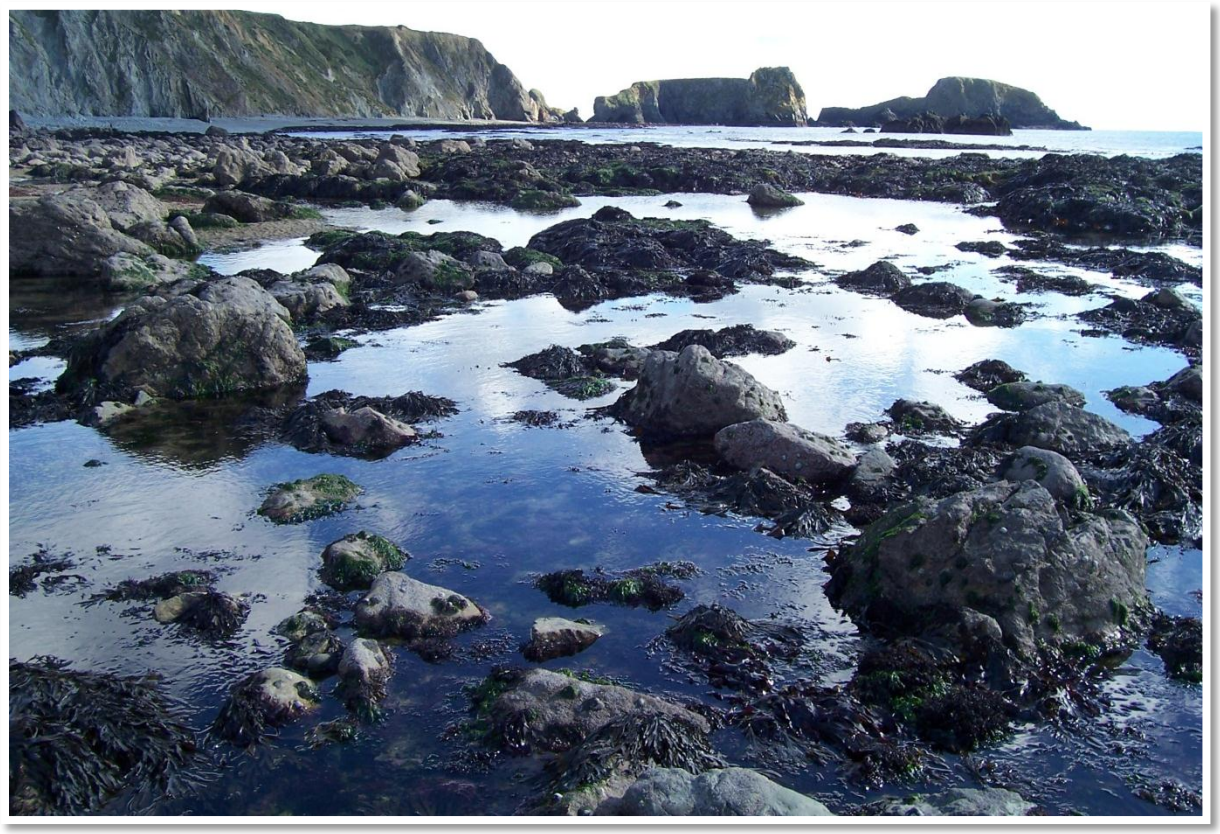


Image 43 – **Landscape at Drillistown, Co. Waterford.** Photo by Patrick Houlihan.

Nature values: Our surveyors noted a range of different biodiversity, form and process aspects that were important to them: this included the variety of birdlife, the heterogeneous habitats, natural formations like quality dunes with no erosion control or buildings that are becoming more and more difficult to find. Examples included:

Paul Quigley: *"Great bird life, seal colony"*
Aine Walsh: *"Little tern breeding site, >350 chicks successfully fledged since 2007."*
Cathal O'Brien: *"There is a high diversity of crustaceans (shells) through the splash zone and intertidal zones including limpets, crabs, clam shells, mussels, dog whelk, razor shellfish and other shellfish shells. Lots of curlews and gulls."*

David Gorman: *"It's a super spot for birdwatching. The road runs parallel to the high tide mark and as it's a small bay the birds tend to be very close, especially near high tide. It is open through a narrow channel and the western end but protected from the main sea swells by a spit of raised land. In the winter it gets a lot of wading birds and large numbers of Brent and other Geese."*

Or the habitats, natural morphologies and processes…

Zoe Elliot: *"The sediment on the beach is maerl debris, very rare and beautiful- High conservation value […]"*
Andy & Niamh Kelly, Sinead & Ross O'Keeffe: *"Spectacular high dunes and bogland […]"*
François Gunning: *"Very spectacular rock formations"*
Carillion Team: "*The mixture of rocky shore and muddy shore*"

Cleanliness and clear water: lack of litter and pollution. Something that should be normal was mentioned by surveyors in several sites:

Braemore Heritage Group: *"Pristine stretch of coast except for that one spot midway between start and finish. Clearest water"*
Chloe Kinsella: *"It is a very clean shoreline, with little to no litter […]"*
Sean Walsh: *"It is a beautiful stretch of coastline and most of the time it is very clean"*

Quietness/ Ambience: The absence of disturbing human uses or activities, as well as warmth and shelter:

Harm R. Deenen: *"The pure outdoor experience of sounds and smells and silence (away from man-made noise)"*
Leo Boyle: *"Shelter and evening warmth […]"*
Patrick Houlihan: *"Very quiet, far for the public to access as access is tidal"*

Use: In this category comments refer to uses or activities carried out in the shore, like walking, swimming, fishing, practicing sports etc., as well as past experiences.

Brian Wingham: "*Good snorkeling through kelp beds, protected by rocks […]*"
Lily Teehan: *"Beautiful strand for families with children for swimming, building sandcastles, picnics and walking."*
François Gunning: *"Dream beach. It's all there. .. Where our son caught his first flatfish."*
Caroline Creane: *"Grew up in this area and always loved this beach, walks in winter and swimming in summer"*

A number of surveyors mentioned education fieldwork potential. This may become a separate Category and be of real use a national inventory with more information in future years.

Others: includes a variety of comments that didn't fit in any of the above categories but memory of might play an important part. For example,

Rose Kelly: *"[…] I love it because it is somewhere I've come frequently since a very young child"*
Charles Stanley-Smith: *"I only went there for Oysters in Moran's - I didn't realize I needed to answer all these questions".*
D. Goggins, S. Cosgrave-McDermott, C. Forde described the survey: *"There was quick sand present in which we sank quite rapidly , which was due to a quick change in the tide and we left , alive, thankfully as had we not, we would not be sending in this survey. The freezing temperatures, lashing rain and gale force winds couldn't dampen our spirits".*

The results of this analysis are shown in figure 41:

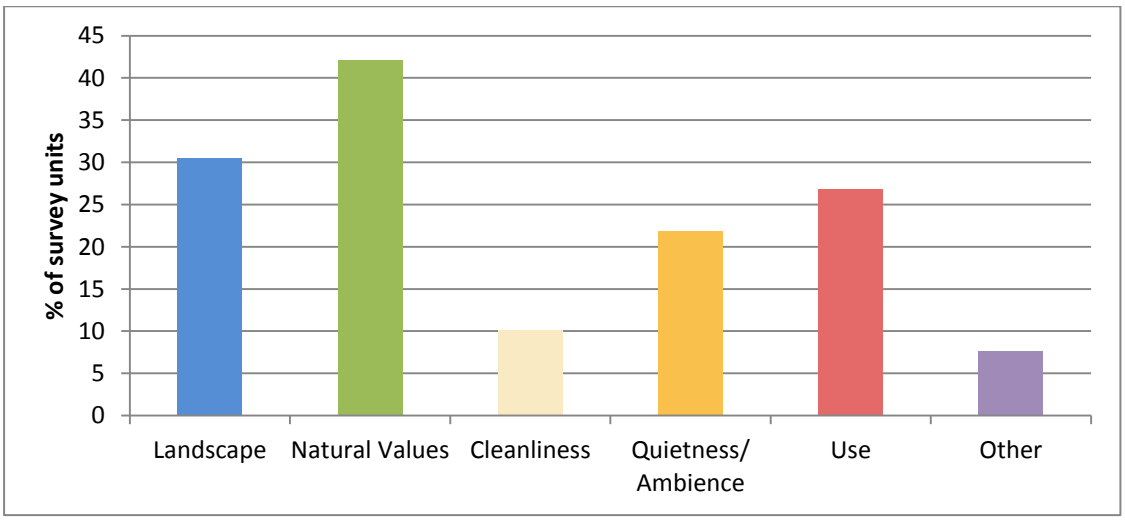


Fig 41 – **Different aspects of the shore valued by the surveyors.** (N=197; Source: Question F5)

The attribute mentioned most frequently was nature (42%), followed by the landscape (31%). These two elements are strongly related to each other where the landscape referred to is on the shore rather than the view to sea.

The use made of the shore ranked third and was mentioned for 27% of the surveyed areas where we had a response. Having an enjoyable use of the coast depends largely on the good quality of the other attributes. Good snorkeling is linked to seeing interesting things under water. A walk on the beach becomes more enjoyable in a beautiful landscape and with the chance of seeing birds, or a seal popping up. If the shore is full of litter, or polluted the use value is impaired.

Shore ambience ranked fourth (22%), and most comments related to the lack of human traffic, noise, warmth, shelter and the natural roughness.

The **cleanliness** of the shore was noted in 10% of the answers and matched shores which were clean. Many interpretations of this pilot question result are possible. For example would more surveyors put this forward as something they love about their shore if it was clean? A corollary question: 'What do you dislike about this shore?' may be added next year and this might throw further light on the role of cleanliness in shore attractiveness.

To conclude, it is refreshing to see how high nature and landscape ranked in the responses. Ireland has an extraordinary diversity of coastal environments and features due to its geological history and geographical position. While as an island our land based species diversity is lower than that of mainland Europe, our marine biodiversity is our strength. Even urban areas like Dublin Bay have very high biodiversity value as testified by the many Nature designations for which the bay qualifies.

The elements of the shore that are treasured by people need to be highlighted to develop awareness on how fragile some of these are, and how complex ecosystems are. To protect shore birds or sea shells you love seeing, a range of other species and habitats need to be in good state of conservation. If one assumes that access to areas we love is important for human well-being then we might focus on ensuring the protection and restoration of these values in urban areas like Dublin Bay where high numbers of citizens could benefit. Here surveyors have pointed out a number of factors which take away from biodiversity, scenic value, high quality dependent use and cleanliness. That depends on both national policy, for example a drinks container deposit on return system and focused local action, like Ringsend Park splash zone restoration.

RECOMMENDATIONS

This report covers Coastwatch surveyor work in the Republic of Ireland and provides a snapshot of 408 survey units, or 204 km of shore in autumn 2012. By collating the individual s.u. data and analysing pooled results, coastal qualities we want to protect and coastal issues to be addressed at local and national level have been identified. When looking back over past results we can see that some coastal pollution and waste issues have been addressed over the past 25 years. However persistent problems like drinks containers and fishing gear in marine litter have remained, coastal development has eaten into pristine shores and new challenges have cropped up.

We are standing at the edge of a new era with a strong economic and environmental focus on our coastal and marine resources. If we are wise and take care to fully implement the Marine Strategy Framework Directive, get the best possible new Common fisheries policy and a sound 7th Environmental Action Programme then more of our seas and coasts could be in Good Environmental Status every year, with more healthy fish and shellfish stocks, biodivers and cleaner seas.

While problems identified require specific solutions, Coastwatchers argue that the 'oil' which ensures laws are applied on the ground and technical solutions are turned briskly into action and best practice, is **informed public participation**. Hence one common thread to our recommendations is that we need awareness raising, provision of timely accessible information and clear pathways for informed public participation in the protection and management of our coast. As a fall back when things threaten to go wrong, it is also essential to have access to justice, so citizens can protect our marine commons and their livelihoods. It is timely for government and all agencies with powers and responsibilities in the coastal zone to embrace this in the **European Year of Citizens.**

Image 44 – **Art work for the Coastwatch Survey 2012 by Julia Dubsky.**

A focus on specific local issues identified in the survey and introduction of some legal changes and economic incentives for addressing certain widespread problems.

The more specific recommendations below build on previous experiences, proposals made by surveyors and points made at the November 30th 2012 national results meeting in the EC offices Dublin. They focus on specific waste and litter issues and one key event proposal. Coastwatch follow up work is in progress on biodiversity, invasive alien species and illegal activities. Further recommendations and progress will be reported upon on the Coastwatch website www.coastwatch.org.

A - Coastwatch Waste and Marine Litter Management Recommendations

Coastwatch seeks a number of fundamental actions which can be initiated or even delivered on in 2013:

1. **AWARENESS and INFORMATION:**

   1.1 We propose that an **international Waste Data Centre (WDC)** be set up for marine litter to help implement the Marine Directive (MSFD) source and share information. The centre could be part of the EEA or other well-functioning data and information hub.
   The data base maintained by the centre should allow stakeholders to feed in local waste issues, problems and solutions. Reports like the Coastwatch survey and OSPAR marine litter reference beach data would be stored, both spatially as litter/specific material maps and in reports.
   Transparent up to date information on progress towards reaching 'Good Environmental Status 'on the marine litter descriptor would feature, e.g. - as annual marine litter reports. An expert panel could address the report findings and flag new problems as well as facilitating finding solutions to old problems. Good practise and guidance would also feature on the WDC website. - e.g. guidance developed for removal of defunct oyster trestles in one area could be shared with others.

   1.2 Marine litter in education: We would welcome and offer to contribute actively to in-service training and brain storming workshops – for geography and science teachers and for universities to devise and share good marine litter education and research modules. These should cover field- and lab work, along the lines of the micro -litter pilot in this year's Irish Coastwatch survey. If education modules and results of student work could feed into the Waste Data Centre (1.1 above) students could see the practical application of their work. It would also foster research into material substitution, economic incentives, and other ways to minimise waste.

2. **Law implementation and enforcement:** Coastwatch fully subscribes to the MARPOL and OSPAR Conventions, EU and national legal instruments to prevent, manage and retrieve waste.
   The group urges:

   - that the law be better applied and enforced. That includes stakeholder information, inspections and easy ways to comply -e.g. fishermen must have adequate waste reception facilities in harbours and affordable alternatives to long lived plastic gear.

- that law which concerns many stakeholders and the general public, like the Marine Strategy Framework Directive (MSFD) be implemented with full and immediate stakeholder involvement, including environmental NGOs at all levels of planning and management. That means (i) inclusion in working groups set up to implement the MSFD and (ii) a wider public forum to bring annual updates, along the lines of the NI 'Good Beach Summit' initiative of 2011 where all stakeholders were invited. This forum should be linked to the NI one or become one All-Ireland initiative. Its data output should feed into the international waste data centre.

3. **A Marine Litter Strategy** is needed as part of a national waste management strategy in Ireland, with systematic waste stream approach - from marine litter to sources and prevention. Given that substantial work on such a strategy has been done in Northern Ireland where the well-researched draft policy was published in Sept 2012, Coastwatch is proposing that the RoI model be drafted as a close match and in cooperation with the North. This could be ready for public comment in summer 2013. However an extra section on economic incentives and the X-border dimension should be included.

4. **Planning substitution and guidance on materials used:**
   - Shore uses which are likely to produce marine litter need to be appraised with published impact assessment before they are adopted.
   - Objects which are likely to become marine litter, including those found in our survey to harvest or grow marine life, dune sand fencing and beach toys need to be screened and made 'sea friendly' before they are allowed onto shelves. Litter damage avoidance may either be a tax, or deposit on return levy (e.g. on disposal lighters) or involve 'using natural materials' which can be incentivised for objects which are likely to be lost or dumped in surface waters or on/near the shore.
   - Among materials polystyrene should be prioritised as a packaging waste product to phase out/substitute. It breaks apart easily and is virtually impossible to pick up when disintegrated into little beads. As further concern, polystyrene cannot be recycled in most areas in Ireland.

5. **Tackling waste and litter in known locations:** Significant improvement is possible in 2013. Action should include a number of targeted reviews with clean up and preventative action. This includes:
   - A check of all riverine and coastal landfill sites as potential litter sources with (i) a published status report, (ii) removal of waste which 'fell out 'and (iii) erosion control with buffer zones if possible.
   - A check of the seaward/ riverside boundary of all industries which are close to the shore
   - A check of all erosion control and sand fencing with prompt waste retrieval/management.
   - A check of waste point sources created by activities which are on the shore, especially associated with harbours (e.g. boat paint scraping) and aquaculture.

6. **Economic Incentives**: Ireland has led the plastic bag tax in Europe and has demonstrated the effectiveness with dramatic and lasting reductions in this marine litter category. This should be expanded upon. There is scope for an early tax on single use lighters and possibly other

products. We further urge that a drinks container 'deposit on return' system be prioritised to address one of the most persistent and widespread marine litter categories.

7. **INTERNATIONAL COOPERATION** Ireland is part of the 'Celtic Seas' region in the OSPAR marine litter work programme. The North – South border runs through two long estuaries and any marine litter management in this area would definitely benefit from cross border cooperation. We urge both governments to produce a cross border or all Ireland marine litter strategy in 2013 and explore further cooperation as possible all Ireland This forum should be linked to the NI one or become one All-Ireland initiative.

B - Citizen Science Conference - a partnership for achieving Marine and Habitat directive goals.

A 3 day international event to further citizen participation in coastal environmental monitoring and protection, hosted by Ireland during the Irish EU Presidency in late May 2013.

The Aarhus Convention, which every European country has now ratified, fosters and legally underpins active citizen participation in environmental matters. Citizen science foresees citizens using scientific methods – whether logging observations or doing scientific tests and then passing that data on so that it can be used to get a better and/or more up to date picture of our environment than if official were doing all the testing and monitoring on their own. Also, as the citizen contributes, (s)he understands the official information and is better equipped to participate in planning and decision making. This is particularly relevant to the coastal zone which is in public ownership and opens to many different uses and pressures.

Ways of involving stakeholders and informing of coastal issues and qualities could be shared to help reach common high environmental quality goals which EU member states have set themselves in the Marine Strategy Framework Directive, Nature law and Biodiversity Action plans.

Aims:

1. Public Information: Set out Marine strategy Framework Directive and Habitat Directive Goals and requirements in a manner which allows citizens to relate this to their coast and experience.

2. Participation in data gathering: Present the Coastwatch survey and other citizen science methods to demonstrate how coastal environmental information can be gathered and used for implementation of the MSFD and the Habitat directive.

3. Participation in coastal/marine protection and management: Present examples of best citizen participation practise in environmental management, law enforcement and site/species protection from across Europe. Select Irish cases can be visited in fieldtrips.

4. Using the experience: Based on the above, produce a draft protocol on informed public participation in coastal monitoring and protection with particular focus on the MSFD and coastal protected habitats. The protocol would be illustrated by the examples brought by delegates during the conference and fieldtrips.

A Background information on the 500 m survey unit & surveyor(s)

office use

A1 Country code | County code | Block code | Unit code | OR GPS coordinates at start of survey unit

A2 **Name of survey unit or area**

Map name | Local name/landmark

A3 **Name and address of surveyor(s)/school/group**

Name (Please write ***very*** clearly!)

Address

Telephone | Email (Please write ***very*** clearly!)

A4 **Date of survey**

Day | Month | Year

For your privacy:
☐ Tick here if you agree to be named as surveyor and results contributor.
No tick means your name will not appear on acknowledgements or released – unless you change your mind.

A5 **How well do you know this site**

☐ Well ☐ A little ☐ Here on 1st or 2nd visit

A6 **Is this unit (or part of) a designated area?** (see Question 7 and survey notes)

☐ Yes ☐ No ☐ Don't know

A7 **If yes, please tick which nature or human use designations you believe or know apply:-**
If used for bathing, aquaculture, whether or not officially designated, mark box 'U'.

- ☐ (UNESCO) Biosphere Reserve
- ☐ Ramsar Site
- ☐ 'Natura 2000' site (SPA or cSAC)
- ☐ National Park
- ☐ Nature or Marine Reserve
- ☐ Other Nature designation .....
- ☐ Designated 'Bathing Water'
- ☐ Designated 'Shellfish Water'
- ☐ Designated access for vehicles (e.g. route to fields)
- ☐ Other use, or use designation incl. boat mooring: .....

A8 **Is there direct access to your coastal unit from land down to high water ..**

☐ by vehicle ☐ by foot ☐ by wheelchair ☐ Difficult, only via another or impossible from land

☐ Access is prohibited

Influences from land (Immediate hinterland up to 500m beyond the splash zone)

B1 **What is the immediate hinterland mainly devoted to?**
(Tick up to five boxes if necessary)

- ☐ **Farmland**: Intensive grazing
- ☐ **Farmland**: Tillage, horticulture
- ☐ **Farmland**: Rough grazing
- ☐ Park, woodland, forest
- ☐ Natural Dunes
- ☐ Wetland (bog, marsh, lagoon)
- ☐ Rock, sand, bare natural sediment
- ☐ Village or town residential
- ☐ Tourist resort
- ☐ Waste tip/dump (official and unofficial)
- ☐ **Industry, or commercial** area, or power station
- ☐ **Transport** underline: road, train, car park, port, other
- ☐ Construction site
- ☐ Other please state: (e.g. golf course, military..)

B2 **Please count all inflows into your s.u. as you walk. Give details of up to 4 inflows in the order encountered. If there are more than 4, choose the most important in terms of potential pollution impact.**

Write initial in box to describe :	Inflow 1	Inflow 2	Inflow 3	Inflow . 4
Type of inflow: 'P' for **P**ipe, **S**eepage, **D**rain / storm drain or irrigation canal, **R**iver, stream or natural lagoon inflow				
Size of inflow: Small, **M**edium, **L**arge				
✓ Tick if you observe: Animal life in the water. If fish seen add **F**)				
A bad smell from the inflow				
Discolour/scum/froth from pollution				
Dead fish				
Dumped debris				
Visible sewage or sewage fungus				
Oil, petrol or diesel				
If you have access to test kits complete for those tests you carried out: Did you detect NITRITE? Please circle	+ -	+ -	+ -	+ -
What levels of Nitrate (NO_3) did you find? Write in approx. concentration mg/l of NO_3				
What is Inflow Water **temperature**? (C)				
How acid or basic is the water? pH test				

THE TOTAL NUMBER OF INFLOWS FOUND IN THIS SURVEY UNIT WAS: ☐

C SPLASH ZONE (*The shoreline from mean high water up to spring high watermark*)

C1 **Indicate the approximate width of splash zone.** (Tick more widths if area is not uniform)

☐ 0-1m ☐ 1-5m ☐ 5-50m ☐ 50-250m ☐ > 250m

C2 **What is your splash zone covered in?** (Tick up to five boxes)

☐ Saltmarsh ☐ Sand, gravel, stones ☐ Building, construction (not erosion control)
☐ Reed bed ☐ Natural rock ☐ Hard erosion control, (walls, rock armour)
☐ Other vegetation e.g. marram grass on drift line plants

D INTERTIDAL (From low to high water) + optional extra biodiversity questions: D extra BIDI

D1 **Estimate the average width of the intertidal area at low tide.** (If width varies, please tick two boxes)

☐ < 5m ☐ 5-50m ☐ 50-250m ☐ > 250m

D2 **What is the intertidal surface mainly composed of:** (Tick max. four boxes)

☐ Solid rock ☐ Sand
☐ Boulders (>20cm ø) ☐ Silt or mud
☐ Gravel (0.2 – 20cm ø) ☐ Other (e.g. walls)

D3 **Which of the plants and seaweeds did you find in the intertidal area at time of survey?**
See key

☐ Glasswort *Salicornia* ☐ Green seaweed: (Ulvas mainly) in patches or thin band
☐ Cordgrass *Spartina* ☐ Green seaweed: wide cover or thick mats
☐ Sea grass *Zostera (S Europe Posidonia)* ☐ Dislodged decaying seaweeds of any kind
☐ Brown or red seaweeds, *algae* ☐ Noteworthy plant ?.....

D4 **Any new species of animal, plant, or seaweed which appeared in this area?**

☐ **Yes,** _____ ☐ **No** ☐ **Don't know**

D5 **Indicate which of the animals listed below you found alive or dead:**

	Alive	Dead
Jellyfish	☐	
Worms or worm casts	☐	
Shellfish (e.g. cockles, winkles)	☐	☐
Crustaceans (e.g. crab)	☐	☐
Fish	☐	☐

	Alive	Quantity	Dead	Quantity
Seabirds	☐		☐	
Seals	☐		☐	
Dolphins, whales	☐		☐	
Rats	☐		☐	

If yes, we would love you to try extra biodiversity questions - page.

D6 **How many visibly oiled birds (alive or dead) did you see during your survey?**

Number of live oiled birds: ☐ Number of dead oiled birds: ☐

LITTER AND POLLUTION (at all shore levels)

E1 **Tick major item(s) found on your survey unit anywhere from start of hinterland to water**
If found, please give extra information in the extra questions at the back

☐ Landfill Materials (e.g. concrete, rubble, debris from sea defences)
☐ Large metal objects (e.g. abandoned vehicles, girders, machines, aquaculture trestles)
☐ Household furnishings (e.g. beds, carpets, pieces of furniture etc.)
☐ Dumped household refuse in bags or piles of rubbish
☐ Ship wreck, or parts of ship wreckage
☐ Dumped crops (potatoes, onions etc.)

E2 **Please count drinks containers, can holders, tyres, and plastic shopping bags found anywhere on the shore.** If number too large, just estimate. Tip: use dashes to tally while counting

Drinks Container Counts:

Plastic ☐ .....
Metal ☐
Glass ☐ .....
Paper ☐ .....

Other Litter Counts

Can holders ☐
Plastic shopping bags ☐
Tyres (half-or-more of a tyre ☐
Most notable other ..... ☐

E3 **Tick which of the following items of general litter or pollution you found on your unit.**

☐ Fishing or aquaculture gear (nets, lines, bags. If you know, tick source (s) → ☐ Fishing ☐ Aquaculture ☐ Angling
☐ Packing strap(s)
☐ Hard Plastic containers like crates, buckets
☐ Foamed Polystyrene and polyurethane
☐ Sanitary waste, condoms, nappies, etc
☐ Medical Waste – syringes, plasters …
☐ Container(s) of hazardous but not medical substance (e.g. chemical drums empty or full)
☐ Other plastics (not any of above)
☐ Tar, oil, petrol. **If found, give extra information see guide notes**

_____
☐ Textiles, shoes, gloves and clothing
☐ Paper, cardboard and worked wood,
☐ Food, fish waste and bones
☐ Faeces - mammal (e.g. dog, human)
☐ Glass (not drinks), including light bulbs
☐ Cans (not drinks), including sprays,
☐ Notable Other:

E3 part 2: Looking back, which area was most littered with non or slow degradable litter?

☐ Splash zone ☐ Tide mark ☐ Intertidal/Sea?.. If obvious reason, note in **F6.**

E4 **If you know the unit well please estimate frequency of sewage pollution incidents.**

☐ Never ☐ Rare ☐ Occasional ☐ Frequent ☐ Usual ☐ Seasonal

F GENERAL OBSERVATIONS

F1 **Has recent weather made the appearance of your coastal unit change?**

☐ Yes, looks cleaner than usual ☐ No, recent weather is insignificant

☐ Yes, looks worse than usual ☐ Don't know

If there are other reasons for changed appearance, please note space at F5 below.

j

F2 **Has the shore been cleaned within the last week?**

☐ Yes ☐ No ☐ Don't know

F3 **Is there any planned change of character (positive or negative) which is imminent for this coastal unit?** (If 'yes' describe in space at F5 below)

☐ Yes ☐ No ☐ Don't know

F4 ***Tick*** **if you have evidence of a serious risk and/or imminent planned change for the worse from any of the threats/activities listed below to your s.u. or adjacent sea/land.** Please mark the box with an **O,** if this is ongoing, or planned but you think it is not a threat, serious risk or change for the worse.

☐ Erosion
☐ Flooding
☐ Beach mining
☐ Construction
☐ Dumping, tipping, infill

☐ Water pollution
☐ Recreational abuse
☐ Aquaculture
☐ Other

☐ Sewage
☐ Radioactivity
☐ Oil
☐ Industrial pollution
☐ Agricultural or industrial farming

ACTION: In case of threat which requires immediate action, call relevant authority or Coastwatch

F5 **Is there something you really like about this survey unit? What is it?**

F6 **Please enter any short comment or observations** or use extra page

Thank you so much for all your work. If willing to do extra questions, there is more ..

Please return completed questionnaires, to national Coastwatch Coordination by October 20th by post, **Coastwatch, Civil eng TCD, Dublin 2**, or submit results by computer. Input form **www.coastwatch.org.**

Queries? Contact us at 086 8111 684 or kdubsky@coastwatch.org, or

EXTRA QUESTIONS Coastwatch Survey 2012

Biodiversity: Extra for Ireland

I **Worms: did you find any colonial worms, or large patches with lots of:**

Lug worm casts ❑ Honey comb Sabellaria Reef ❑ Sand mason patch ❑

please take photo if Sabellaria: if GPS available:

Mark on map & look for shore marker to find it again.

(latitude, longitude)

II **Mollusc shells** NB - If you have time, collect diff. types of empty shells as your own shore record

Double-tick if found alive.
Tick once if only empty shells.
Circle box if lots found.

Mussel ❑ Limpet ❑
Native oyster ❑ !Slipper limpets ❑
Gigas oyster ❑ Dogwhelk ❑
Cockle ❑ Shellfish eggs ❑

III **Fish Nursery (** areas where fish hatch, and/or their young stay **)**

Did you see **juvenile fish**? Yes ❑ No ❑

...If Yes, where? _____

how many? _____

what type ? _____

Seen juvenile fish here before? Yes ❑ No ❑

If yes was it in the past months? ❑ years? ❑

Found **fish egg case** (s) -mermaid's purse today? No ❑

Yes found some ❑ found lots ❑

Comment ? _____

Harvesting from the sea : Extra for All

I **Harvesting from the wild and Aquaculture:**

Mark A for Aquaculture and H for commercial harvesting

Seaweed alga Mussel Oyster Winkle Clam

Crab Lobster Other _____

Comment on methods and photos v welcome.

Shore Changes : Extra for all

If you know this area well...

I Any changes of note to wildlife, fishing or habitats over the last decade?
(e.g. animal or plant which has disappeared, or noticed a new arrival?)

II Note signs of sea level rise, &/or **vulnerability to storm or flood d** amage?

METHOD / CRITEREA	COASTWATCH	OSPAR	Key overlap (& options)
Standard survey unit (s.u.)	500 m shore splashzone to water's edge	100 m shore + 1 km around the 100m for >0.5m items. (where poss.)	Same shore width
How often	1/annum (augmented by a spring survey in training areas)	4/annum	1 of 4
How much	As much as possible. In Ireland that is generally 300-1000 s.u. In 2012 = 389 s.u. with litter data = 195 km of shore in total	4 sites 0.4 km core zone and 4 km for large items (>0.5m)	Shores can be shared in autumn if CW is 1st or same time.
Where	All accessible shores, including those cleaned and those with rocks and litter traps	Beaches with ideally no cleaning apart from the 4/annum OSPAR cleaning.	
When	Every autumn, same month or week, cl region specific in N to S bands In Irl **mid-Sept to mid-Oct**	Mid-Dec/mid-Jan, April, mid-June/mid July, **mid-Sept/mid-Oct**.	Autumn survey
How	Walk the shore around low water and record marine litter among other shore data. Deal with clean ups in follow up targeting worst areas or specific issues (like illegal dumping)	Focused litter survey. Walk the shore, identify, record and remove litter items. Use rake or gloves to find litter in debris or sand. Dispose of collected waste.	Similar, but a 100m focused litter search will find more.
What is recorded	Presence/absence of 6 large waste in categories, 7 Counts - drinks containers, plastic shopping bags and tyres. Presence/absence of 16 select small litter items and other'	All macro waste items in 100m in > 110 categories are counted, and large items only (> 0.5m) over 1000m. Some categories are the same items but in a size range, like **Paraffin or wax pieces**	Tyre counts are directly comparable over the 1000m, other counts in 100m. Rest in trends only.
Count data	An item is counted, even if it is identifiable, even if broken – i.e. A glass bottle with a missing part is counted as bottle, but a glass bottle broken into umpteen pieces is just ticked as broken glass and not counted. Broken drinks cans are counted if the round end piece has some of the body metal left (ie the end plate alone is not counted)	A broken but identifiable plastic bag, can or bottle is counted as one item even if broken up into many separate pieces. (Note though if a string or rope has broken to such pieces, the surveyor is instructed to count each individual piece).	Method virtually compatible. Tiny difference for broken ítems. NB –A rope count may be introduced in CW 2013:
Use for addressing sources & tackling the existing litter load.	Coastwatch is likely to pick up local ilegal dumping and local point sources. Trend data over time and between countries has been used for widespread waste (e.g. plastic shopping bags, drinks containers and can holders	OSPAR may picks up trend data within and between countries and can follow seasonal variations. But the small simple size, shore variability and risk of interference may limit use on its own.	Combining data may bring significant extra benefits

APPENDIX 2: Table comparing Coastwatch and OSPAR litter survey, prepared by Karin Dubsky after attenting a OSPAR marine litter meeting in 2010.