WFD Fishing & Aquaculture Risk Assessment Methodology

GUIDANCE ON THRESHOLDS AND METHODOLOGY TO BE APPLIED IN IRELAND'S RIVER BASIN DISTRICTS

Paper by the Working Group on Characterisation and Risk Assessment

Guidance document

This is a guidance paper on the application of a proposed **Surface Water Point Source Discharges Risk Assessment** methodology. It documents the principles to be adopted by River Basin Districts and authorities responsible for implementing the Water Framework Directive in Ireland. This is a working draft describing a method that will evolve as it is trialled, and will be amended accordingly.

REVISION CONTROL TABLE

Status	Approved by National Technical Coordination Group	WFD Requirement	Relevant EU Reporting sheets	Date
Final		Impacts and Pressures		March 2005

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Acronyms

CEFAS **Centre for Environment Fisheries and Aquaculture Science**
GIS **Geographical Information System**
MarLIN **Marine Life Information Network for Britain and Ireland**
nm **Nautical Mile**

1.0 Background and Method Overview

The Fishing and Aquaculture Risk Assessment process covers activities occurring in the inshore areas of Ireland (1nm past the baseline) and covers fishing activities using towed gears (primarily) and aquaculture activities.

All of the inshore fishing activities were noted and the aerial extent was estimated. The extent of each fishery was achieved by surveying fishing contacts in the relevant areas, taking the information provided and digitizing the areas according to the types of fishing gear utilized. These were imported into a GIS where the appropriate analysis was carried out. While all fishing types were mapped, the assessment focused primarily upon towed gear which has the greatest potential to impact a wide range of species and habitats. The proportion of fishing grounds within each water body was estimated. Based upon the output of assessment of impacts (2 below) thresholds (extent of area/activity in a water body) will be set according to the potential impact. These thresholds will correspond to the four risk categories;

- 1a – at risk
- 1b – probably at risk
- 2a – probably not at risk
- 2b – not at risk

Licensed aquaculture activities were documented and the location and aerial extent of the activity incorporated into a GIS.

In assessing fishery activity, the target species, for the most part, dictated the type of gear used - which have varying degrees of impact. The type of species fished will also indicate, to some degree, the habitat found. The sensitivity of the habitat to impact by the different gear types was estimated. Although, it must be appreciated that some species are fished in a range of habitats (e.g. scallop).

The water bodies in the GIS were assigned a risk category based on the aerial extent and type of fishing in the area in conjunction with the habitat sensitivity. It must be noted that the level of confidence associated with this process is very low, particularly as there is no information provided relating to the level of activity in any particular area.

2.0 Methodology

Preparatory work for the application of this methodology included the identification of different gear types utilised and an assessment of the impact each practice has. Secondly, habitats and their sensitivity to different practices were identified.

2.1 Identify gear and impact

Gear

Static Gear

Pots – crabs, shrimp, lobster, whelk

Drift nets – salmon

Draft nets (in Estuaries) - salmon

Tangle nets – Crawfish, flatfish

Towed Gear

Box dredge – oysters, clams

Scallop dredge – scallops, oysters

Beam trawl – *Nephrops*, flatfish

Otter Trawl – *Nephrops*, white fish

Hydraulic dredge – cockles, razor clams, surf clams

Small meshed pelagic gear – smelt (this gear targets pelagic species but is towed into very shallow water where it encounters benthic habitats).

Impacts:

- Box dredge
    - Scrape along surface,
    - Some penetration,
    - Narrow track
- Scallop dredge
    - Scrape along surface,
    - Re-suspension of sediment,
    - Some penetration due to tynes/teeth,
    - Tangle seaweed and dig up angiosperms (Zostera sp.),
    - Narrow track for individual dredge however, multiple dredges (up to 34) are operated from vessels at any one time.
- Beam Trawl ***(use in inshore waters is questioned)***
    - Wide track,
    - Re-suspension of sediment,
    - Heavy gear (compaction?)
- Otter Trawl (including Small-meshed pelagic gear)
    - Scrape along surface,
    - Tickler chain will resulting some penetration (up to 5 cm),
    - Door provide greatest penetration 10-20 cm,
    - Wide track
    - Suspension of fine material

- Hydraulic dredge
    - Deep penetration (5-25 cm),
    - High re-suspension of material,
    - Removal and destruction of infauna.

    (Escalator dredge can cover larger areas given the delivery of material to the vessel surface, narrow track)
- Draft Net ***(not considered in this version of fishing RA due to lack of information)***
    - Sweeps across river or estuary bed
    - Re-suspension of material
    - Removal and destruction of infauna
- Tangle Net ***(not considered in this version of fishing RA due to lack of information)***
    - Tangles bottom dwelling species
    - Considerable potential for by-catch
- Aquaculture (Finfish)
    - Organic enrichment
    - Disease and parasite source
    - Risk of genetic introgression posed by escapees
- Aquaculture (Shellfish)
    - Current flow restriction
    - Phytoplankton depletion
    - Organic enrichment

2.2 Identify Habitat Sensitivity

Different habitats will have varying degrees of sensitivity to physical disturbance. MarLIN (www.marlin.ac.uk) have produced habitat sensitivity indices using key structural species and functional species as the primary drivers, followed by characterising species that are significant to the in defining the biotope. The sensitivity of the habitat is ranked according to the susceptibility of the key and characterising species to disturbance. These sensitivities will range from outright removal and destruction of the key species (high sensitivity) to no detectable impact (not sensitive). Changes in species richness is another method of determining the impact on a particular habitat, whereby, major decline is listed as >75 % decrease in species richness, a minor decline is recorded as a <25% decline in species richness.

Our knowledge of (benthic) species in these habitats will determine whether or not the fishing activity will have a measurable impact. In most situations we rely on literature produced elsewhere (such as reviews by Collie et al 200 and Kaiser et al 2003) to estimate the impact of the various gears on benthic communities.

3.0 Risk Assessment: Fishing

The goal of the risk assessment is to assign a level of risk to all water bodies for which fishing activities are carried out in tidal waters. As a first cut a number of habitats are listed where fishing is likely to occur. A first cut of these habitats is:

- Maerl – scallop, oysters
- Coarse Sand – surf clams, razor clams
- Fine sand – razor fish, scallop
- Muddy sand – cockle, scallop, razor clams
- Mud – *Nephrops*
- Mixed sediments – scallops, oysters, cockles

As certain gears may be used in a variety of habitats a matrix is generated to identify the level of sensitivity the various habitats will have to the gear types.

Table 1: Matrix of potential gear interactions with habitat types

	Box Dredge	**Scallop Dredge**	**Otter Trawl**	**Beam Trawl**	**Hydraulic Dredge[2]**
Mearl[1]	**High**	**High**	**High***	**High***	**High***
Coarse Sand	**Moderate**	**Moderate**	**Low**	**Moderate**	**High**
Fine sand	**Moderate**	**High**	**Moderate***	**Moderate**	**High**
Muddy Sand	**Moderate**	**High**	**Moderate**	**High**	**High**
Mud	**High***	**High***	**High**	**High**	**High***
Mixed Sediment	**Moderate**	**Moderate**	**Low***	**Moderate**	**High**
Zostera[1]	**High**	**High**	**High***	**High***	**High***

Notes: ***** Applicability in question.

[1] Given the highly sensitive nature of mearl and *Zostera* sp. beds any physical disturbance in the form of fishing activity could be highly destructive (reducing the maerl to rubble and uprooting the eel grass) and greatly disturbing the species that rely on them for habitat and refuge.

[2] The activity of the hydraulic dredges is to fluidise the seabed to the depth of the target species, in the case of razor clams this could be > 20cm. Effectively, much of the substrate and its constituents is entirely removed or relocated. Mortality of associated (soft bodied) organisms is very high and the impact is considered high in all instances.

The scoring is based upon the impact of the activity on the substrate itself and the susceptibility of the organisms typically associated with that substrate type (MarLIN). Typically, epifaunal organisms that use the sediment to support themselves but are proud of the surface, e.g. anemones or sea pens would be considered particularly sensitive to these activities. As some of these species are considered characterising for the habitat (e.g. maerl species), their destruction or removal would be considered high impact. Coarser sediments that are exposed to naturally turbulent hydrodynamic conditions may

be more resilient to physical disturbance caused by towed fishing gear. Disturbance of the uppers layers of sediments in finer sediment environments cause re-suspension of sediments and the potential for re-mineralization of nutrients and resorting of particles (Kaiser et al 2000).

Taking those activities and assuming that the primary concern is in areas where the activity has a high level of impact the next phase involve combining the impact information with the coverage of activities in water bodies. Based upon the type of activity in and the habitat it will be necessary to develop thresholds that may be expressed as proportion oaf a water body for an activity that may put the water body into one of the four risk categories.

As a first attempt, the thresholds used for the dredging component under the morphological risk assessment are similar to those listed in Table 2 below. These refer to the proportion of a water body that is subject to dredging activity. While the fishing dredging may not actually remove substrate the potential to impact communities and alter the benthic ecological quality element is great and a similar impact may be realised.

Table 2: Fishing activity thresholds subject to a **high** level of impact based upon the gear type used and the sensitivity of the habitat.

Thresholds*

Water Body Proportion	**Risk category**
<5%	2b
5-15%	2a
15-60%	1b
>60%	1a

* From Morphological Risk Assessment – Guidance document found at www.wfdireland.ie

If similar proportions were applied to activities and habitats subject to high level of impact in Table 1 the output of the mapping exercise would provide the risk categories for those areas. For areas with a moderate or low level of impact the thresholds should be increased (Table 3).

Table 3: Fishing activity thresholds subject to a **moderate/low** level of impact based upon the gear type used and the sensitivity of the habitat.

Thresholds

Water Body Proportion	**Risk category**
<15%	2b
15-45%	2a
45-90%	1b
>90%	1a

Caveats

1. A very important caveat to all these levels is that there is no provision for the intensity of the activity in a water body. This would typically be represented as the number of boats fishing in the area, the number of days the area is fished or the average fishing effort (days km^{-1} $year^{-1}$ - CEFAS 2004). This would increase the confidence of the risk assessment but would require setting alternative thresholds based upon fishing intensity. As it stands the confidence of the assessment must be categorised as **low**, at best.

2. There are a number of fishing activities that have an impact on the ecology of marine systems but have not been considered in this assessment. Some of these activities are:

1. Seed mussel collection by dredging
2. Seed mussel collection by scraping from intertidal rocks
3. Periwinkle collection from intertidal areas
4. Seaweed harvest from intertidal and infra-littoral areas
5. Intertidal digging of lug worms, cockles and razor clams

Some of these activities would be considered highly destructive forms of fishing (e.g. Intertidal digging) and should be considered in future fishing risk assessments.

4.0 Risk Assessment: Aquaculture

For the purposes of the risk Assessment, aquaculture is defined as the culture of shellfish and finfish species in controlled situations. Bottom culture of mussels because of its extensive nature is considered in the **morphology** risk assessment. Shellfish culture can have an impact on the seabed by reducing flow and causing a build up of sedimentary material in the vicinity of the structures and perhaps a buildup of organic material as a consequence of pseudo-fecal and fecal production. In areas of high density of shellfish production there is a risk of phytoplankton depletion that can impact upon the culture organism and other suspension feeding organisms in the water body. Finfish aquaculture can also result in reduced flow conditions in the vicinity of the cage structures increased sedimentation and organic enrichment. There are also risks resulting from escapes, disease and parasites associated with finfish aquaculture activities. Even acknowledging that these activities are licensed and that, in

the case of finfish aquaculture, there are monitoring programs to assess the status of activity in light of the potential risk categories, they do not specifically deal with risk to the wider water body as a whole. In the case of shellfish, monitoring is confined to human health issues (bacteriological, harmful algal blooms and biotoxins) – there are no monitoring programs that can define the impact on the level of a water body as defined by the WFD. As a consequence of the lack of distinct information pertaining to the wider impacts on water bodies imposed by aquaculture activities and that it is acknowledged that aquaculture activities have inherent risks associated with them all water bodies having licensed aquaculture activities are being classed as 2a - probably not at risk but there is insufficient information to class as not at risk. It is important to point out that this assessment is not considered definitive and is subject to revision.

5.0 References

CEFAS 2004. Water Framework Directive Risk Assessment; Commercial Fishing. Contract report C1877/01 for Environment/Agency.

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