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A tax mechanism to encourage compliance with marine fisheries management regulations

Edward Fahy

ABSTRACT

The case presented here is a very simple one:

Marine fisheries depend on fish; without fish to harvest there is no economic basis for a catching sector. The existence of fish stocks is threatened by over-exploitation and fisheries for several valuable ones have declined rapidly over the past forty years. The EU has responded with a variety of measures, the latest being species recovery plans which are not effective. The industry has made it clear that as long as a single species can be harvested in a recovery area fishing will continue there. The scientific establishment anticipates there will be more recovery plans. The decline which is already well established is set to continue indefinitely unless there is a fundamental change of policy.

Numerous studies have demonstrated that the catching powers of the global industry, the EU and Irish fleets are too large. Decommissioning schemes have removed some capacity but technology improvement has progressed at a faster rate so the problem intensifies. The EU fleet is operating under considerable financial stress. The rising cost of fuel has been identified as a major obstacle to solvency. Throughout the EU fuel for fishing is subsidised. The value of the subsidy can be greater than the profit made by certain fishing operations.

In the Republic of Ireland, every €4 generated by landings of marine produce is subsidised by €3 from the Irish and European taxpayer; the fuel subsidy in 2003 was worth an estimated 31% of the landings. Why would a nation subsidise any activity which destroys the resource on which it depends?

The case is made for a removal of the fuel subsidy, initially from vessels towing unselective gears (beam and otter trawls and dredges) – the most expensive to operate and the most environmentally damaging – in fish recovery areas.

The argument is advanced for the industry in general. Official attitudes to fisheries administration in Ireland are examined and an argument is put forward for a more integrated, resource-centred administration and conservation policy. The need for cross compliance or more simply, joined-up thinking in the formulation of management objectives is emphasised.

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FOREWORD

It is generally recognised that over-capitalised marine fisheries are depleting the resources on which they depend and that the current trend of development is unsustainable. This report demonstrates the high dependence by the industry on subsidies, which are exacerbating over-exploitation and encouraging harmful fishing practices.

The underlying principle of the report is that a regulatory system should be designed to foster sustainable harvesting; best practice safeguards a healthy environment in which conservation of biodiversity is a priority. Taxation policy has a part to play and should be used to optimise resources in the medium and long term.

The report argues for a comprehensive resource policy involving the principle of cross compliance in the exploitation of living marine resources in Ireland. It proposes a simple taxation reform to encourage industry observance of the spirit and intention of fishery regulations in the most depleted fisheries.

The report was commissioned by *Smart Taxes*, a policy development network led by *Feasta*, the Foundation for the Economics of Sustainability. *Smart Taxes* is funded by the Department of Environment, Community and Local Government to develop policy options for the reform of fiscal and monetary mechanisms to deliver environmental, social and economic sustainability. The report is part of *Smart Taxes*' objective of identifying mechanisms to protect natural resources and ecosystems.

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EXECUTIVE SUMMARY

The health of marine fisheries in Europe and in Ireland has been worsening for some time. Industrial fishing is energy-intensive and, increasingly, unprofitable, kept in business only by subsidy. Over a period of 25 years fuel consumption has been shown to correlate with over-fishing. Decommissioning has taken place but has been overtaken by technology creep. Fuel prices should have the effect of reducing fishing capacity but subsidy obstructs this relationship (1.).

Fuel subsidies have been reported as amounting to 25% of an operation which generated a profit of 10%. World-wide calculation of fuel consumption estimates it to be 75% of landings (tonne for tonne); for Ireland in a particular year (2002) the calculation is 69% (4.2.2.)

The proposal is made to remove the subsidy for marine diesel from vessels that use unapproved gears in the most sensitive management areas: those in which species recovery plans are in place (2.). The solution is outlined in the most general terms: to withdraw or make ineligible to avail of fuel subsidy any vessel that fishes with an unapproved gear (i.e. any gear which takes the species for which the recovery area was designated) as a by-catch (4.10).

The proposal is made on the basis that cod recovery areas constitute a “hard case” - specifically that of the Irish Sea whose cod stock has been fished out, despite efforts to establish plans to save it (3.) The decline of cod cannot however be looked at in isolation. The case epitomises much that is currently happening in marine fisheries everywhere. Furthermore, despite the disaster which developed over a number of years and to whose solution the industry made little contribution, the depleted condition of the Irish Sea cod stocks (other species are also involved) is likely to spread to the adjacent Celtic Sea where further recovery plans are in prospect (4.6.2.)

The background for the current recovery plans is briefly provided (4.6.; 4.6.1.). Sufficient information is given to explain the case. Marine fishing methods are

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briefly described (4.1.); details of fisheries subsidies are provided (4.2.) along with their consequences, the creation of monocultures and the destruction of biodiversity (4.2.1.). Fuel types are defined (4.2.3.) and the EU policy on fuel subsidy is set out (4.2.4.). Fuel pricing policy in Ireland is elucidated (4.2.5.). Available reported figures make it difficult to disaggregate fuel consumption by elements of the Irish fleet (4.2.6.). However, working from published data, it is estimated that the exchequer foregoes €62 m by not applying excise duty on marine diesel as on DERV (4.10.). The history of Ireland's fin-fish fisheries development from inshore artisanal to industrial ventures is exemplified by whiting and cod (4.4.2.).

The administrative context of the Republic's fisheries is outlined (4.3.) geographically (4.3.1.). Ireland has exclusive administrative rights to 27,000 km² of marine and transitional waters. The objectives of the CFP are given (4.3.2.). The status of stocks in the northeast Atlantic is reported (4.3.3.). The objectives of Commission policy (4.3.2.1) and the outcomes of this policy are discussed, showing that they have resulted in over-fished stocks out of balance with fishing capacity (4.3.2.2).

Ireland's administration (4.4.), in common with other EU nations, has seen inshore fleets decline to give way to larger vessels (4.4.1.).

It is difficult to get a firm grasp of the economic situation within the Republic of Ireland's fleet. Possibly because of inaccurate, or incomplete and certainly inconsistent reporting, the economic solvency of the Irish fleet is unclear (1.). Ireland's fleet reporting requirements to Brussels were fully satisfied only in 2007 (4.3.2.). The fleet currently contains three segments that are not constrained by EU capacity limits (4.5.3.; 4.5.4.; 4.5.5.). At times illegal but known fishing has been omitted from effort assessments (4.7.2.3). Attempts are made to estimate the fuel consumed by elements of the Irish fleet but they are inconclusive (4.2.6.1; 4.2.6.2). The composition of the Irish fleet is described (4.5.) with emphasis on the polyvalent segment, the largest and most diverse (4.5.3.) in an effort to assess the capacity of the fleet segments towing gears: they accounted for 91% GT and 83% of kW.

The current administration of marine fisheries in Ireland is described as demoralised, consisting of piecemeal initiatives, which seek good headlines but are otherwise ineffective (3.). There is an apparent reluctance to cap the fleet size (4.5.); taxpayer-invested monies in decommissioning have been used to purchase more effective vessels accommodated in one of two or three uncapped fleet segments (4.8.1.).

Management of marine fisheries in the Republic is evaluated (4.7.) and described as crisis management, without any medium or long term objectives. There is no consideration of resource protection or conservation. And there is no interest in regulating fisheries within exclusive waters (4.7.1.). Those involved with over-capitalised fisheries cannot afford the luxury of medium to long term planning (1.) and, as this is the sector which dominates the Irish fleet, policy is consequently unclear. Instead, initiative is directed at seeking good headlines (4.7.2.). BIM is the principal agency for injecting B and C type subsidies into the industry. Attempting to exploit "green" issues, for public relations and marketing purposes, BIM has established eco-labelling and schemes to reduce marine waste; a green certification scheme for fishing boats is believed to be in formulation. But BIM is also associated with over-capitalising the fleet and with the promotion of over-fishing which led to the collapse of one of the Republic's most valuable fisheries (4.7.2.2).

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Effective fisheries management must implement scientific advice rather than disparage unpopular analyses and it must implement the precautionary principle, which is a protocol of the CFP (1.). Piecemeal environmental gimmicks are no substitute for a comprehensive resource-based policy, designed according to the principles of cross-compliance (4.8.).

Opinions on fuel subsidy are reviewed (4.9.): OECD (4.9.1), the Doha Round of WTO talks (4.9.2), the NGO Seas at Risk (4.9.3), the Environmental action programme of the European Commission (4.9.4), Stakeholder opinion (4.9.5.), and EU policy on subsidies to fishing (4.9.7.).

Scientific research on atmospheric emissions, energy and the fishing industry generally have moved in various directions with occasionally contradictory outcomes (4.9.6.). Reducing emissions by devising more effective fishing practices imposes a greater burden on the resource and may be a B type subsidy (1.). The definition of "sustainability" varies among studies and the inclusion of "socio-economic" factors complicates the definition of goals (1.). Meanwhile, the EU marine agenda is widening, threatening to diminish the management of marine fish and invertebrate stocks and lose these topics in a wider agenda (4.4.1.).

1. GENERAL INTRODUCTION

A communication from the European Commission (2006), reviewed the prospects for the fishing industry throughout the Union on data up to 2005. The document acknowledged the depleted stocks which had, in turn, necessitated restrictive management measures that had increased costs and reduced income levels. The problems affected all sectors of the European fleet but were most acute for vessels towing gears and fishing demersal stocks. These are the vessels and stocks of greatest concern to this study.

The evolution of the current relationship between resource and fleet has been obvious for some time. Lei (2006) provided a prognosis of the consequences of a fuel oil increase in European fisheries (EU-20) based on a review of fleet statistics from 2002 and previous years. In 2002 the EU fleet consisted of 73,777 active vessels employing 204,000 on board. The value of landings was €7.31 billion (b), the fleet fuel requirement was 4.82 million (m) tonnes (t) which cost €1.1 b, or about 15% of the value of the catch.

A more detailed analysis of fleet composition was instructive: about 56% of total value was generated in Spain, Italy and France, while 60% of all fishers were located in Spain, Greece and Italy. The latter fisheries were also the most profitable, probably due to the smaller wages paid under the "share" system.

When fuel costs were expressed as a percentage of gross value added (GVA) they averaged 43% for the EU-20 and were lowest in Greece (10%), as might be expected for a country having a fleet of small inshore craft; Poland was second highest with a value of 83% but Ireland had, by far, the most uneconomic fleet with a value of

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189%. It was indeed difficult to understand how the Republic's fleet was solvent in such circumstances.

Lei observed that the most energy-intensive fisheries in the EU-20 occurred in the country with the lowest fuel prices. However, it was not possible to speculate about the consequences of a fuel price rise because economic solvency in the industry depended on a number of independent variables, such as the price of fish which, in Europe, is not necessarily influenced by the cost of fuel. That said, a rise in fuel oil prices would present serious problems for the industry. The study postulated the consequences of a doubling of fuel costs. A 50% increase would cause a reduction of 5.5% in on-board employment within the EU-20 and would wipe out 5,162 jobs at sea (the total on-board employment) in the Irish fleet. Apparently it did not happen.

Between January 1995 and May 2005, the total power of the European fleet declined from 7.2 m to 5.7 m kilowatts (kW), a decrease of 2% annually. While this might seem to be a move in the right direction, Villasante and Sumaila (2010) observed that the EU-13's fleet capacity, expressed as gross tonnage (GT), was reduced by more than 4% in only three years (1991, 2004 and 2005) in the period from 1987 to 2006. Meanwhile, technological progress (also known as technology creep or fishing efficiency) rose by a conservatively estimated 4.4% annually. Villesante (2010) concluded that the Common Fisheries Policy (CFP) had been ineffective in reducing fishing capacity. The result of decommissioning schemes removing fishing power, tonnage and vessels from the fleet too slowly to counteract the progress of technological efficiency, had been the accumulation of redundant fishing capacity which could be brought on stream again at any time (see for example Tingley and Pascoe, 2005).

The thrust of the work of Lei (2006) was to ascertain how the European fleet might evolve in the circumstances of increasing fuel prices. Fuel prices could not be grant-aided by individual governments because that would amount to unfair competition under EU rules and any financial assistance of that kind which had previously been given (it was by France and Spain) had had to be in the form of a repayable loan. The future for the fleet lay in more fuel-efficient technologies, research into which would have to be grant-aided. Fishing operations would have to become more profitable.

A fishing operation can increase its efficiency by a variety of methods ranging from the use of innovative materials to construct fishing gears, more accurate electronic navigational methods or less fuel-demanding hull design. Examples of the latter are contained in Thomas et al (2010) and there are many others. Research into more efficient technologies is funded by subsidies provided by national and European governments which are regarded as "bad" because they intensify over-fishing. Despite bringing more fishing pressure to bear on already over-exploited resources, research often favours technological progress, which is interpreted as environmentally beneficial because it reduces greenhouse gas emissions.

Throughout the EU, and within constituent nations, the marine fishing fleet consists of a variety of vessel sizes and gears. It is important that their overall impact on the resource should be known. Therkildsen (2007) examined the performance of small and large scale fishing operations in New England from several socio-economic and

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environmental perspectives. She observed that diversity could be manipulated to secure certain policy goals. As has been observed elsewhere, small artisanal vessels employed more people per landed tonne, used a larger number of vessels, obtained higher prices for landings, had lower by-catches (did less environmental damage) and used a greater proportion of their catches for human consumption than their larger industrial counterparts. However, large scale boats may have had a lower fuel consumption per landed tonne, an observation which requires further examination before it might become a generalisation (author's comment). Utne (2008) examined energy consumption by Norwegian inshore and offshore vessels and concluded that the energy costs of the inshore boats were lower but that this fleet suffered greater human fatalities, presumably because its vessels were less robust and more vulnerable to poor weather conditions. Depending on how one wished to interpret 'sustainability', larger vessels might have an advantage in these circumstances. The work undertaken here interprets sustainability as a necessary biological characteristic of a healthy fishery rather than an ambition for a particular fleet operating programme.

On the question of stock recovery plans, Lei (2006) concluded it was too early to make an assessment of the consequences of fuel prices on them. Here it is argued that an increase in fuel price, particularly for the most energy-demanding and environmentally damaging vessels, would be a disincentive to the further pursuit of stocks in recovery.

Fuel price is a critical element in the operation of fishing gears, particularly towed nets and dredges, so any increase is likely to influence harvesting strategy. Van Marlen (2009) examined the economic performance of a number of gears used by fleets of six EU states. Passive (gillnets) and a variety of mobile gears (beam, pelagic, demersal trawls) were investigated. Approximately 58% were operating at a loss at the fuel prices obtaining in 2004-2006; 33% at a profit. Fuel increases in 2008 had reduced 79% of them to loss. The study observed that Irish pelagic trawlers 24-40 m in over-all-length (oal) were profitable, while some demersal vessels in the UK, Italy and France could improve their performance.

Between 2003 and 2007, the energy efficiency ratio (quantities of landings/fuel consumption) had been declining (European Commission Staff Working Document, 2008). Vessels using mobile gears presented a lower ratio between landings value and fuel cost than passive gears. The data for Ireland on landing value and fuel cost were separately reported. They are somewhat anomalous.

Beyond this, a more detailed scrutiny of the data revealed inconsistencies. The species composition at which gears are directed influences the energy efficiency of a fishing operation. The highest energy efficiency ratios were reported for the largest vessels (24-40+ m) which might well reflect the type of fishing on which they were engaged.

Over longer periods the ratios are likely to be more divergent. Schau et al (2009) examined these criteria in Norwegian fisheries for a 25 year period from 1980. They proposed that the correlation between reduced catch rates and increased fuel consumption is sufficiently strong to be used as an indicator of over-fishing.

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Amason (2007) argued that a rise in fuel prices – doubling between 2004 and 2007 – would be beneficial in reducing capacity in the fleet size but that view is simplistic. Sumaila et al (2008) surveyed fisheries which they concluded were, on a global scale, over-capitalised. Certainly, rising fuel costs should have the effect of reducing over-capacity. However, the extent to which rising fuel costs would be effective in doing this would depend on the cushioning effect of the amount of subsidy that was available before the rise in oil prices took place. The authors estimated the global amount of fuel subsidies to be in the range of US$4.2 - 8.5 bn.

Within Europe a substantial proportion of the research establishment is sympathetic to and/or serves the industry and, *inter alia*, ignores or insufficiently prioritises the plight of over-worked stocks. The approach of Abernethy et al (2010) who examined the consequences for fisheries of fuel price rises between early 2007 and mid 2008, is typical. The cost of fishing operations had increased particularly for vessels towing gears and fisher behaviour had altered: fishing was taking place closer to home port and skippers reported they were less inclined to experiment with more environmentally-friendly gear. Fish first sale prices had not increased "as a result of the price-setting power of seafood buyers". The authors, who recognized that commercial fish species were declining, surmised that a rise in fuel price was a threat to the viability of fishing communities. It could also be argued that the depletion of fish stocks due to over-fishing presents a greater threat. In their introduction, the authors stated that "… economic performance of many sectors of the EU fishing fleet has been further constrained by restrictive management policies and lowered quotas implemented in response to the declining stocks". Within much of the catching sector the actions of the EU Commission are interpreted as simply imposing additional restrictions irrespective of the reasons for them. This is a subtle emphasis on a particular perception which typifies the way in which the industry views the management efforts of the EU Commission.

Much effort has been made by the scientific community to bond with and convince the industry of the necessity for regulation and to win co-operation in implementing appropriate policies. This can be seen in the study of Rochet et al (2008) which examined the accuracy of fishers' observations measured against fish survey data. Overall, they found close agreement between both and concluded that fishers had "a greater power than survey data to detect recent changes" which included the decline of important commercial fish species. However, fishers were not good at identifying the causes of such changes. Fishers are indeed, with very good reason, highly critical of EU fisheries policies but few effective alternative suggestions emanate from their representative organisations. However, a stressed fishing community is less likely to conserve its fish stocks (Bratton and Hinz, 2002). Clear thinking may be a luxury that an over-capitalised fishery cannot afford. What is lacking, and not merely within the EU, is greater enforcement of regulations based on scientific principles and a greater emphasis on safeguarding the productive capacity of the fish and invertebrate stocks on which the industry depends.

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2. THE PROPOSITION

Commercial fishing vessels are entitled to avail of "marked diesel" which has a lower rate of excise duty than DERV. Thus they are subsidised by the State. The resources on which these vessels depend, fin-fish and invertebrate stocks, are currently heavily fished and many are in obvious decline. Recovery plans have been put in place for cod stocks and hitherto they have not been effective. It is proposed that any vessel whose activities target or collaterally take a by-catch of a species which is the object of a recovery plan within the area covered by that plan should not be able to avail of the lower rate of excise duty on marked diesel.

The case is explained in the text that follows.

3. RATIONALE

This review will scrutinise the marine fishing industry and its harvest methods. The exercise begins with the status of marine fisheries in the north east Atlantic but it will consider Ireland's fisheries in greater detail and focus attention on the plight of the Irish Sea and its cod fishery as a well documented indicator to the direction in which the industry is progressing.

The argument will be advanced that commercial marine fisheries are highly subsidised. Those subsidies are destroying the resource on which the industry depends.

One subsidy, for fuel, is examined in detail. Fuel is a large element in the cost of operating mobile fishing gears which are highly damaging to the environment and destructive of fish stocks.

The argument for withdrawing fuel subsidy, initially from vessels which operate in sensitive "recovery" sea areas is advanced as a means of securing compliance with conservation regulations. Supportive opinions from other sources are reviewed.

The sea fishing industry in Ireland is demoralised and its administration consists of piecemeal initiatives rather than coherent resource management policy. Some grants dispensed to the fishing industry in recent years have been presented as more environmentally acceptable. The argument is advanced that occasional gestures are insufficient and that a more fundamental review of their consequences for the resource on which the industry depends should take precedence.

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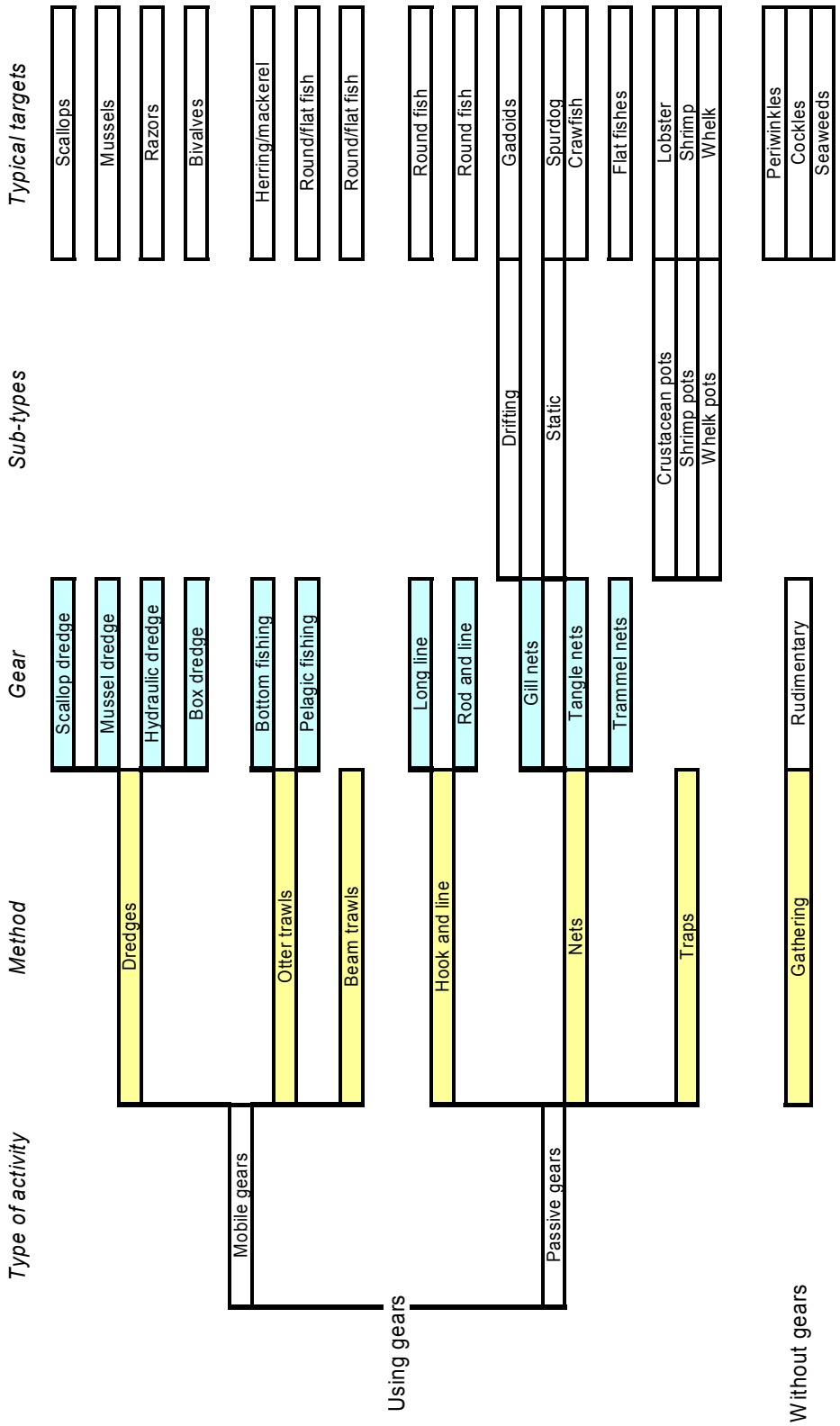

Fig 1. Generalised and greatly simplified diagram of fishing gears in use in the Irish Exclusive Economic Zone (EEZ). Working up the page the methods become more intensive (ie. consume more energy) and less selective (take a wider range of fauna, flora and by-catch). Working across the page from left to right, methods become more specific. The last column lists typical catch.

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4. ELEMENTS IN THE ARGUMENT

4.1. Fishing methods

It is not appropriate in a report of this kind to embark on a detailed description of fishing methods in use in Irish waters. A greatly simplified account of them is provided in Fig 1. Marine fauna and flora are harvested using a variety of gears. The simplest and least-capitalised are shore-gathering, which may require no more equipment than a garden fork and a bucket. Working from a boat, a range of low energy possibilities is also available. Fauna may be caught on hook and line or in baited traps or in nets, which are allowed to drift or are staked or anchored and in which fish or crustaceans become wedged. When an enclosing net (a design which surrounds a target species) is used, energy must be injected into the process of dragging the net through the water or over the sea bed. That is also true of dredging, in the course of which a metal apparatus agitates or penetrates the substratum.

No method of fishing is without some adverse collateral consequences for fish stocks. Some are more damaging than others.

Enclosing fishing methods tend to cause most environmental damage, particularly those which interact with the substratum (beam trawling, hydraulic and scallop dredging). Pelagic trawling can be less damaging and more target-selective. There are many general accounts of the fuel requirements of different gear types (see for example Abernethy et al, 2010).

Fig 1 is arranged (approximately) so that as the diagram is ascended, the fishing processes become more energy-intensive. In the same direction the methods also become less selective and they can accumulate a higher proportion of by-catch: landings. Much has been written on fishing methods and their consequences for environment and stocks. For non-specialists I would recommend reading general texts on the matter, such as Roberts (2007) and Grescoe (2008).

Lei (2006) assembled data to show that within the European fleet the greatest consumers of fuel were towers of mobile gears. Their fuel costs could range between 33 and 55% of total production costs; vessels using passive gears had fuel production costs of 10-14%.

4.2. Subsidised fishing

Khan et al (2006) reviewed subsidies to fisheries. Originally intended as seed investment in the “infant sector” of the 1930s and 1940s, they have become a major

Category	Details	€	t	%	Notes
A1	Total amounts in administrative, research and fish stock sustainability programmes	46,310,778			1
B1	Irish and EU investments in white fish fleet renewal	2,778,293			1
B4	Direct total payments for marketing and processing programmes	1,001,938			1
B6	Foreign access agreements	10,776,945			1
C1	Direct payments for fisher assistance programmes, may include other descriptions	33,070,700			1
	Total subsidies A - C	93,938,654			1
	Fuel subsidy for landings in 2003	66,278,298			Box below
	Grand total of subsidies	160,216,952			
	First sale value of landings in 2003	213,161,213			
	Percentage total subsidy of landings			75	
	Percentage fuel subsidy of landings			31	4

Calculation of fuel subsidies			
Weight of landings		293,176	
Fuel input			
Assume 80% of landings from towed gears		234,541	
Assume 0.69 t fuel per 1 t landings (t)		202,291	
Therefore assume 611 litres per 1 t landings			3
Price of Derv in August 2003 / litre	0.73		2
Subsidy at 50% / litre	0.37		
Subsidy per t landings (€)	226.07		

NOTES
1: Converted from US$ as valued on 15 June 2003
2: Budget 2003
3: 885 litres per 1 t gas oil

Table 1. Estimate of subsidy input to commercial fishing in the Republic of Ireland in 2003.

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contention in fisheries everywhere. Khan et al grouped those currently available into three categories:

A. Good subsidies: *maximise investment in natural capital assets to a social optimum. They enhance the growth and management of fish stocks. Examples are:*
1. Fisheries management programmes and associated services
2. Fishery research and development

B. Bad subsidies: *lead to disinvestments in natural capital assets once the return from exploitation exceeds maximum economic yield. Examples are:*
1. Boat construction, renewal and modernization programmes
2. Fishery development projects and support services
3. Fishing port construction and renovation programmes
4. Marketing support, processing and storage infrastructure programmes
5. Tax exemption programmes (including fuel subsidies)
6. Foreign access agreements

C. Ugly (ambivalent) subsidies: *have the potential to lead to either investment or disinvestment in the fishery resource. These programmes can lead to either stock enhancement or over-exploitation. Examples are:*
1. Fisher assistance programmes
2. Vessel buyback programmes (decommissioning schemes)
3. Rural fisheries community development programmes

Sumaila and Pauly (2006) provided data on Ireland under these headings but omitted fuel. Based largely on OECD data from 2005, referring to the years 2002 and 2003, their data are summarised in Table 1. Table 1 also contains an estimate of fuel subsidy based on very conservative assumptions, calculated on the basis that towed gears contributed 80% of landings and that fuel subsidy accounted for €226 for each 1 t landed.

Table 1 estimates the total value to subsidies to the Irish marine fishing industry at 75% of the first value of the landings; fuel subsidies were worth 31% of the value of landings.

4.2.1. Environmental consequences of subsidies

Subsidies artificially generate profits from over-exploited fisheries. They also increase discarding and habitat destruction. Damage to coral reefs, suspended sediment settling back, the smothering of sessile marine life in the process and non-target by-catch all accompany the use of certain gears. A typical sequence of decline sees mobile gears remove predatory fin-fish. The fauna, which had been eaten by the predators, then becomes a fishery in its own right. Thus, the collapse of the Newfoundland cod fishery was followed by the rise of a fishery for snow crab, a species that had previously been preyed on by cod. In the Irish Sea, the removal of cod was accompanied by burgeoning populations of *Nephrops* (also known as Norway lobster or Dublin Bay prawn) and whelk (*Buccinum undatum*, a large marine snail which is a delicacy in the Far East, particularly in South Korea) which became dominants in their turn and provided fisheries which, in some instances, now appear to be in

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decline. The removal of target species and associated fauna by, for example, trawling can ultimately lead to a reduction in biodiversity and the creation of a monoculture.

4.2.2. Fuel subsidies

A key motivator in fishing is profit. It is generally accepted that marine fisheries everywhere are over-capitalised and it is known that fuel is a major element of operational costs particularly for vessels using mobile gears where it can amount to 60% (Sumaila et al, 2006[2]). While costs might be expected to act as a restraint on over-fishing in such circumstances, fuel subsidies negate that effect. Sumaila et al (2006[1]) also observed that high seas bottom trawl fleets receive subsidies of 25% of the value of the landings. The fishing operations, including the subsidy, generate an overall profit of 10%.

Tyedmers et al (2005) attempted to map the global consumption of fuel and estimated that almost 59m t were consumed in the course of harvesting 80 m t of marine life, or 0.74 t per 1.0 t landed. The equivalent for Ireland in a particular year is 0.69 t fuel per 1 t landings.

4.2.3. Relevant Fuel types

The following definitions are from Easson et al (2004):

DERV - Used in diesel engine road vehicles. It is automotive diesel fuel for use in high speed, compression ignition engines in vehicles subject to Vehicle Excise Duty.

Gas oil - Used as a burner fuel in heating installations, in industrial gas turbines and in the way DERV is used, except the vehicles in question are not subject to Vehicle Excise Duty. Examples of these are agricultural vehicles, fishing vessels and construction equipment. This product is also referred to as marked gas oil, being distinguished by being dyed red or green.

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It has not been possible to distinguish figures for consumption by commercial fishing vessels from the total consumption figures collected for statistical purposes. Easson et al (2004) reported, on information received from the Department of Communications, Energy and Natural Resources, that the fuel market for gas oil and marine diesel in the Republic of Ireland in 2003 was 1,705 m litres (1.9 m tonnes[1]) of which 43 m litres (48,832 t) supplied tractors and rail transport. Howley et al (2009) state that the total primary energy requirement (TPER) of agriculture fell from 3.5 to 2.2% between 1990 and 2008 but it is not known whether the requirements of the fishing industry were included in those figures.

[1] The conversion used in this work is 885 litres to 1 tonne.

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4.2.4. Taxation of mineral oils in the EU

The general arrangements for the taxation of products subject to excise duties are set out in European Council Directive 92/12/EEC of 25 February 1992. Mineral oils, alcoholic beverages and tobacco are the products covered by the directive. European Council Directive 2003/96/EC of 27 October 2003 restructured the framework for the taxation of energy products and electricity.

Article 14 of 2003/96/EC directs that member states shall exempt from taxation the following:

(c) energy products supplied for use as fuel for the purpose of navigation within Community waters (including fishing)……..

The preamble to Council Directive 2003/96/EC explains the basis for this, stating, *inter alia*, that (12) energy prices are key elements of Community energy, transport *and environment* policies (author's emphasis). It recognizes (13) that taxation partly determines the price of energy products and electricity and that the minimum levels of taxation should reflect the competitive position of different energy products. It goes on to state (15) that the possibility of applying differentiated national rates of taxation to the same product should be allowed in certain circumstances. It further stipulates (20) that member states may need to differentiate between commercial and non-commercial diesel, and that (21) business and non-business use of energy products and electricity may be treated differently for tax purposes. Paragraph (29) states that business entering into agreements to significantly enhance environmental protection and energy efficiency deserve attention; among these businesses, those that are energy intensive merit specific treatment. It is not however clear whether this is a requirement for greater leniency in the taxation of such operations or whether they should be discouraged.

However, the earlier paragraphs of the preamble state (6) that environmental protection requirements must be integrated into the definition and implementation of other Community policies and (9) that Member States should be given the flexibility necessary to define and implement policies appropriate to their national circumstances.

4.2.5. Price of marine diesel in Ireland

The Finance Bill of 2010 introduced carbon taxation of mineral oils. The tax would apply to all mineral oils, including marked gas oil. These increases, when VAT was included, amounted to 4.9% on a litre of diesel to provide a carbon charge of €15 per tonne of CO_2 emitted. These taxes are not included in the calculations advanced here.

Prior to the imposition of carbon tax, the excise duty on marked gas oil was 4.7 cents per litre, whereas the excise duty on DERV was 41 cents per litre, almost ten times as high. Both are *specific* duties.

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VAT is applied *ad valorum*. For marked diesel the rate is 13.5% but for DERV it is 21% (VAT guide, 2008).

Fig 2 shows the relationship between the pre-tax price of diesel and the addition of excise duty and VAT to marked diesel and DERV. The higher the "base" (pre-duty) price of diesel, the lower the post-duty discrepancy between marked diesel and DERV. Arguably, at higher base values, the lower excise duty on marked diesel becomes more critical to fishing operations.

Some additional points: the smallest commercial fishing vessels use outboard motors which run on petrol for which there is no excise duty relief. Larger business operations avail of VAT relief which enables them to recoup that element of the fuel price; small business operations are unable to do so.

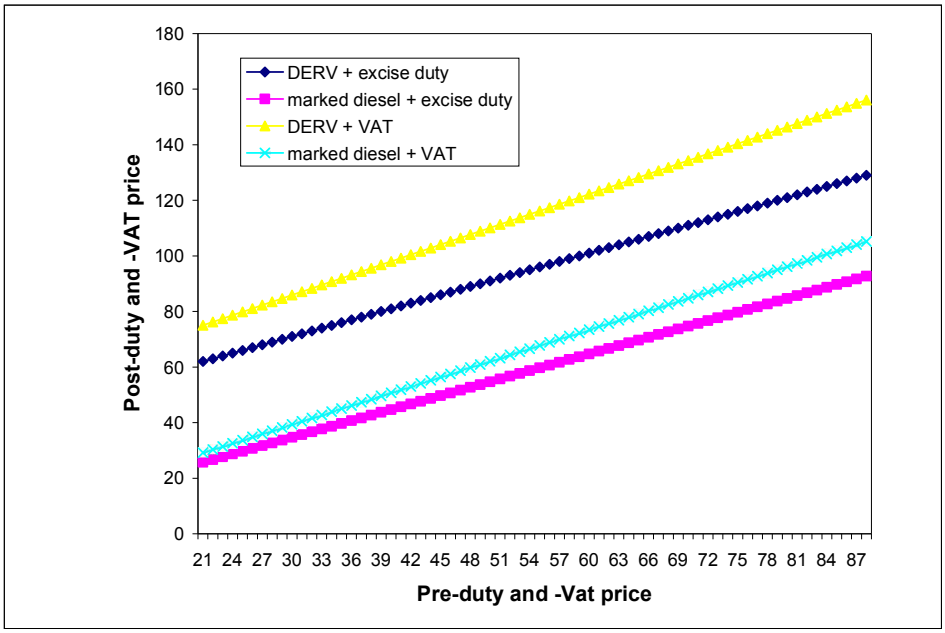

Fig 2. The addition of excise duty and VAT to the base price of diesel oil

If, as estimated by Lei (2006) the Irish fishing fleet consumed 193,000 t of marked diesel, excise duty amounted to €8 m as opposed to €70 m for a similar quantity of DERV, a difference to the exchequer of €62 m.

4.2.6.Estimates of fuel consumption by the fishing fleet

Bord Iascaigh Mhara (BIM) has in recent years reported data on fuel consumption by the Irish fishing fleet to the EU annually. Because of the way they are reported, these data are difficult to disaggregate. A European Commission Staff Working Document (2008) contains certain generalisations about the performance of fleet segments but there is considerable variability among similar categories across EU nations.

Lei (2006) reviewed fuel consumption by three segments of the Irish fleet (polyvalent, beam trawl and pelagic), pelagic was the most energy intensive sector and accounted for 2% of fleet numbers but harvesting 25% of landings, in 2002. The fleet in 2002

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used 193,000 t of fuel, 35% of it in large trawlers, i.e., those greater than 40 m overall length.

In total (fin-fish, shell-fish [crustaceans and molluscs]) the Republic's fleet landed 281,000 t live weight in 2002, a ratio of fuel consumed to landings of 0.69 t of fuel per 1 t landing, not dissimilar from the calculations of Tydemers et al (2005) for global fuel:landings ratios.

4.2.6.1 Estimates of fuel consumed per day

Data on fuel consumption by vessels towing mobile gears are not easily accessible. Some indicators have been used from IFREMER (2007). That study was concerned with small scale coastal fleets (sscf) but it contained a number of comparisons with larger vessels (lsf) using towed gears. The data are abstracted from Table 5.12-1 – Energy Consumption in the IFREMER report and are reproduced here as Table 2.

The data in Table 2 contain wide variations and they are generalisations. Notwithstanding, the figures are used to obtain an estimate of the likely consumption of marine diesel by vessels fishing in the Irish Sea. The average consumption was 2.35 litres per kW/day, the standard deviation was however large, suggesting the maximum could be as high as 3.81 or as low as 0.89 litres per kW/day.

4.2.6.2 Estimates of fuel consumed annually in the Irish Sea, statistical division VIIa

Estimates of the amount of fishing effort by mobile gears in the Irish Sea are available for the years 1998-2005 inclusive. Table 3 has been abstracted from ICES (2008). Later years were more fully documented than earlier ones in this short series. KW days were highest in 2003 at more than 10 m. Using the estimates obtained in Table A, the consumption of fuel oil by all fleets towing mobile gears amounted to almost 45,000 t in 2003 (high estimate) or 2,000 t in 2005 (low estimate) or 8,600 t in 2004 (medium estimate). Ireland accounted for 26-28% of these amounts.

4.3. Ireland's marine fishing opportunities

4.3.1. Administrative division of the seas

European maritime countries are surrounded by a band of waters of 200 nautical miles (n m) from the base lines of member nations. This band, established in 1976 is known as the Exclusive Economic Zone (EEZ) and the common fisheries policy (CFP)

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Fleet	Length, m, given	Fishing activity (days)	Fishing activity (engine hours)	Fuel consumption per year (litres)	Fuel consumption per day (litres)	Fuel consumption/kWday (litres)	Fuel consumption/ hour (litres)	Fuel consumption /kW day (litres)
Estonian trawlers	<24 m	62		2,298	37	0.47		
Estonian trawlers	>24 m	75		30,382	405	1.54		
Greece Thermaikos trawlers	24-40 m	195		105,000	538	1.55		
Greece Thermaikos trawlers	12-24 m	214		71,429	333	1.14		
France Mediterranean trawlers	18-25 m	220		223,404	1,016	3.44		
Portugal trawlers	unspecified	313		181,327	579	1.14		
France exclusive trawlers	12-16 m	198	3,515	168,444	861	3.53	48.1	0.19
France exclusive trawlers	16-20 m	230	4,967	300,038	1,325	4.08	61.0	0.19
France exclusive trawlers	20-24 m	248	5,626	446,309	1,825	4.26	82.0	0.19

Average	2.35
Standard deviation	1.46
Maximum	3.81
Minimum	0.89

Table 2. Data assembled on fuel consumption by vessels towing mobile gears.

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operates within it. National boundaries across the EEZ extend from terrerstrial borders between adjacent states.

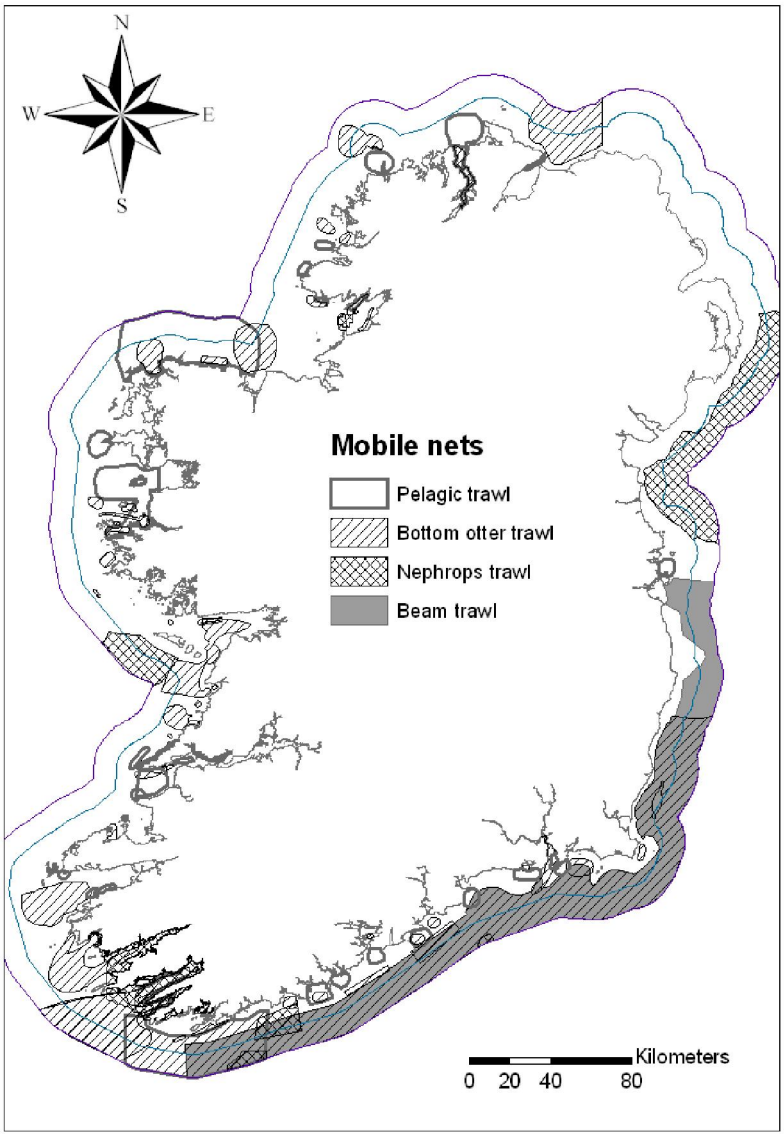

Fig 3. Divisions of the territorial sea: 6 and 12 n m limits and the use of mobile gears within them. From Fahy et al, 2008.

Moving landwards, national marine policies become more influential. At 12 n m from the baselines, the territorial seas begin. Six n m further landwards, the exclusive national waters commence. Access of fishing vessels to national EEZ sectors is by entitlement, negotiated with Brussels on the basis of traditional access. Between the 12 and 6 n m lines a more limited access is permitted to certain nations traditionally fishing there. Inside 6 n m marine waters are under the exclusive jurisdiction of the state in question. An account of these boundaries is set out in Fahy et al (2008) from which Fig 3 is reproduced.

Ireland's territorial sea is 27,487 km² in extent.

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The band from 6 to 12 n m has an extent of 13,824 km²
From the base lines to 6 n m the area is 13,662 km²
Inside the base lines the extent of marine waters (known as internal) is 13,650 km²

In other words, Ireland has exclusive rights over an area of 27,312 km² of marine and transitional waters (from the coast to the 6 n m line).

4.3.2. The Common Fisheries Policy (CFP)

Marine fisheries in the north east Atlantic of greatest interest to Ireland are carried on within the administrative framework of the Common Fisheries Policy (CFP) whose writ extends over the EEZ of all member nations. Its objectives, outlined by Holden (1994), are fourfold: the conservation of fish stocks, a structural policy (regulation of fishing fleets), the organization of markets and an external fisheries policy which arranges access to the waters of third countries.

Negotiation of the CFP was a fraught and protracted process. In order to win compromise Brussels agreed to fund fleet modernization and improvement (Fahy, 2008[3]). The result was a dramatic increase in fishing effort in the later 1970s and 1980s.

While the purpose of the structural policy was to make the sector socio-economically viable and contribute towards a more selective and sustainable utilization of resources, it rapidly deteriorated into an imbalance between fishing power and fish stocks. Gulland (1990) reckoned that an average of 40% reduction in fishing mortality should be secured in order to maintain sustainability. Four multi-annual-guidance programmes (MAGP) were introduced in order to restore balance between fleet capacity and resource, the last of them was to conclude in 2006.

By 2002 little had been achieved in adjusting discrepancies and the Commission sought further alterations through a review of the Common Fisheries Policy. The Commission acknowledged that current trends, if maintained, would result in the collapse of many fish stocks. Fishing mortality had to be reduced by between one third and a half, depending on the stock (European Commission, 2002).

Subsidies for fleet modernization and renewal were phased out in 2005. In his review of these developments Lindebo (2005) maintains that the major thrust of the CFP is now to devise multi-annual guidance programmes to engineer stock recovery. It is also an objective to reduce fish mortality so that stocks are harvested at maximum sustainable yield (msy) by 2015, in accordance with the outcome of the World Development Summit on Sustainable Development. There would also be greater scrutiny of the use of subsidies.

Method	Details of method	Nation	1998	1999	2000	2001	2002	2003	2004	2005	
Beam trawl	Beam>=80 mm	Belgium		982,855	1,484,122	1,759,801	1,759,801	1,541,794	1,140,300	1,251,345	
Beam trawl	Beam>=80	UK	283,705	276,217	127,813	216,216	138,473	213,234	110,839	165,015	
Beam trawl	Beam (all meshes)	Ireland						917,379	661,852	602,429	
Beam trawl	Beam>=80	Netherlands			181,060		1,895				
Demersal trawl >=100	whitefish otter trawls>=100	UK	239,935	103,007	251,045	419,976	366,994	428,708	177,883	100,117	
Demersal trawl >=100	twin trawls>=100	UK	1,265	34,147	4,065	5,480	22,323	77,098	40,091	5,183	
Demersal trawl >=100	seine nets >=100	UK	32,108	24,597	161,552	97,435	60,073	126,488	67,594	27,984	
Demersal trawl >=100	Nephrops otter >=100	UK	0	0	0	0	1,788	209	0	288	
Demersal trawl >=100	otter trawl >=100	Ireland						448,335	161,981	76,845	
Demersal trawl >=100	semi-pelagic >=100	UK	2,952	885	1,171,304	1,395,759	1,625,759	1,757,119	1,050,681	827,758	
Demersal trawl	semi-pelagic 70-90	UK	1,520,802	1,842,037	81,331	13,621	5,398	0	12,983	0	
Demersal trawl 70-99	whitefish otter 70-90	UK	922,300	830,738	627,184	564,833	382,865	408,090	684,043	582,907	
Demersal trawl 70-99	twin otter 70-90	UK	0	0	6,197	0	0	9,204	78,411	32,922	
Demersal trawl 70-99	Nephrops single 70-90	UK	2,545,381	2,494,306	2,342,478	2,522,752	1,960,901	2,143,790	1,722,762	1,682,888	
Demersal trawl 70-99	Twin Nephrops 70-90	UK	859,307	926,249	1,308,012	1,140,422	830,739	1,064,004	1,052,313	1,226,483	
Demersal trawl 70-99	Seine nets 70-90	UK	41,158	120,545	18,175	777	333	666	222	0	
Demersal trawl 70-99	Nephrops trawl 70-90	Ireland						1,274,785	1,445,775	1,628,742	
Trawl unspecified	Trawls excluding beam	Ireland						27,451	128,981	615	
Trawl unspecified	Trawls excluding beam	Ireland				4,416			8,107	17,800	
		TOTAL	**6,448,913**	**7,635,583**	**7,764,338**	**8,141,488**	**7,157,342**	**10,438,354**	**8,544,818**	**8,229,321**	
		Total for Ireland	**0**	**0**	**0**	**4,416**	**0**	**2,667,950**	**2,406,696**	**2,326,431**	
	Estimated Fuel consumption all fleets (litres)	Maximum	24,570,359	29,091,571	29,582,128	31,019,069	27,269,473	39,770,129	32,555,757	31,353,713	3.81
		Minimum	5,739,533	6,795,669	6,910,261	7,245,924	6,370,034	9,290,135	7,604,888	7,324,096	0.89 From Table A
		Mean	15,154,946	17,943,620	18,246,194	19,132,497	16,819,754	24,530,132	20,080,322	19,338,904	2.35
	Estimated Fuel consumption Ireland (litres)	Maximum				16,825		10,164,890	9,169,512	8,863,702	
		Minimum				3,930		2,374,476	2,141,959	2,070,524	
		Mean				10,378		6,269,683	5,655,736	5,467,113	
	Estimated Fuel consumption all fleets (t)	Maximum	27,763	32,872	33,426	35,050	30,813	44,938	36,786	35,428	Converter 885 l / tonne
		Minimum	6,485	7,679	7,808	8,187	7,198	10,497	8,593	8,276	
		Mean	17,124	20,275	20,617	21,619	19,005	27,718	22,690	21,852	
	Estimated Fuel consumption Ireland (t)	Maximum				19		11,486	10,361	10,015	
		Minimum				4		2,683	2,420	2,340	
		Mean				12		7,084	6,391	6,178	

Table 3. Total mobile gear effort in the Irish Sea, 1998-2005, expressed in kW-days

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Other developments in the CFP since its reform in 2002 were reviewed by Lutchman et al (2009). The reform gave member states more responsibility for the management of their fleets and there are quarterly reporting obligations. Compliance with the need to report balance between fishing capacity and resource remains poor: in 2007 only half of the member states reported on time. Ireland registered "less than average" compliance in 2003 and "poor" compliance the following year. However between 2005 and 2007 Ireland's record has been "full or almost full".

4.3.3. The status of fisheries in the Northeast Atlantic and adjacent waters

Many texts and scientific treatises have been prepared on the topic of overfishing worldwide. There are many other suitable and readable accounts and, rather than provide a lengthy bibliography, I would refer the reader to two general texts: Grescoe (2008) and Roberts (2007).

For a more immediate overview of fisheries in the European EEZ reference is made to European Commission (2010) which outlines consultation on fishing opportunities in 2011, the fifth such annual appraisal which has been published to assist determining the size of Total Allowable Catches (TACs) later in the year.

4.3.2.1 Objectives of Commission policy

The desirable outcome of fisheries policy is a sustainable resource which is also managed in a stable way to provide predictable harvest.

Fish stocks within the EU are recognized to be over-exploited. It is Commission policy that depleted stocks should be rebuilt and over-fishing reduced.

Proposals are based on advice from the International Council for the Exploration of the Sea (ICES) filtered through two other committees, the Advisory Committee on Fisheries Management (ACFM) and the Scientific Technical and Economic Committee for Fisheries (STECF) to the Commission in Brussels. The precautionary approach must apply: the absence of evidence that a fishery is over-exploited must not be understood to mean it is sustainable.

4.3.2.2 Outcomes of Commission policy

Attempts are made to manage only a proportion of shared fish stocks in the northeast Atlantic under the Common Fisheries Policy. The management of inshore fish stocks is left to the discretion of national governments. In 2010, 129 stocks of relevance to the CFP were assessed: 33% were insufficiently known to enable provision of scientific advice on them, 47% had some scientific advice but only 28% were adequately assessed to enable forecasts of stock size and fishing mortality. These

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figures are close to the average of outcomes obtained in the period 2003-2010 inclusive.

Where scientific advice was provided, almost 60% of those stocks were outside safe biological limits, a mere 40% within them, that is, fished sustainably.

Of stocks for which information was available: 72% were over-fished and 28% at msy. Over-fished stocks would yield more if fishing effort on them were reduced. As an emergency measure, in 2010, advice had been issued to cease fishing on 14 stocks.

A considerable problem in the TAC/quota system of fish stock management is the fact that scientific advice is merely one input to a political process in which the industry urges its national politicians to press for higher allocations than are advised on the basis of scientific assessment. In 2010 the estimated excess of TAC tonnage over advised sustainable catch was 34%, admittedly the lowest in the period 2003-2010 where, in 2005 that statistic reached 59%.

In the words of the Commission: "While there are signs of improvement, this is only a small start. Success in recovering stocks is far from guaranteed and efforts to eliminate overfishing have to be kept up."

The result is that EU waters contribute progressively less fish to the European market, supplies are maintained largely on imports from third countries.

The objective of the Commission is to achieve msy by 2015. Progress towards sustainability has been slow. The scientific advice has not been adopted by the industry; in the words of a press release "the fleets have not been able to adapt quickly enough to the scientific advice".

4.4. Ireland's marine fishing administration

4.4.1. Administration of fisheries in Ireland

Over the past half century the intensification of fish catching has greatly intensified and change has been very rapid (Fahy, 2010[4]). Villasante and Sumaila (2010) and Villasante (2010) analyzed the development of the CFP to which they ascribed the reduction of small-scale fishing and the increase of large fleets that fish in community waters and third countries and, in the 1990s, intruded into deep waters. The drive to harvest from deep waters was short-lived. Species frequenting these are long lived, late maturing and slow to reproduce and hence very vulnerable.

Although 2015 is the target date for recuperation of stocks, that objective is unlikely to be realised. Decline of over-exploited stocks is likely to continue, others being added to the list.

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The problem is considerable and daunting. Technology creep makes fishing ever more efficient. Controls are lax and ineffective. Management is demoralised. There is a high volume of waste in discarding and in energy expended to harvest ever-scarcer target species. Subsidies assigned by governments are politically expedient but, at best, they result in short-term profits at the expense of more rational longer-term management.

Since entering the EEC in 1973 the industry in Ireland has sought to diversify into "new" (hitherto unexploited) species of fin-fish and invertebrates (markets for some species, such as anglerfish, did not exist before our entry to the EEC in 1973, Fahy, 2009[4]) "in order to take pressure off those currently exploited", a futile ambition which instead mobilises redundant capacity within the existing fleet.

A resource management policy that delivered stability between the catching sector and the resource would be a considerable relief to those involved but it really is not enough. The objective should be "sustainability", a concept that is all the more unattainable because its definition is uncertain (Standal and Utne, 2011), due to the confusion of socio-economic and biological objectives; biological sustainability should be the criterion. And while threats to the survival to a number of commercial fin-fish and invertebrate stocks intensify, the EU is attempting to move the agenda ahead, integrating fish stock management into a wider EU maritime policy while implementing a number of subsidiary policies: maritime spatial planning, the Habitats and Water Framework Directives. There is a very real danger that the conservation of living marine resources will be simply left behind, abandoned because it is inconvenient or unattainable.

It is to be expected therefore, that there is a strong and increasing emphasis within the government department responsible for fisheries and its agencies on publicising good news. These initiatives are details of a much larger picture.

4.4.2. Ireland's fin-fish fisheries

The purpose of this section is to provide a brief history of the development of marine fin-fisheries as illustrated by the landings of two species: whiting (*Merlangius merlangus*) and cod (*Gadus morhua*) (Fig 4).

Since the collection of marine catch statistics commenced in 1898, until the 1940s, the fleet was largely an artisanal one, working close inshore and consisting of sail and oar propelled craft. In the early twentieth century small numbers of steam trawlers and drifters became involved and after that vessels propelled with engines powered with mineral oils gradually claimed dominance.

In the 1930s there was a concerted attempt to motorise the fleet. It was frustrated by the advent of the Second World War. In 1952 Bord Iascaigh Mhara (BIM) was established and fleet expansion began in earnest. First efforts were directed at constructing an inshore fleet and whiting, with an inshore distribution, became the most popular whitefish species (Fahy, 2011[1]).

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In 1973 Ireland acceded to the European Economic Community. Fleet capitalisation followed. At that stage the resource was regarded as unlimited or, rather, its biological boundaries were unknown. Whitefish landings rapidly expanded. Then, in the late 1980s – 1990s, they went into reverse. Fishing capacity had become too large and the fin-fish resource went into decline. That decline shows no sign of abating. Ironically, but significantly, Ireland is currently landing less cod than in 1898 when the fleet consisted of sailing and row-boats.

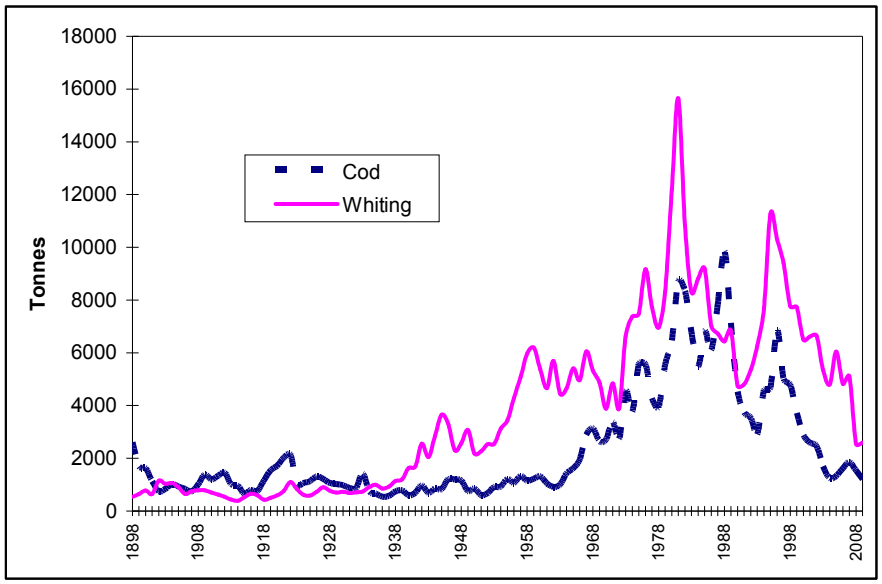

Fig 4. Landings of two species, cod and whiting from 1898 to 2008 inclusive.

The loss of fin-fish is an environmentally significant development. The reproductive capacity of some species, like cod, is considerable. Juvenile fish prey on the eggs, larvae and adults of species of invertebrates whose numbers, in the absence of fish predators, expand. Thus, fin-fish can be replaced by alternative fisheries in which prawns, crabs or molluscs, become targets.

In recent years invertebrate species that had previously been the food of fin-fish became significant fisheries in the Irish Sea: *Nephrops* in the north and whelk (*Buccinun undatum*) in the south west are two examples.

Another possible development of fin-fish removal is their replacement with large numbers of pelagic coelenterates – jellyfish (jellies). These species reproduce sexually and asexually and they are capable of rapidly colonising areas where conditions favour them. There has been much speculation about the relationships between jellies and fin-fish and it would appear that either group can feed on the other and that there may be some commensal associations between members of each. While jellies have been taking over large marine areas in recent years, the explanations may be multifactoral. Temperature, eutrophic conditions, salinity and low densities of fin-fish, particularly planktivorous species, are all implicated. A simplified account of these phenomena is contained in Fahy (2011[2]).

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Lynam et al (2011) provided evidence for rapidly expanding populations of jellies in the Irish Sea in recent years. They examined the contributions that climate change and fishing pressure might have made and concluded that jellies and haddock are currently playing a greater role in the area than previously, following the depletion of other species, notably cod. Lynam et al were very cautious about suggesting an ecosystem shift might be taking place but their findings are sufficient to prompt a precautionary attitude to what is occurring, in accordance with CFP protocols.

4.5. Composition of the Irish fishing fleet and its use of mobile gears

Fishing fleet capacity is measured using three criteria: number of vessels, their gross tonnage (GT) and their motive power (kilo Watts (kW)); 1 kW=1.34 horse-power. The latter two are proxies for fleet "capacity", an index of fishing power. GT and kW are purchased from brokers on the open market and their value probably alters with availability of perceived fishing opportunities. There is a cap on the total GT and kW available as a means of containing the total size of the fleet.

All commercial fishing vessels must be licensed and, under EU regulation, the capacity must be below a ceiling; the reference level for this was set out in European Commission Regulation 1438/2003 on 1 January 2003. The capacity of the fleet in Ireland (and, no doubt, in other member nations) is not immediately clear however because while a proportion of the total effort is controlled and reported annually by the Licensing Authority for sea fishing boats (Hayes, 2008; Anon, 2008), not all of it must be.

Fleet management in recent years has attempted to group vessels in "segments" as a means of limiting access to resources. In 2008 there were five segments:

4.5.1. The Pelagic segment

(also known as the refrigerated seawater pelagic segment (RSW): These are large pelagic boats of which 23 in 2008 fished mainly mackerel, horse mackerel and blue whiting.

4.5.2. Beam trawl segment

Contained 12 vessels which pursue this type of fishing only.

4.5.3. Polyvalent segment

This is a large segment containing vessels that operate a wide variety of gears. In theory more than 30 are possible. European registration rules require a vessel to register the principal (1) and secondary (2) gears it employs. The record is not reliable

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(Fahy, 2008[1]). Most significantly, it provides no indication of the usage of the gears listed. In 2008, the only gear breakdown of the polyvalent segment to hand was for mid-year, so it is not strictly comparable with the fleet census figures which are recorded at the opening and closing of the calendar year. The occurrence of mobile type gear 1 in mid-year is used to estimate the occurrence of these gears among the end of year figures for vessels belonging to the polyvalent segment.

Table 4 demonstrates the high potential of mobile gears within the Irish fishing fleet (61% of vessels) and their preponderant usage by bigger boats (91% of GT and 83% of kW).

Recent additions to the Polyvalent segment were 376 vessels using pots for the capture of crustaceans or molluscs (accounting for 855 GT and 2,406 kW) in 2006 (Anderson and Guillen, 2009). They were allowed to fish provided they confined their activities to this gear. These boats were not required to acquire capacity (GT or kW).

4.5.4. Specific segment

This segment contained 146 vessels fishing bivalve molluscs (mussels, scallops, razor clams). The specific segment was not restricted by EU regulations and, hence, vessels could enter it without capacity requirements of GT and kW. When such capacity became expensive in the polyvalent segment, some fishers joined this one instead. Between 1997 and 2002, the segment expanded from15 vessels, of 764 GT and 3,167 kW to 193 boats amounting to 6,952 GT and 29,285 kW. In 2008 the number of vessels had fallen back to 146.

White (2005) observed that the industry was unhappy with the growth of this segment, which it claimed the resource could not support, whereas the government department responsible for fisheries replied that the industry had been pressing for the issue of licences. Both sides are probably correct but there has to be an ultimate control in the amount of exploitation permitted on a national resource and, in this instance, there does not appear to be

4.5.5. Aquaculture segment

Vessels belonging to this segment must be used exclusively in the pursuit of "aquaculture". Their licences permit them to dredge mussel beds to collect juveniles for on-growing. In 2008 it contained 65 boats. The segment is not subject to Council Regulation No 1438/2003, hence it is not limited in size and has been expanding in recent years.

Mussel dredging exploits natural mussel reefs which are a source of diversity and provide food and shelter for marine invertebrates and food for commercial fin-fish species. The management of this segment outside the limits of fleet capacity has been justified on the grounds that juvenile mussels are harvested and on-grown and these operations are essentially different from capture fisheries. However, there is a counter-claim that removal of shellfish reefs has adverse environmental consequences for fin-fish stocks.

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In his introduction to the Whitefish decommissioning scheme, White (2005) stated: "it would make little sense if after investing State funds in a decommissioning programme, people could add capacity again and bring the industry back to square one." Although GT and kW of whitefish capture fisheries are capped, the Aquaculture segment has been able to expand and this must have resulted in additional pressure being indirectly brought to bear on fin-fish.

Segment	Mobile gears?	Number of vessels	GT of segment	kW of segment	Note
Pelagic	Yes	23	28,344	41,764	
Beam trawl	Yes	12	974	2,577	
Specific	Yes	146	3,109	14,455	
Aquaculture	Yes	65	4,675	11,796	
Polyvalent	Mixed	984	26,353	89,054	Estimated
	Totals	1,230	63,455	159,646	
Using mobile gears	Total fleet size	2,016	69,723	192,386	
	Percentage using mobile gears	**61**	**91**	**83**	
Calculation of mobile polyvalency in 2008					
Polyvalent		1,770	32,621	121,794	31-Dec-08
Polyvalent	Mixed	1,451	66,150	182,585	Mid-June 2008
Mobile gears among polyvalent	Gear 1	807	53,439	133,503	Mid-June 2008
	Gear 2	159	10,636	32,465	Mid-June 2008
Percentage using Gear 1		56	81	73	Mid-June 2008

Table 4. The composition of the Irish fishing fleet in 2008 according to Hayes (2008) and Anon (2008). The emphasis is on elucidating the proportion of effort which is expressed through mobile gears. The breakdown of the polyvalent sector is for mid-2008 from the European register of fishing vessels. The other data are reported from the end of year, 31 December 2008.

4.6. A specific case history: the use of mobile gears in the Irish Sea.

Most fishing in the Irish Sea is currently for *Nephrops*, with either single or twin rig otter trawls (ICES, 2008). The vessels have by-catches of whiting, haddock, cod and plaice. Studies show that the twin rigs yield a higher proportion of round fish by-catch in *Nephrops* fisheries than do single rig trawls.

Round fish fisheries are pursued primarily by vessels from the UK and Ireland. A semi-pelagic fishery for cod and whiting developed in the early 1980s and, as these species declined, it switched targets to haddock. Republic of Ireland, Northern Irish, English and Welsh otter trawlers target plaice, haddock, whiting and cod and they take by-catches of anglerfish, hake and sole. There is a fishery for ray in the southern Irish Sea. Some gear modifications (mesh sizes) have taken place in response to the introduction of EU technical conservation measures (TCMs).

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INTERACTIONS	Cod	Haddock	Nephrops	Plaice	Sole	Whiting	Rays	Herring	Scallops	Razors	Whelks	Large crustaceans (crab, lobster)
Cod		H	M	M	M	L	0	0	0	0	0	0
Haddock	White fish trawl, Semi pelagic trawl, Seine net		M	M	L	M	L	0	0	0	0	0
Nephrops	*Nephrops* trawl	*Nephrops* trawl		M	L	H	L	0	0	0	0	0
Plaice	Flatfish beam trawl, Nephrops trawl	*Nephrops* trawl	*Nephrops* trawl		H	L	M	0	0	0	0	0
Sole	Flatfish beam trawl, *Nephrops* trawl	Flat fish beam trawl	*Nephrops* trawl	Flat fish beam trawl		L	M	0	0	0	0	0
Whiting	Flatfish beam trawl, *Nephrops* trawl, Whitefish trawl	Whitefish trawl Semi pelagic trawl Seine net	*Nephrops* trawl	*Nephrops* trawl	Beam trawl		L	0	0	0	0	0
Rays	Ray otter and beam trawl	Ray otter and beam trawl	*Nephrops* trawl	Beam trawl	Beam trawl	Ray otter and beam trawl		0	0	0	0	0
Herring	Herring pelagic trawl	None	None	None	None	None	None		0	0	0	0
Scallops	Scallop dredge	Scallop dredge	None	None	None	None	None	None		0	0	L
Razors	Hydraulic dredge	None	None	None	None	None	None	None	None		0	0
Whelks	Pots	None	None	None	None	None	None	None	None	None		0
Large crustaceans (crab, lobster)	Pots	None	None	None	None	None	None	None	Hydraulic dredge	None	None	

Fig 5. Interactions of principal gears in the Irish Sea (division VIIa), adapted from Table 5.2.3.2. of ICES (2008).
The Table demonstrates the consequences for cod and other species of the principal fishing gears in use in the Irish Sea. Species are listed on the left hand margin and again across the top of the diagram (grey boxes). The black boxes forming a diagonal line, indicate the interaction of a species with itself. Gears are identified in groups in the space to the left of the diagonal, each box indicating the principal combinations taking a species listed along the top margin and one on the left. To the right of the diagonal each box indicates the degree of interaction between species and gears marked as H, high; M, moderate; L, low and 0, none or negligible. Mobile gears are coloured yellow.

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There is a beam trawl fishery in the eastern Irish Sea, conducted by vessels from Belgium, Ireland and the UK. It targets mainly flat fish: sole with important by-catches of plaice, ray, brill, turbot, anglerfish and cod. This fishery peaked in the 1980s, coinciding with a number of strong year classes, and is currently in decline.

There is a greatly diminished pelagic fishery for herring.

4.6.1. Cod recovery programmes in the Irish Sea

In the previous section the landings of two fin fish species over more than a century were set out to illustrate the course of development of the industry. Fig 4 is for landings to all ports combined. Now it is appropriate to examine attempts to arrest the decline of one of those species, cod, simply because it has been the focus of so much management effort. A particular instance is examined: the progress of cod recovery programmes in the Irish Sea. At the outset it should be noted that this fish stock is not unique. The European Commission (2010) stated:

Against this background (outlined under the status of fisheries in the North East Atlantic) the Commission is still very concerned about the conservation of cod, for which a recovery plan has been in force since 2004. Cod stocks in the Kattegat, the Irish Sea and the west of Scotland are showing no signs of recovery….

The cod stock of the Irish Sea (statistical division VIIa) had been declining for almost twenty years before fire brigade intervention to halt its slide. In 1982 the spawning stock biomass (SSB) was estimated at 20,000 t and four years later recruitment was at the highest level in the period 1968-2000. Both indicators declined, along with the landings in the years that followed.

In November 1999 the Irish Sea cod stock was reckoned to be in imminent danger of collapse. The first remedy was a closure of fisheries in the Irish Sea for the spring spawning period. However, various exceptions and derogations were sought by the industry and granted. Fisheries targeting other species would be allowed to continue their operations. This pattern of less than whole hearted co-operation with recovery plans by the industry has continued since.

Fig 5 sets out a number of gears in use in the Irish Sea and the species they fish and describes their interaction with other species which are not targeted when these gears are used. Cod are susceptible to some extent, to all mobile gears.

Successive reports on this stock rebuilding programme revealed problems. In 2003 scientists had difficulties accessing samples. There was considerable mis-reporting and undeclared landings: the industry simply did not co-operate. In 2004 another recovery plan was introduced aiming to rebuild the stock against a background of low SSB and very low recruitments. However, the data on the stock were of such poor quality that there was uncertainty about any prognosis based on them. Both ICES and the Marine Institute (MI) favoured a zero catch of cod until some evidence of stock rebuilding had been observed. There should be no derogations in areas designated for recovery.

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Similar uncertainties and conclusions were registered the following year; effort reductions were proposed. Gradually the MI advice hardened to stating in 2007 that only fisheries which could prove a zero by-catch of cod should be allowed operate in the Irish Sea.

Throughout the attempts to rescue this declining fishery, the industry has been less than enthusiastic about implementing or observing recovery regulations. A standard response is that as long as any fish species is catchable, it will be pursued. In 2008, the MI considered the Irish Sea cod stock had collapsed. Further decline was expected and weak recruitments from the depleted SSB of previous years would provide little hope for the future. A prolonged period of rebuilding was envisaged.

It is this writer's belief that cod landings currently reported from the Irish Sea (division VIIa) may in fact originate in the neighbouring Celtic Sea division (VIIg), which has a more robust but nonetheless also declining cod stock. The line of latitude that divides them runs through Dunmore East, the major cod landings port for the Irish Sea at the present time. Cod landings to Howth, the centremost post in division VIIa, are negligible.

The background documents for this greatly simplified account of the Irish Sea cod fishery are found in the Stock Book published annually by the Marine Institute, for the years 1999-2010 inclusive. A less technical account of the cod collapse and attempts to engineer its recovery in the Irish Sea are contained in Fahy (2009[2]).

4.6.2. The Irish Sea - an isolated case?

The Irish Sea cod recovery programme has, to date, been a failure and the longer its fin-fish stocks remain in a depleted state, the longer the time-scale for recovery will be. But the Irish Sea is not alone. The Stock Book (2010) foresaw the necessity for a long term management plan for the adjacent Celtic Sea whose cod stock has also been declining.

To an outsider or any uninvolved objective thinker, the progressive economic elimination of one fish stock after another is senseless. For those involved in making a living within the industry the perspective is different. The fleet is too large and too powerful for the available fish stocks. Modern boats and equipment are expensive and it is becoming impossible to remain solvent in prevailing circumstances. A socio-economic study (Bratton and Hinz, 2002) has demonstrated that stressed fishing communities are less likely to rate conservation measures highly; instead, day to day survival becomes their *raison d'être*. This is probably a generalised human response to a deepening crisis. The last people who can give a rational response under stress are those directly involved. A commentary on Bratton and Hinz, (2002) was provided by Fahy (2008[2]).

4.7. Management of marine fisheries in the Republic

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4.7.1. Enforcement of regulations

The government department administering fisheries is a very troubled one to manage, and, no doubt the task is a thankless one. Overshadowing the local, national and international competition for declining resources with all the associated political pressures, EU policy has contributed to a grossly over-capitalised fleet to which national and individual ambitions have added.

It is hardly surprising in these circumstances, that official departmental policy is directed at crisis management, assuaging political demand, defusing problems piecemeal but without any coherent overall strategy. The most celebrated fisheries plan to have emerged in recent years is the report *Steering a new course* (Cawley, 2006) but that merely describes how to get best value out of prevailing market arrangements and proposes no fundamental change in resource management. The status of the quota species "resource" is annually reviewed in the Stock Books of the Marine Institute. Their recommendations are clearly stated and sensible but they are usually less than fully effective as subsequent volumes in the series reveal. When non-quota species are occasionally scientifically assessed and recommendations are made for legislative change or greater enforcement of regulations they are invariably ignored.

The CFP formulates the rules for fishing over the entire EEZ but its regulations cover only certain shared species whose capture is regulated by TAC/quota, by effort controls (kW/days) and by TCMs. In national waters, host nations formulate their own rules for the capture of species of interest to the indigenous industry not covered by EU regulations. The legislation in question is often in the form of bye-laws drafted within the framework of statute law. Over the past twenty years, there has been decreasing evidence of any desire by government in the Republic to do so (see for example Fahy, 2008[1]). Prosecuting fisheries offences is politically unwelcome and electorally problematic.

Management of marine fin-fish species is currently conducted under the Sea-Fisheries and Maritime Jurisdiction Act (2006). The legislation was required by the EU in order to up-date enforcement measures for the conservation of shared fish stocks (i.e. whose exploitation is regulated by TAC and quota measures) and there was a possibility that Ireland would have been penalised had the Act not been introduced. The Bill was sent to the Dail in 2005 and provoked immediate resistance from the political establishment and the fishing community. A government (Fianna Fail) junior fisheries minister was transferred to another department when he refused to support the legislation and fishers congregated in the ports of Dublin, Cork, Waterford and Galway in protest against it. Accounts of these events are contained in the Irish Skipper journal (December 2005 and February 2006) and the Marine Times (February and March 2006). (Coverage is unsigned and extensive and it is not appropriate to provide more detailed reference). The senior government (Fianna Fail) minister, Noel Dempsey, stressed the urgency of approving the legislation in order to avoid fines from Brussels (Wall and Hennessy, 2006).

Under the 2006 Act, the sea fisheries protection officers who had been part of the staff of the government department responsible for fisheries, were transferred to the newly established Sea Fisheries Protection Authority (SFPA), which took over the

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Enforcement actions		Nationality of offenders	2007	2008
Inspections by SFPA and naval service		Non-Irish	1,351	
Enforcement actions			42	57
	Detention orders		18	12
	Warning letter to master		23	45
	File to AG's office		1	
Total fines (€)		Mainly French	387,950	54,000
Inspections by SFPA and naval service		Irish	2,270	
Enforcement actions			99	126
	Detention orders		24	33
	Warning letter to master		53	58
	File to AG's office		22	35
Total fines (€)			49,000	17,300
Inspections by SFPA and naval service		All nationalities	3,621	
Enforcement actions			141	183
	Detention orders		42	45
	Warning letter to master		76	103
	File to AG's office		23	35
Total fines (€)			436,950	71,300

Table 5. Summary of enforcement actions by the SFPA in 2007 and 2008

department's responsibilities for enforcement. The Authority has issued two annual reports, for 2007 and 2008.

The types of offence in which the SFPA has shown an interest are listed on Page 23 of its Report for 2007. All appear to be associated with the enforcement of the Common Fisheries Policy; there is no indication of an attempt to impose national regulations that were enacted to conserve stocks within the exclusive 6 n m limit.

Table 5 summarises enforcement activities by the SFPA in 2007 and 2008. Court convictions obtained were, respectively, sixteen and eight. Given the sensitivities associated with enforcement, the SFPA has provided details of the nationalities of those pursued, probably to defuse a persistent resentment within the industry at the perception that Irish fishers are pursued to a greater extent than other EU nationals. The number of court convictions obtained by Irish nationals in 2007 and 2008 were, respectively, four and five. More extensive details of the actual offences were not published. However, even if these convictions had been obtained for offences committed within the territorial sea, the rate of offending would have been very low; in fact, the likelihood is that none of them was.

National interest in enforcing fisheries management and conservation regulations is negligible. Fahy (2008[1]) examined a particular instance. Another example of legislation that was known to be defective but was left unchanged and, officially, relied upon for forty years is contained in Fahy (2008[4]). A further deficiency is the practice of signing up to international conservation treaties and then failing to transpose them into national legislation (Fahy, 2010[3]). The existence of protective legislation in the three instances cited here, provides an illusion of legal enforcement which, on closer scrutiny, turns out to be non-existent.

Without enforcement, there is no management, and without management a fishery is, effectively, in open and unregulated access, a major contribution to the declining health of fish and invertebrate stocks in the Irish territorial sea.

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4.7.2. The search for good news

It used to be, and probably still is, said that the ministry for fisheries is not a popular one because it is problematic and does not have much to celebrate. Modern methods of communication seek to address this deficiency and put a positive spin on developments.

4.7.2.1 BIM and the distribution of subsidies

The highly subsidised nature of the Irish fishing industry has been alluded to. Subsidies within group *A* are, in theory, contributed by the SFPA and MI while subsidies in groups *B* and *C* have been mainly the responsibility of BIM. The latter, in the course of an almost 60 year history, has been responsible for a variety of programmes ranging from boat building to dispensing fishing equipment *gratis* to local communities in order to initiate fishing for "underexploited" species. BIM is also responsible for marketing and for educational programmes. It often provides the secretariat for EU, Regional Advisory Council (RAC) and enquiries into the operation of, for example the CFP. BIM acts as agent for the government department responsible for fisheries in the administration of boat registration and compensation schemes. In 2003, BIM received, to dispense, €27,827,025 in grants from the Oireachtas and €98,923 from the EU (BIM, 2003), 13% of the value of the landings (€213,161,213).

4.7.2.2 Good headlines in green issues; higher first sale prices too.

The authorities (the government department responsible for fisheries and its agencies) are aware of the fragile biological nature of the resource whose management has been entrusted to them and sensitive of the need to acknowledge public concerns. The approach is piecemeal and inconsistent as the following examples will illustrate.

This is taken from the BIM web site:

> Today, not only must the Seafood Industry conduct its business in an environmentally responsible manner, it must also proactively demonstrate its environmental credentials if it is to continue to maintain access to key markets. In this respect, BIM's range of certified Eco-labels along with the development of operator-based Environmental Management Systems (EMS) have become increasingly important services to the sector.

Various initiatives are promoted by BIM for the control of animal and packaging wastes in aquaculture and fishing gear in capture fisheries. These are desirable but they amount merely to tokenism without a more fundamental recognition of the vulnerability of the biological resource.

On the question of fisheries management, the term "sustainability" is frequently used. The following statement is also abstracted from the BIM web site (11 March 2011).

> The objective of managing a fishery is to ensure that the level of fishing activity is sustainable and that the benefits of the resource are allocated according to prevailing policy that defines how society is to benefit from it.

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Fish stocks are renewable resources with limited levels of production. They can only therefore replace or produce a given biomass each year through reproduction and growth. Fisheries that have no management system typically overexploit fish stocks to the point that their capacity to produce biomass becomes limited.

In spite of this apparent sincerity, BIM provided the secretariat for the committee that prepared the excessively optimistic proposals for the renewal of the whitefish fleet in 1999. That programme expanded fishing effort to a level at which, five years into the scheme, urgent action in the form of a decommissioning scheme was required to withdraw capacity (Fahy, 2009[3]).

The BIM excerpt (above) was written about the lobster trap fishery. Similar gear is also used for the capture of brown crab, which was identified as Ireland's third most valuable species (Anderson and Guillan (2009) recorded its value as 10% of landings), a fishery with whose intensification and collapse BIM has been closely associated.

In 1990 a vivier (a tank boat with facilities to store live crab on board) fleet operating traps targeted brown crab off the north west coast of Ireland. The crab stock was large, accounting for in some years 75% of national brown crab landings. The traditional fishery had been conducted close inshore and it depended on the annual migration of female brown crab into the shallow water to moult and mate; male brown crab do not undertake lengthy migrations. The vivier boats were able to follow the migrating female crab to the shelf edge and fish them all the year round. The fleet numbered four or five vessels and they maintained very detailed logs of their activities which were transmitted to scientific staff via BIM.

From the inception of the vivier fishery, the landings of brown crab to both inshore and offshore fisheries declined. Such a decline is most readily interpreted as a fall in abundance or depletion of stock. The signs were ignored and the fishing industry, through BIM, sought to increase its fishing effort, which, outside 12 n m, was covered by a kW-days restriction on boats greater than 15 m oal. A case for increasing effort was presented to STECF which was asked to support increased offshore fishing effort. STECF, on seeing the landings records, recommended a withdrawal of capacity from the fishery. That too was ignored and effort continued to increase, the traditional inshore fleet being converted to faster, more seaworthy craft < 15 m oal, so as to evade the kW-days restrictions to exploit the declining resource further from shore in competition with the vivier fleet. An assessment of the inshore element of this fishery was prepared by Meredith and Fahy (2005). Much besides has been written about it. In September 2010 it was officially admitted that the stock had declined to a level at which it ceased to provide economic returns. A less technical account of the case has been provided by Fahy (2010[2]).

Public concern about over-fishing and consequent environmental damage has given rise to a number of "ethical" brands of seafood, harvested under sustainable conditions. The best known of these is the Marine Stewardship Council (MSC) whose work was reviewed by Fahy (2010[5]). The MSC imposes onerous standards and operates its scheme by permitting its logo to be attached to appropriate produce in return for payment. MSC fisheries are independently audited and, while the scheme is not without criticism, its standards are not easily attained. That has prompted the

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creation of a number of less exacting standards. In 2010 a "green certification" proposal was proposed by BIM for vessels which harvest sustainably (Siggins, 2010).

4.7.2.3 Inconsistent reporting of the industry

In addition to the problems posed for the resource by the increasing efficiency of the fleet, there has been, in Ireland, a tendency to increase the fleet size by expanding elements that have not been capped under MAGP. This may be a widespread tendency everywhere (Petter Johnsen, 2005). One consequence is the problem it presents for the evaluation of environmental impact by the Irish fleet, whose statistical characteristics are not comprehensively recorded or consistently reported. This might, in effect, explain some of the inconsistencies in the data included in annual census. Examining the change in key indicators of the industry in Ireland between 2004 and 2007, Anderson and Guillen (2009) reported income to the fleet had declined from €273 m to €177 m, GVA had fallen from €119 m to €84 m and profit had increased from -€3 m to €28.2 m. A decommissioning scheme in 2005 removed 4,901 GT of the vessel categories from the fleet and another, due for completion in 2009, would take out 6,885 GT, together amounting to 45% of whitefish capacity. Strangely then, while employment had remained fairly stable between 2004 and 2007, the fishing effort had increased from 158,000 to 179,000 kW days, a rise of 13%. The authors explained this by the addition of the 376 pot fishing vessels, which had officially joined the fleet in 2006. However, before these vessels had been granted licences, *gratis*, in fulfilment of an amnesty; they had already been fishing without authorisation. Allocating their owners free GT and kW had been a political mechanism for legalising their status without incurring local wrath by requiring them to either purchase licences or stop fishing (Siggins, 2003). Legalising vessels in this way caused considerable resentment within the industry and created two tiers of fishers, one of whom had purchased GT and kW, the other which had not, both relying on the same target species. The decision-making process involved in creating the polyvalent pot (P) licence was criticised by Fahy (2010[1]) among others.

4.8. The principles of cross compliance.

Cross compliance is a technical term for common sense, joined-up thinking in environmental/resource management. As a formal process it has not had the greatest success but its principles are sensible.

The European Court of Auditors recognized the importance of the principle in awarding assistance payments under Common Agriculture Policy (CAP) to observance of certain rules on environment, health and animal welfare in 2000 (European Court of Auditors, 2000). Prior to the introduction of the scheme, Council Regulation EC 1782/2003 established common rules for direct support schemes under the CAP and Commission Regulation EC 796/2004 set out detailed rules for the implementation of the cross compliance policy.

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Cross compliance had been introduced as part of the Common Agricultural Policy (CAP) in 2005. Three years later another report by the European Court of Auditors (2008) queried whether the scheme was effective.

The Court concluded on that occasion that the objectives of cross compliance were not sufficiently well defined and that its purpose was unclear. The legal framework was too complex. The scheme was not well designed. Member states did not take their responsibilities to implement effective controls and sanctions. Data provided by member states on checks and infringements were not reliable and the Commission's performance monitoring was less than satisfactory.

The Court of Auditors went on to make a series of recommendations to tighten up the operation of cross compliance at Commission and Member State level. The Court of Auditors also confirmed the importance of a system of cross compliance as a vital element of the CAP.

4.8.1. Cross compliance in fisheries management

There are many inconsistencies in the way the Republic's fisheries administration operates. Here, one is described in order to make the point, on information provided earlier in this submission.

Though not explicitly invoked, cross compliance has obvious relevance to fisheries management because the industry is dependent on the viability and productivity of a renewable natural resource. Occasional references are made to a common-sense approach to particular issues in the course of charting initiatives but there is no overall coherence in policy formulation.

An example of this is the decommissioning scheme formulated in 2005 (White, 2005). Fleet size had been capped according to regulation (European Commission (EC) 1438/2003) at reference levels as of 1 January 2003 at 86,981 GT and 230,226 kW. This fleet size proved too large and a decommissioning scheme was introduced in 2005. The adjusted fleet ceiling on 31 December 2008 was 78,240 GT and 213,028 kW (Anon, 2008). In the course of introducing the decommissioning scheme, White (2005) argued:

....it would make little sense if after investing State funds in a decommissioning programme, people could add capacity and bring the industry back to square one.

A decommissioning scheme removes specific vessels from the fleet but it does not prevent their owners from buying available capacity on the open market and reinvesting in other boats. And while those boats may not be permitted to re-enter a particular segment of the fleet, they may be accommodated in an uncapped one. Thus we have seen aquaculture and specific bivalve segments enlarge without any defined ceiling. The justification for this is that the vessels contained within the uncapped segments exploit separated marine biota but that line of reasoning ignores the inter-connected nature of the elements making up marine ecosystems.

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4.9. A Review of opinion on revising current taxation policy for marine diesel

There is currently much support for a revision of subsidies to commercial marine fisheries simply because stocks worldwide are under heavy fishing pressure. However, momentum for real change is still not adequate. Here some of the opinion is reviewed.

4.9.1. Organization for Economic Co-operation and Development (OECD)

McDonald (2010) reported that a document published by OECD estimated that cutting half a trillion US dollars in subsidies for fossil fuels could cut greenhouse gas emissions by up to 10% of the levels they would otherwise reach by 2050 under a "business as usual" scenario. The fuels they referred to were coal, oil and gas, amounting to €466 b worldwide. Tax exemption for diesel oil used in agriculture and fisheries was estimated at €6.7 b for farmers and €962 m for the fishing industry annually. The G20 group meeting in Pittsburgh in September 2009 agreed to "rationalise and phase out over the medium term inefficient fossil fuel subsidies that encourage wasteful consumption."

4.9.2. Doha round of World Trade Organization (WTO) talks

WTO talks have usually been about eliminating irregularities in competition but the Doha round has taken a more robust attitude on the sustainability of the fisheries resource. A number of Agencies like the Food and Agriculture Organization of the United Nations (FAO) and the United Nations Environmental Programme (UNEP) have contributed. The objectives of the Johannesburg Summit on Sustainable Development (2002) have also been influential.

The Doha round of negotiations commenced in 2001. It is anticipated that it will come to an end 2011 (see for example BBC News, 2011) although there are no guarantees of that. The Doha round has taken a particular interest in the management of fisheries worldwide. For background to this see Fahy (2009[1]). A proposal in formulation is to ban B type subsidies in the interests of conserving fish stocks.

Khan et al (2006) identified two approaches to the resolution of the problem in the Doha round:

A "top down" approach by a group of nations 'Friends of Fish', recommends a ban on all subsidies excepting some for developing countries under a "special and differential" provision. Friends of Fish include New Zealand, Iceland, Australia, Pakistan, India, Chile and Brazil. The advantages of this approach include greater transparency but there are complications in its implementation.

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The "bottom-up" alternative is led by Japan, Korea, Taiwan and the EU. It advocates addressing over-capacity by cutting back on modernisation schemes, vessel construction and export of capacity elsewhere.

4.9.3. Seas at Risk, NGO

This NGO was set up as a Foundation (Stichting) under Netherlands law and became an association (VZW) under Belgian law on 1 January 2007. Its funding comes from private foundations (the Waterloo Foundation; the Oak Foundation, the Pew charitable trusts), national agencies (Dutch Ministry of Housing, Spatial Planning and Environment (VROM) and the Swedish Environment Protection Agency and from the European Commission (DG Environment). It operates as a forum for political and technical input and it functions at national and international levels. Marine energy policy is a major preoccupation for the group. Its policy is outlined in Seas at Risk (2007).

4.9.4. Environmental Action Programme of the European Commission

The mid-term review of the Sixth Community Environment Action Programme (European Commission, 2007) pointed out that Brussels has initiated some 80% of national environmental legislation within the Union. The document stated that the EU is committed to removing environmentally damaging subsidies. It stressed the desirability of working closely with international fora in the pursuit of joint objectives and specifically identified the World Trade Organisation and the Convention on Biological Diversity. Bottom-trawling is recognised as highly destructive. posing significant risks to marine diversity and the desirability of eliminating undesirable fishing practices is recognised.

4.9.5. Stakeholder opinion

Fisheries managers regard the involvement of stakeholders in the formulation of policy as a significant and necessary consultation. In the course of canvassing opinion for the latest reform of the Common Fisheries Policy which is due to take place in 2012 the process provoked 16 responses from interested persons and groups to the publication of a Green Paper by the Commission. These, together with some other policy documents, were consulted in the preparation of a submission that became Ireland's response to the Green Paper (DAFF, 2011).

One of the submissions to DAFF (2011) was prepared under the auspices of the Institute of International and European Affairs (Kehoe, 2009). Some of its recommendations, for example, on extending the territorial sea, appear to have been influential. Section C5 of Kehoe's submission deals with carbon emissions and the

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reduction of fossil fuel consumption from fishing operations. It contains the statement:

The current rebate of excise duty on marine diesel in almost all member states encourages fuel-intensive fishing patterns (to distant waters) and a level of usage which is considerably beyond what it would otherwise be….

The implication appeared to be that more remote quota entitlements might be abandoned to states which had more ready access and the following section C6 went on to recommend the decommissioning of vessels which are required to make long journeys to access resources.

Kehoe's submission was prepared in consultation with the fishing industry, particularly the Federation of Irish Fishermen, the umbrella group embracing the four Producer Organizations in the Republic, who are clearly aware of the problems caused by carbon emissions and of the possibilities of using fuel subsidies as a management tool.

4.9.6. Greenhouse gas emissions and the ambivalent research response

Fossil fuels became the principal energy input in the majority of the world's fisheries in the course of the twentieth century. Tyedmers et al (2005) calculated that fisheries in 2000 accounted for 1.2% of global oil consumption.

Sean Connick, Minister of State at the Department of Agriculture Fisheries and Food, reviewed the debate on greenhouse gas emissions on 22 April 2010 in the context of the Carbon Tax whose introduction was an element of the Programme for Government (Connick, 2010).

Heads of States and Governments of the European Union committed to reduce its total greenhouse gas emissions to 20% below 1990 levels by 2020. An EU burden-sharing agreement had been drawn up whereby each member state would adopt an emissions reduction target appropriate to its GDP and capacity to contribute towards this reduction. Accordingly, Ireland is required to reduce national emissions levels at 2005 by 20% before 2020.

Each litre of gas oil "whether used in a tractor or a diesel engine car" generates between 2.7 and 3.2 kg of carbon dioxide. In 2007 greenhouse gas emissions associated with the combustion of diesel oil, in the agriculture sector, were in excess of 800,000 t of CO_2 equivalent. Convery (2009) argued in favour of carbon taxes (among others who are environmentally sympathetic) as a means of encouraging appropriate behaviour.

The fisheries research response to rising fuel costs and the need to reduce greenhouse emissions has been twofold. One is to remove fishing capacity and thus directly lower the release of gases. The other is the development of alternative fishing strategies involving lower fuel costs/carbon emissions. Examples are Ziegler and Hanssonb (2003), Thrane (2004) and Schau et al (2009). Research for this purpose is often

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sponsored by national and EU governments. Such sponsorship qualifies as a bad subsidy because it intensifies fishing pressure on the resource.

4.9.7. EU policy on subsidies to fishing

Among the ambitions of the CFP is the review of fisheries subsidies, many of them discontinued in 2005 (Lindebo, 2005) in order to reduce over-fishing. Accordingly, the failure to confront the low price of fuel, which is obviously central to the achievement of many items of Commission policy, is curious. It is appropriate to raise the matter at this time because another revision of the CFP is in progress. It may be that under the terms of European Council Directive (2003) the imposition of a lower rate of taxation is not regarded in the same light as cutting an existing tax rate. Lutchman et al (2009) observed that although every EU state allows fuel subsidies to the fishing industry, none regards them as such. They go on to state:

..In effect every single European country exempts or refunds duty and value added tax (VAT) on fuel used by fishing vessels. Even though most member states do not register this as a subsidy, fuel subsidies to the fisheries sector are explicitly recognized at European level by the Block Exemption Regulation.

The Block Exemption Regulation is set out in European Commission Regulation (2008[1&2]); see also TheFishSite Latest News (2008).

It is difficult to be categorical about the sum lost to revenue because of variation in prices across the EU but an average of 15% has been estimated. Lutchman et al (2009) noted that fiscal arrangements for fuel would be reviewed in 2010 but they anticipated that those currently in force would be renewed.

Among their recommendations towards a further reform of the CFP in 2012 Lutchman et al (2009) identified:

(Weeding out) the remaining subsidies still clearly linked to maintaining fishing effort and capacity increase, including those currently disguised as incentives towards more fuel-efficient engines, which can only defeat other efforts to reduce fishing mortality.

Accordingly, it is disappointing to learn that the European Commission put forward a proposal to renew the Energy Tax Directive which maintains the harmful exemption on tax for fuel used by the fishing sector (Seas at Risk, 2011).

4.10. Recommendation: a mechanism to encourage compliance with regulations in fish recovery areas by substituting fuel subsidies on marine diesel with higher taxes.

It has been said that hard cases make bad law but the desperate plight of our most acutely affected fish stocks requires immediate remedial action. Taking the example of the cod stock in the Irish Sea, scientific opinion has made it clear that the use of any unselective gear will further reduce its prospects of recovery. Vessels > 15 m oal

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are currently obliged to use the electronic Vessel Monitoring System (VMS), so their positions are known and recorded at all times. This monitoring system is expected to be obligatory for all boats in the size category 12 m oal. Larger vessels that tow mobile gears are likely to inflict greatest damage on the fish stocks of greatest concern and for which recovery plans have been designed.

Fishing boats would be registered (licensed) to permit their taking advantage of marked diesel. The proposed mechanism suggests that this benefit would be allowed only where vessels complied with recovery plans and desisted from using towed and/or certain other gears in sensitive locations.

Based on the estimate of 193,000 t of marked diesel being consumed in 2002 by commercial fishing (Lei, 2006), raising excise duty to the rate applied to DERV would net the exchequer a further €62 m; applying the higher rate of VAT which is appropriate to DERV (which would be reclaimable by larger operators), would increase exchequer income by up to €82 m, assuming a base, pre-duty price of diesel of €0.5 per litre.

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GLOSSARY OF TERMS, ABBREVIATIONS AND ACRONYMS

ACFM	Advisory Committee on Fisheries Management scrutinises the outcome of assessments undertaken by ICES
Active gears	see Mobile gears
Aquaculture segment	A fleet segment containing mussel dredging boats
b	billion
Base lines	Straight lines drawn across bays to simplify the shape of the coastline
Beam trawling	A type of mobile gear fishing involving a heavy trawl net
BIM	Bord Iascaigh Mhara
Buccinum undatum	Latin name for a marine gastropod snail
CAP	Common Agriculture Policy
Capacity	A term used to describe the catching power of the fishing fleet
Celtic Sea	The Sea abutting on the south coast of Ireland; statistical area VIIg
CFP	Common Fisheries Policy
Cross compliance	A protocol to ensure compatible policy formulation
Decommission	The removal of vessels (excess capacity) from the fleet. Funder by national and EU governments
Demersal	Refers to fish which frequent the lower water column, close to the bottom and which are harvested in bottom trawl
DERV	Diesel fuel used in diesel engined road vehicles; subject to a higher rate of excise duty and VAT
Dredging	A type of fishing using an enclosing gear drawn behind a fishing vessel
Dublin bay prawns	also known as *Nephrops* or Norwegian lobster
Ecosystem shift	A fundamental change in the biology of an area
EEZ	Exclusive economic zone, the sea area enclosed within 200 n m from the base lines of the European coastline
Enclosing gear	A net or dredge which encloses catches and which may be drawn or towed behind a vessel
EU	European Union
FAO	Food and Agriculture Organization, an agency of the United Nations
Federation of Irish Fishermen	An umbrella group embracing the four producer organizations in the Irish Republic
Green diesel	Diesel fuel which is used in fishing (and other productive pursuits) which carries lower rates of excise duty and VAT
GT	Gross tonnage
GVA	Gross value added
Hydraulic dredging	Fishing with a dredge designed to penetrate the substratum loosened by air pumped under pressure.
ICES	International Council for the Exploration of the Sea
Johannesburg Summit	An international conference at which desirable biological objectives were set in 2002.
kW	kilo Watt, a measure of power
m	million
MAGP	Multi annual guidance programme. A protocol to bring the size (capacity) of the EU fleet into balance with the resc
Marked diesel	See green diesel
MI	Marine Institute
Mobile gears	Fishing gears which are towed or drawn behind a vessel
MSY	Maximum Sustainable Yield: the greatest harvest which can be drawn from a stock on a perpetual basis
n m	nautical mile
Nephrops	Dublin bay prawn
NGO	Non governmental organization
Norwegian lobster	Dublin bay prawn
oal	over all length (referring to boats)
OECD	Organization of Economic co-operation and Development
Passive gears	Gears which operate in a static way: examples are gill nets or lobster pots
Pelagic	Mid-water
Polyvalent	A collection of different gear types
Precautionary principle	Dictates that one cannot assume that lack of knowledge on a species or stock automatically means it is not being c
Producer organizations	Private management organizations, approved by the Commission and entrusted with some administration of the C
quota	A national share of TAC
RAC	Regional advisory council, a committee of fishers and scientists to oversee resource manangement
Recovery area	A sea area designated for the recovery of a depleted species; supposedly managed under a special regime
Recruitment	The entry of young fish to a fishery; they may be large enough to be retained in a particular mesh size.
Red diesel	See green diesel
RSW	Refrigerated sea water vessels: large pelagic trawlers
SFPA	Sea Fisheries Protection Authority, An agency entrusted with the enforcement of fisheries regulations
share	the method of payment of a fisher, in effect, a percentage of the price obtained for the landings
Snow crab	*Chionoecetes opili,* occurs in Canadian waters
Specific segment	A fleet segment for various shellfishers - using dredges
SSB	Spawning stock biomass. Literally, the weight of a fish stock which spawns.
Statistical division	An area defined by co-ordinates of latitute and longitude. The two of interest here are VIIa, the Irish Sea and VIIg
STECF	Scientific, Technical and Economic Committee for Fisheries: a committee situtated between ACFM and the Comr
Stock	A combination of a species and a statistcial area
Sustainability	Capable to maintaining itself, refers to a biological resource (unfortunately the term could be interpreted in other w
t	tonne
TAC	Total allowable catch: the quantity of a fish stock which it is permitted by a management authority to remove.
TCM	Technical conservation measure. An adjustment to gear (such as a minimum mesh size) which is a requirement t
Technological progress	The development of technical improvements in fishing technique - examples are hull design, satellite navigation et
Technology creep	see technological progress
Technology improvement	see technological progress
Territorial sea	The sea area within 12 n m of the baselines
UNEP	United Nations Environmental Programme
Vivier	A vessel design which includes a large tank containing sea water in which fauna are kept alive
Whelk	see *Buccinum undatum*
Whitefish	Demersal species like cod, hake and plaice
WTO	World Trade Organization