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The ups and downs of working with industry to collect fishery-dependent data; the Irish experience

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Working with the fishing industry to collect fishery-dependent data for scientific and advisory purposes is essential in most countries. Despite the many advantages of working with fishers to collect data, it is not without challenges. The objectives and ups and downs of sixteen recent projects are described and three case studies are discussed in more detail. We identify some common themes that characterize both successful and unsuccessful experiences. One critical aspect is the sometimes unrealistic time horizons and expectations that industry have when engaging with scientific data collection. Detailed communication of objectives, procedures, results, and relevance not only to industry representatives but also to vessel owners and crew is required throughout a project life-cycle. For some programmes there is a clear need to include incentives in the design, for others this is less critical. We discuss the critical need for ongoing quality control and assurance, validation of data, and appropriate programme design. We discuss the linkage between successful management systems and participatory research, and comment on how the expected

reforms of the EU Common Fisheries Policy will place new demands on joint research.

Keywords: stakeholders, participatory research, data collection, industry science partnerships, discards, self-sampling.

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Introduction

Working with the fishing industry to collect fishery-dependent data for scientific and advisory purposes is essential in Ireland as it is in most other countries. Effective engagement between scientists and fishers is a key ingredient in successful fishery-management systems worldwide, and an integral part of the evolving policies for European fisheries (Mackinson et al.2011; Hilborn et al., 2005; Motos and Wilson, 2009). In Ireland there is a long history of scientific investigations mainly, using commercial fishing vessels, on Irish herring and mackerel stocks dating back to the beginning of the 1900s and even earlier (Molloy, 2004; Molloy, 2006). Most of the early fishery research focused on developing productivity and elucidating the basic biology of species. In more recent times the research has focused on stock assessments and gear technology. The two State agencies, the Marine Institute (MI) and the Bord Iascaigh Mhara (BIM, the Irish Sea Fisheries Board) have carried out much of the applied fishery research in Ireland, although various university-led projects have also occurred. Most of the research costs of have been borne by the State and the European Commission (EC), through various funding initiatives. Consequently, the majority of contemporary research has focused on servicing the needs of the management system, mainly that of the EU Common Fisheries Policy (CFP).

In 2010, the Irish fishing fleet consists of slightly more than 2000 vessels (http://ec.europa.eu/fisheries/fleet/index.cfm). Most of the fleet (>70%) are inshore vessels (<10 m long) engaged in small-scale coastal shellfish fisheries. Here we focus on the larger vessels (>10 m) that catch shared demersal and pelagic stocks around Ireland, mainly in ICES Divisions VI and VII (Marine Institute, 2010). These vessels

operate in approx. 50 defined metiers using a wide range of gears: otter trawls, pelagic trawls, gill nets, trammel nets, and long lines. They target different areas and species assemblages.

Three common forms of co-operative research have been defined by Johnson and van Densen (2007): fishery-dependent data collection, industry-based surveys, and gear-selectivity studies. In Ireland there are also examples of co-operative projects to inform and develop management plans, to develop research surveys, and to provide a research-oversight function. Here we focus on some specific case studies in more detail, and identify common themes that characterize both successful and unsuccessful experiences.

Overview of Irish industry-science projects over the last decade.

Funding considerations are critical for any work on fishery-dependent information (FDI), however, there is no on-going funding mechanism for industry-science projects in Ireland. In contrast, the UK government has dedicated £1 million of funding annually to involve more fishers in the commissioning of scientific research, e.g. since 2003 through the Fisheries Science Partnership in England and Wales. A variety of different funding models have been used in Ireland (Table 1). These range from examples where the scientific agencies paid for all the work, through to a few projects funded entirely by the industry.

A few examples of the main joint industry-science or “participatory research” projects informing the discussion are summarized in Table 2 with further detail on other projects available online (see Supplementary material). The objectives, information, data collected, ups or “positive outcomes”, and downs or “learning

points" across a range of projects vary widely. This broad diversity of projects illustrates the potential for interaction at many levels (as also noted by Mackinson *et al.* 2011). The scientific and industry goals and objectives within individual projects have been presented separately, as they are subtly different in many cases. There are examples where one party was the main instigator and beneficiary and the other co-operated (top down) to truly collaborative endeavours (bottom up).

Case study 1: The demersal discard-sampling programme

In 1993, the MI established an on-board observer programme in order to monitor the levels of discarding by the Irish fishing fleet. The initial and subsequent programmes have been entirely or partly EC-funded, and could be descried as a top-down cooperation. Data-collection protocols and management procedures were established at the outset but have been refined over time. The collection of discard data at sea is performed by trained MI staff (Fisheries Assessment Technicians, or FATs), and since 2004 by seagoing contractors. Data are collected onboard the commercial fishing vessel only with the agreement of its skipper. No financial or other compensatory incentive is provided to encourage vessels to carry an observer. Whilst onboard the observers collect a wide range of metadata concerning the trip, sampling both the retained and discarded parts of catches, as well as taking otolith samples for age estimation (details in Borges *et al.,* 2004; Borges *et al.,* 2005a; Borges *et al.,* 2005b).

The selection of vessels for sampling trips is not random in the strict statistical sense. In the early years, trips were carried out "representatively" on vessels operating from ports in the locality of the observer's base (Borges, et al, 2004). Currently, targets are stratified by métier and time, guided by recent activity levels and the requirements of the Data Collection Framework (DCF; EC, 2008). Trip

selection within a métier is quasi-random since practical considerations arise (e.g. is the vessel skipper co-operative, is there suitable accommodation, safety issues, trip departure time, duration etc.). This compromises the estimation of true variance and bias, but completely random sampling is rare in discard programmes.

Data collected during the MI discard-sampling programme have been described and used in several scientific publications (e.g. Borges et al., 2005a, Vianna et al, 2010). The data are routinely reported to the International Council for the Exploration of the Sea (ICES) and the EU Scientific, Technical and Economic Committee for Fisheries (STECF) for use in fish-stock assessment and other work (STECF, 2008; ICES, 2010). Participating skippers receive direct feedback by way of a "Skippers report" which outlines the sampling results (i.e. the observed discard rates and length/age distributions of the catch).

The time series of days-at-sea is presented in Figure 1. The sampling effort for the first decade fluctuated around 150 days-at-sea annually. Effort increased to 300-400 days-at-sea since 2004 (except 2006). This is just below 1% of the total days-at-sea for Irish vessels >10 m. The programme accounts for ~35% of the annual sampling budget. Whilst increased sampling levels are desirable, to increase accuracy and precision of the data collected, it would imply a considerable increase in sampling effort and associated cost (Borges, et al, 2004). The increased sampling since 2004 was achieved mainly through partial outsourcing to MI-trained contractors. It is interesting to note that the scientific objectives, essentially collection of reliable data, are very different to those of individual skippers. They regard cooperative engagement as an opportunity to learn about or influence the scientific perception (Table 2). Whether these "industry objectives" are sufficiently achieved with contract observers remains to be seen. The complexity of mixed-demersal fisheries, scientific

assessment procedures, and the current management framework essentially means that the relevance of data collected during one discard-sampling trip may appear very abstract to individual skippers.

In 2006, sampling levels were significantly reduced due to a period of non-cooperation by parts of the fishing industry with scientific programmes. This affected both at-sea and shore-based sampling. There is a complex background to this problem, but essentially a "confidential report" that compared data collected by discard observers and logbook returns for the same trips in 2003 and 2004 was made public. The report indicated various "mis-matches" between the observed and reported landings. This was perceived by fishers to have contributed to the enactment of stricter legislation, namely the "Sea Fisheries Bill", and the establishment of a new control and enforcement agency (the Sea Fisheries Protection Authority).

This highlighted issues and frailties within the discard-sampling programme. Prior to 2006, observers always emphasized the difference between scientific and control agencies and the "confidential nature" of the scientific data that might be collected. Notwithstanding data-protection laws, official observer data cannot be withheld from State bodies such as fishery control and enforcement agencies, and the police. Since 2008, the MI has developed a code of conduct for both staff and contractors, who must explain how the data are used and the limits on confidentiality.

Over time, trust has been re-established and now the Irish at-sea observer programme has widespread industry cooperation, although a few skippers are still reluctant to carry observers. The DCF and related national regulations oblige vessels to carry observers on request. Considering the need to have reliable data, and the duty of care for staff, the trip selection focuses on cooperative vessels. While external factors such as stricter controls on reported landings may make fishers less willing to

carry observers, other external drivers such as legislation with evidence-based provisions have resulted in the industry demanding more discard-observer coverage. The Cod Long Term Management Plan (EC regulation 1342/2008, see below) is a good example of this, whereby in the face of increasingly stringent fishing-effort restrictions, vessels must demonstrate by means of enhanced scientific-observer coverage that their cod *catches* (as opposed to *landings*) are less than 1.5% of their total catch, in order to obtain and maintain exemptions.

Case study 2: Working with industry on cod assessment and management

Two of the three cod stocks around Ireland (in ICES Divisions VIa and VIIa) are severely depleted and subject to recovery measures since 2002. Mortality rates in all three cod stocks (as above and VIIe-k) remain very high despite the introduction of various management measures aimed at reducing the fishing mortality (ICES, 2010). Restrictive TACs and effort controls have resulted in changing fishing practices, increased discarding, and various types of misreporting. The deterioration in the quality of landing records, in particular, has meant that all three cod assessments are now conducted without using the commercial-landings or catch data. Consequently assessments and management advice have high uncertainty (ICES, 2010). This situation has been the catalyst for several initiatives, including an industry-based surveys and tagging studies, as outlined in Table 2. Despite close collaboration, the different perception of the cod-stock status has been a major cause of diverging opinion between the industry and scientists.

In 2008, a new long-term management plan (LTMP; EC Regulation 1342/2008) was agreed for several EU cod stocks. The LTMP is the most significant and potentially restrictive instrument to affect Irish demersal fisheries since the implementation of the CFP. The plan aims to reduce fishing mortality to a target level ($F = 0.4$) through regulating TACs and national effort allocations across a range of gear types. A key feature is that the management responsibility for achieving the required fishing-mortality reduction has been devolved to the Member State. In Ireland, the fishery authorities established a steering group to make recommendations on national management of effort and on practical options to reduce fishing mortality e.g. cod-avoidance measures (for further detail see Davie and Lordan, in press). This group included policymakers, fishery managers, industry representatives, control agencies, and scientists. Its work, although mainly co-implementation since the EC is responsible for CLTP regulation and policy context, could be considered a small step towards co-management.

The intensive interaction between scientists, industry representatives, managers, and control authorities resulted in a high degree of shared understanding of the different issues and perspectives. The group has worked to provide an equitable basis for the allocation of restrictive fishing effort. Technical measures to reduce cod catches were developed and implemented in consultation with the industry. This is expected to result in better uptake and compliance. The shift in the burden of proof to member states and fishers has stimulated several collaborative projects to develop the "scientific cases" need to prove cod avoidance and by-catch reductions (as discussed in case study 1).

Case study 3: Cod tagging programme

A comprehensive cod-tagging programme has been in place in Ireland since 2003. This focused on a cod nursery ground in ICES Division VIa off the coast of Donegal, known as “The Cape”, and the juvenile and spawning components of the Celtic Sea stock in VIIg and VIIaS. The Cape project was instigated by the local fishers who called for the closure of a traditional winter fishery for juvenile cod. The industry defined an area to be closed to all fishing from October 2003 to February 2004 under national legislation. Only vessels involved in the tagging operations were permitted within the area. Further, the fishers requested an extension of the closed area in subsequent years. Over three seasons, more than 13 000 cod were tagged with a return rate of 10% (Ó Cuaig and Officer, 2007). The research yielded valuable information on migration patterns and growth rates of cod. The closure itself had a significant conservation benefit, as spatial analysis showed that a high proportion of the Irish VIa cod catch was traditionally taken from this area. The project was very much a collaborative initiative as the fishers were regularly consulted during its development, design, and execution. Further, the industry provided ship time when official funding was scarce. The project was widely reported in the trade press as an excellent example of close co-operation between fishers and scientists.

The Celtic Sea cod-tagging project was another fisher-led initiative. This joint study investigated two components of the Celtic Sea stock; juvenile cod residing in Waterford Estuary in the spring, and the offshore spawning component. Since its inception in 2007, over 9000 cod have been tagged, 291 of which were released with a Data Storage Tag (DST) (Bendall *et al*, 2009). From a scientific perspective, the programme has yielded important new data. Migration patterns from the study have shown that many of the juvenile cod released in VIIaS are recaptured in VIIg, and that most of the cod tagged offshore in VIIg were recaptured within the Celtic Sea region

(VIIg, VIIj, VIIh, and VIIf) with a only few in the Irish Sea (VIIa).. The high growth rates historically reported for Celtic Sea cod have been confirmed (e.g. Brander, 1995).

An important element of the tagging work is the enthusiastic response and participation of the fishers. Apart from those involved directly in the tagging, fishers often call from the wheelhouse to report a tagged cod. Fishers often take the opportunity to relay other information to scientists, such as biological observations, perspectives on the stocks and fisheries, or thoughts about the management regime. Scientists also feed back information on the recovered fish, the project, and scientific findings. This type of direct interaction and sharing of knowledge is uncommon in fishery science, often the information exchange has a significant time delay, associated with analysis of data collected or is one sided. Tagging studies give tangible and easily interpreted results – Where did the fish go? How much did it grow? How do they behave? They enable stakeholders to actively participate in and understand the application of science.

Case study 4: Self-sampling of *Nephrops*

A self-sampling programme for catches of *Nephrops*, including both landings and discards, has been operating in the Western Irish Sea (FU15) for more than three decades. This developed because in the early years of the fishery, vessels typically returned to port with a large volume of unsorted catch which was then sorted and "tailed" (the tail is detached from the rest of the body and landed separately for human consumption) by fishing families. Scientists had access to unsorted catch and discard samples and could thus estimate on-board retention ogives. In more recent years this practice has largely ceased and much of the catch is now processed at sea. The self-

sampling programme is a voluntary scheme. The fisher is paid for the samples at the current market price. The number of participating vessels varies. In the Irish Sea, for example, up to 15 vessels or around 40% of the fleet have engaged in self-sampling. The number of samples for each Functional Unit (or stock area) determined by the DCF targets and sampling intensity is temporally stratified based on recent landings patterns.

The success of the scheme is largely down to the simple protocol involved. For each trip, vessels retain one representative box (approx. 40 kg in weight) of the unsorted catch, and one representative of the discards from a randomly selected haul. The on-board discard observers assist the self-sampling, providing a quality-control benchmark and training the crew in sample selection. The protocol works particularly well in fisheries with high discard rates of small *Nephrops* and where the length at 50% retention (L_{50}) is close to the modal length in the unsorted catch. Occasionally samples may have been biased by removing the larger *Nephrops* from the catch-sample box. This problem appears to be uncommon and in any case can be cross-checked against observer samples or the size distribution of “heads” in the discard box. The mean size, sex ratio, and discard rates estimated through self-sampling, together with abundance estimates from an underwater-television survey are used to determine the catch advice (ICES, 2009). This assessment method is conceptually simple and easy to explain to the industry, compared to the general analytical assessment and forecasting procedures of fishery science.

Discussion

Effective engagement in collaborative research is not a prerequisite for successful fishery management, but in many cases it is a significant by-product (Motos and

Wilson, 2009). Hilborn et al. (2005) gives a good example from the Canadian sablefish fishery, where the fishers are actively engaged in the research programme. Collaborative stakeholder engagement is a cornerstone of the Ecosystem Approach to Fisheries Management (EAFM). Such engagement is intrinsically and intractably linked to the current and evolving fishery system. Here we reflect on the Irish experiences in the context of on going CFP reform and consider how the make the most of fishers information and collaboration in the future.

Motivations to engage in research often differs between scientists and industry. As one Irish-fisher representative put it; “Fishers are in the business of catching fish and making money. Scientists are in the business of carrying out research and writing papers”. Both sectors have a key stake in the sustainability of the marine ecosystem. One of the main challenges in building participatory research is to ensure that goals or objectives are complementary although not necessarily aligned. Our experience is that industry objectives are often short-term and motivated (e.g. to receive financial gain, to demonstrate a perspective, to increase quota, to influence perceptions). Science objectives whilst also motivated tend to be neutral in perspective and longer-term (e.g. to obtain unbiased data at lower cost and high-precision). Since the last CFP-reform process longer-term and strategic objectives have become more apparent in industry thinking, e.g. “we need better information on the state of the stock and the best way to fish it the longer term”. This is particularly evident in projects such as the Irish Fisheries Science Research Partnership, and in the development of long-term management plans (e.g. the Celtic Sea herring-management plan).

The EC Green Paper (EC, 2009) states that: “In a mostly top-down approach, which has been the case under the CFP so far, the fishing industry has been given few incentives to behave as a responsible actor accountable for the sustainable use of a

public resource". This top-down management framework has also led to a culture of top-down research funding. The effectiveness of this approach must be called into question, given that an instrument like the DCF spends ~€ 64 million on data collection annually, whilst the state of around 60% of the stocks is considered unknown due to poor data (EC, 2010). In New Zealand, the seafood industry is an intensive generator and user of knowledge about the sustainable use of fishery resources. Around 2.5 % of the value of seafood landings is spent on sustainability-related research (Harte, 2001). Providing incentives to fishers to engage constructively in fisheries management, including collaborative research, together with rights-based management, has contributed to a higher proportion of sustainable fisheries in New Zealand than in other countries (Beddington et al., 2007).

The Irish experience has been that industry can sometimes be persuaded engage with, and even pay for, research (e.g. the mackerel fishery, boarfish research, cod-tagging surveys). More often, however, profit margins are too tight, fishing rights are unclear, and the outputs of research too vague for fishers to risk any financial or time investment in research. Fishery-management policies should be reformed to promote and facilitate participatory research initiatives. Bottom-up results based initiatives can be used to achieve management objectives if carefully designed. For instance, when fishers call for a seasonal closure to protect juvenile or spawning aggregations; a dedicated research project utilizing fisher knowledge creates a sense of ownership, leading to better compliance and a more successful outcome. Quota access can be used to incentivise responsible behaviour, including facilitating research or data collection. In the context of CFP reform, the evolution towards long-term regionalized management plans, and clear rights-based management, should put the burden of proof on fishers as the key stakeholder.

Maintaining scientific integrity and independence through proper scientific designs, standards, and protocols, together with transparent reporting are critical in any joint data-collection exercise. In the case of fisher self-sampling programmes the design considerations in ICES (2008) should be adhered to. For such schemes it is also essential that almost real-time quality control, assurance, and validation of the data is carried out. Concessions on the ideal sampling design and statistical methods may be inevitable when carrying out programmes reliant on fishers and commercial vessels (e.g. the discard-observer case study described above), It is critical that bias is not introduced by making such concessions. Keeping protocols simple is critical to success.

Useful guidelines on developing and carrying out participatory research projects are given in Mackinson *et al* (2008). Clarity and transparency on the project objectives, and any expectation differences that may exist between scientists and fishers, are critical from the inception of joint projects. Detailed communication of objectives, procedures, results and their relevance, not just to industry representatives but also to vessel owners and crew, is essential throughout the project cycle. As mentioned earlier it is not necessary that industry and scientific objectives are the same, although that does help. It is also important to be clear on the sometimes unrealistic time horizons and output expectations that industry may have when engaging with scientific data collection. This is particularly true for fish surveys on commercial vessels. Such surveys typically require a time series over several years before the information can be formally integrated into the assessment; it is very important to be clear about that issue at the outset. One clear benefit of engaging with industry on bottom up FDI projects, is that it prioritises effort and encourages

maximum utility of any outputs, which may not always be the case in top down data collection frameworks.

Another important message form the Irish experience is that there may well be institutional and regulatory challenges to be overcome. Increasingly scientific information has been integrated into control aspects of EC regulations (e.g. the catch-control rules in the CLTP). In the future it may not be possible to maintain the differentiation between science and control as has been the practice historically. Evidence-based decision making is central to modern fisheries management. This in turn results in new demands for and uses of scientific data. Precautionary actions such as reducing TACs and effort allocations are an increasingly likely consequence of data deficiencies (see e.g. EC, 2010) these policies are shifting the burden of proof to fishers.

A wide range of diverse participatory research projects have been carried out, and are ongoing in Ireland. Commercial vessels have been used as research platforms, while fishers have contributed to research surveys and even commissioned research projects. There are many opportunities for engagement varying across a continuum from consultation, to full engagement in joint projects as also noted by Mackinson *et al* (2011).. The value of participatory research is multi-faceted and certainly offsets the extra time required. Priority areas for future participatory research in Ireland include:

- Fishers self-sampling of catches (both landings and discards)
- The development of reference fleets and/or fully documented fisheries
- Improved quantification of effective fishing effort by enhanced recording gear parameters and integrating changing fishing strategies and practices.
- Developing useful and cost effective industry based fishing survey series

- Further tagging studies
- Most importantly developing long-term management plans that integrate biological, ecosystem, economic and social objectives.

Reform of the governance system through regionalization, results-based management, and reversal of the burden of proof have all been suggested in the CFP-reform discussions, and are likely to increase further the need for participatory research in the future.

Supplementary material

A more comprehensive table of science-industry projects carried out in Ireland recently is available at ICESJMS online:

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Table 1. Overview of funding models for some recent science-industry projects carried out in Ireland.

Funding Model	Description
1	100% of costs borne by scientific agencies
2	Staff costs borne by fishing industry, vessel costs by scientific agencies
3	Partial vessel-cost recovery (i.e. selling of catch), with staff costs borne by scientific agencies
4	Vessel costs borne by fishing industry, staff costs by scientific agencies
5	Vessel and some staff costs borne by fishing industry
6	100% of costs borne by fishing industry
7	Sharing of staff costs by scientific agencies and fishing industry

Table 2. Summary of selected recent science-industry projects carried out in Ireland.

Project or programme	Time Frame	Category/funding model	Scientific Objectives	Industry Objectives	Information Collected	Ups - Positive outcomes	Downs- Learning points
Irish Fisheries Science Research Partnership	2008-Present	Research oversight / 7	To get industry input to scientific projects, to feed back the results of scientific work to the industry To understand and engage with industry priorities	To input to scientific planning, To align scientific to industry priorities, to review scientific work	Information on priority stocks and issues	Good communication between scientist and industry representatives, better awareness of issues, better understanding of scientific activities by industry, longer term strategic focus, mini-symposium in 2010 well attend by industry	Lack of manager/policy input, limited funding opportunities since establishment, no national mechanism to commission joint projects, communication from the group to wider industry is poor, lacking in transparency
Demersal Discard Sampling Programme	1993-Present	Fishery-dependent data collection/ 4	Collection of catch (landings + discard) data for assessment and advisory functions	To engage with scientists, To demonstrate low discard rates or large stock size (in some cases), to influence scientific perspective, To learn about scientific activities	Landing and Discard, Numbers, Lengths, Weights.	Excellent source of data Concurrent data collection (DCF) Data extensively used by ICES Several Scientific Publications Excellent interaction with industry Thus far Voluntary	Dependent on good co-operation Statistical sampling design compromised Relatively Costly & High Administration burden Expensive to optimise further Perceived "Abstract use" Risk of becoming part of control
Irish Sea *Nephrops* sampling	1970-Present	Fishery-dependent data collection / 1	Collection of catch (landings + discard) data for assessment and advisory functions	Financial incentive, to engage with scientists	Catch, Numbers, Lengths, Weights and discard ogives	Sustainable, reliable and cost effective way of sampling Allows for higher sampling levels Requires close communication with the industry Very simple protocol	Some individual samples may be biased Only applicable to certain *Nephrops* stocks Difficult to obtain representative samples in other areas Legal grey area

Project or programme	**Time Frame**	**Category/funding model**	**Scientific Objectives**	**Industry Objectives**	**Information Collected**	**Ups - Positive outcomes**	**Downs- Learning points**
Irish Sea data enhancement project	2007-2009	Fishery-dependent data collection / 4	to improve sampling levels and precision of commercial catch (landings and discards) data	to supplement discard observer data with industry self-sampling data, and to verify the usability and quality of the data. To obtain payment for some samples	Diary information, discard samples and raising information	increased quantity and quality of data, efficient, cost effective, improved relationships and trust between fishers and scientists	Difficult to maintain momentum and quality, incentives for self sampling need to be integrated into monitoring and management of the fishery, protocols not adhered to in a large proportion of trips, need for strict QC procedures
Albacore Tuna fishery	1990-present	Gear-selectivity studies /1	Gear development initially then by-catch monitoring and mitigation	Fishery development, Financial incentive, to demonstrate reduce by-catches	Accurate CPUE & Spatial data Gear and operational changes in the fishery monitored & documented	Good cooperation with industry Vessels were a platform for testing of deterrent devices	Perceived differences in observed and reported cetacean by-catch data Different perception of cetacean by-catch Difficult in accessing some vessels when no subvention available Industry suspicion of motives Poor understanding by industry of the need for observation ("burden of proof")
Boarfish Research Project	2010-present	Fishery-dependent data collection / 6	To collect the necessary data for doing a stock assessment and advising sustainable catch levels.	To get realistic quotas set as soon as possible	Age, growth, reproductive and length frequency data. An acoustic survey is being planned for July 2011.	Good cooperation between the industry and scientists. Fishers have been very good at collecting samples and are also keen to contribute as much information to the project as possible. They are also going to fund a boarfish acoustic survey in July 2011.	No negatives at the current time
Cod Recovery & Management	2000 - present	Developing Management Framework / 7	To inform management system and strategies To explain the scientific advice	To maintain economically viable fisheries	Various data related to cod catch and effort in the context of the LTP	Ministerial group high profile Develops a share understanding of issues Evolution towards shared & regional management Places burden of proof on industry Rewards good fishing practices Incentivises accurate data & assessments	Lack of "buy in" & trust Economically vey damaging to non cod targeting fisheries Little progress towards CLTP objectives Very complex and stringent management arrangements Very resource hungry for all Different interpretations of the legislation

Working with industry to collect fishery-dependent data

Project or programme	**Time Frame**	**Category/funding model**	**Scientific Objectives**	**Industry Objectives**	**Information Collected**	**Ups - Positive outcomes**	**Downs- Learning points**
						Constructive dialogue	
Celtic Sea Herring Management plan	2008-present	Developing Management Framework / 7	To develop a sustainable long term management plan	To develop a profitable long term management plan	MSE evaluations, industry objectives	Very good vehicle for communication and building trust, good buy in by all to the process and plan, fully inclusive of industry sectors	Difficult discussions initially, but a recognition that that was part of the process

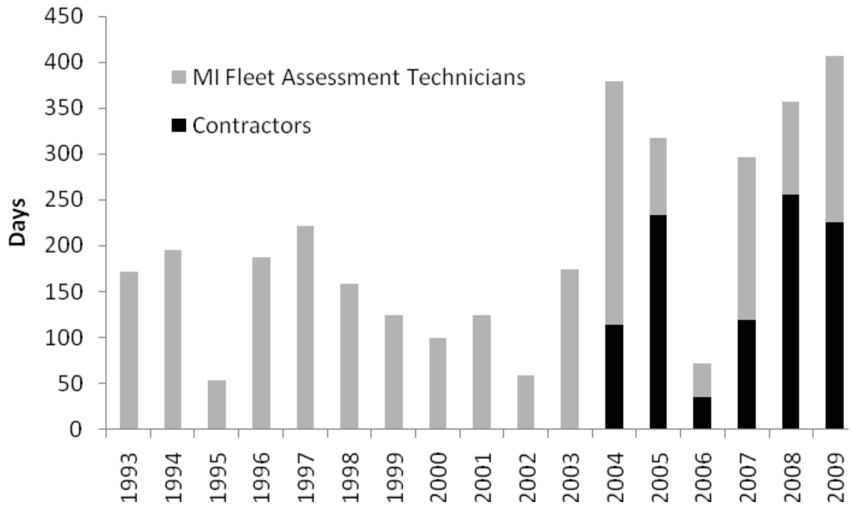

Figure 1. Time series of days-at-sea per year for the Irish discard-observer programme in the period 1993 - 2009. Since 2004 this has involved external contractors as well as MI staff.