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The burden of proof in co-management and results-based management: the elephant on the deck!

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Results-based management requires that outcomes can be demonstrated by industry and verified by managers on behalf of society. The core questions are: what outcomes, and how can they be proved? Existing fishery approaches to reversing the burden of proof are examined with focus on how proof is demonstrated. Outcomes can be measured *in situ* (on the vessel) or *ex situ* (at the stock or ecosystem level). *In situ* measures are preferable because they give direct measurements, although they can be invasive and costly. *Ex situ* results are only observable on scales that make it difficult to attribute them to specific management measures, or they may be influenced by external factors. Three main environmental impacts caused by fishing are assessed with respect to how industry can assume the burden of proof. The combined use of vessel-monitoring systems and benthic-impact models may offer a practical solution to the problem of managing fishery impacts on the benthos. Three Irish fisheries are assessed in terms of the feasibility of reversing the burden of proof. There are limits to the extent to which industry can assume the burden of proof, and the concept of sharing the burden of proof could be more realistic.

Keywords: benthic impact, burden of proof, co-management, indicators, policy, results-based management, VMS.

Introduction

The debate about where the burden of proof should be placed in fishery management and what standards it should reach is not new. As far back as 1919, W. F. Thompson wrote, “Proof that seeks to change the way of commerce . . . must be overwhelming” (quoted in Ecosystem Principles Advisory Panel, 1998). Before the widespread application of the precautionary approach, the burden of proof in most fisheries lay with managers who were required to demonstrate that fishing levels were creating a resource problem. The desire of fishery managers and conservationists *inter alia* to reverse the burden of proof has been expressed repeatedly (Mangel *et al.*, 1996; Dayton, 1998; Agardy, 2000; Gerrodette *et al.*, 2002). The precautionary approach may have shifted the burden of proof somewhat, and its application has led to a feeling commonly expressed by the fishing industry that the onus is on them to provide evidence that is often rejected on the grounds of bias or because it does not match scientific-assessment standards (Charles, 2002). These issues relating to the standard of evidence have a direct implication for any approach seeking to reverse the burden of proof, and some of these are explored here, using discard reduction as an example.

The current debate in European fishery management about reversing the burden of proof can be linked to the 2009 Green Paper on the reform of the Common Fisheries Policy (CFP; Commission of the European Communities, 2009). It proposed co-management, self-management, or results-based management as potential solutions to the problem of increasingly complex and costly micromanagement of fisheries, and suggested that reversing the burden of proof is a necessary element of these approaches, one that would simplify regulation and provide incentives for better provision of information. There is significant support in the literature for the Green Paper’s aim of moving away from a traditional top-down management regime, through benefits such as improved legitimacy and compliance, enhanced stewardship, a broader stakeholder and knowledge base, and generally more robust and resilient management (Jentoft and McCay, 1995; Charles, 2002; Jentoft, 2005; Townsend *et al.*, 2008; Berkes, 2009).

The fishing industry has responded positively to the concept of results-based management, in submissions made to the CFP reform consultations (Commission of the European Communities, 2010). Sustainable-fishing plans developed by industry have been proposed by several representative bodies. However, they do not yet contain sufficient detail on what would constitute proof or how audits could verify compliance. One submission addresses the issue as follows: “One of the key features of the plan will be an obligation to document the vessels’ activities in a way that allows for periodic audit. This amounts to reversing the burden of proof.” Clearly, more discussion is required on the details of how this could work. Options for addressing the question of how industry can demonstrate satisfactorily that fishing is taking place within sustainable limits in a

European, and more specifically Irish, context are discussed here. First, some examples of evolving approaches to reversing the burden of proof are given, to provide a context for the following discussion.

Current approaches to reversing the burden of proof in fishery management

In Australia's prawn fishery in the Spencer Gulf, 39 demersal trawlers are licensed to fish. Their success in maintaining good catch rates has been ascribed to the decision to limit entry from the onset of the fishery in 1968, and also to the strongly collaborative co-management arrangement that exists between fishers, government managers, and scientists (Townsend *et al.*, 2008). Although the Government retains ultimate control, management of the fishery has been delegated to a Fisheries Management Committee since 1995. The management plan for the fishery (Dixon and Sloan, 2007) lists various goals, objectives, and strategies (with associated indicators and limit reference points) across a wide range of factors. One of the four key management goals is to minimize impacts on the ecosystem. There are three objectives linked to this goal, one of which is to minimize fishery impacts on bycatch and by-product species. Several strategies are linked to this objective, including *inter alia*limiting fishing effort through restricting the total quantity of gear used, permanently closed areas, and risk assessments to determine the vulnerability of bycatch species to overfishing. The success of impact-mitigation strategies is assessed through fixed-station trawl surveys conducted by industry vessels three times per year, risk assessments, and dedicated fishery-independent bycatch surveys. The Committee at Sea, consisting of skippers and licence-owners, is also required to report regularly on industry compliance with harvest control rules.

Under a 2010 amendment to fishery legislation (Parliament of Australia, 2010), further delegation of management responsibility to the fishing industry has been mandated. These changes strengthen the ability of fishers to commission and design their own research programmes, while refocusing the role of the Australian fishery management agencies on their auditing function.

On the Canadian Pacific coast, a pilot Commercial Groundfish Integration Plan (CGIPP) was developed jointly by industry and managers, and initiated in 2006. The plan arose as a result of concerns over the status of various species, and in particular rockfish stocks. The CGGIP scheme has a number of guiding principles that are relevant here (Fishery and Oceans Canada, 2009). These are that all groundfish catches, across a complex mix of 60 species, must be accounted for. Also, the plan stated that both at-sea and dockside-monitoring arrangements needed to be revised. This resulted in a requirement for 100% observer coverage and an enhanced dockside-monitoring programme, both jointly funded by Government and industry. At-sea observers record details of fishing activity and gear, catch quantities retained, and discard levels. The at-sea programme allows vessels to choose between carrying an observer or a video-monitoring system. This is supported by a dockside-monitoring programme that combines video records of all landings, of which ~10% are checked against vessel declarations, with random inspections. Discrepancies between the declared catch and the video records can trigger a full inspection, the cost of which is charged to the fisher.

Following an evaluation of the pilot plan, an extension was agreed, and 2010/2011 is the first year of a more permanent integrated plan (Fishery and Oceans Canada, 2010). Although the evaluation indicated that conservation objectives were being achieved, there are some concerns about the sustainability of funding for what is an expensive monitoring programme.

The practical application of reversing the burden of proof is increasing in the context of European fisheries. Many cod stocks are well outside desirable biomass levels and exploitation rates, and have been for the past decade at least. Despite the introduction of management initiatives that aimed to rebuild stocks by 30% annually (EC, 2004), many have continued to decline. More recently, a new long-term management plan (LTMP) for cod (EC, 2008) has been introduced. It shifted the focus from rebuilding biomass to setting a target fishing mortality. Incorporated within the LTMP are annual reductions in both total allowable catch (TAC) and fishing effort, the extent of which is dependent on stock status and fishing mortality. For cod stocks west of Scotland and in the Irish Sea (ICES Areas VIa and VIIa; Figure 1), this has meant an annual reduction of 25% in both TAC and effort allocations. However, the LTMP offers individual countries the opportunity to implement alternative measures, provided they can demonstrate that equivalent reductions in cod catches are being achieved. Also, where the annual cod catches of a vessel demonstrably do not exceed 1.5% of its total catch, then that vessel may be exempted from the effort-control rules. It must be emphasized here that the regulation is based on catches (including discards), not only on declared landings. Therefore, it is necessary that total catches be monitored adequately either by on-board observers or remote-sensing equipment, e.g. video cameras. These elements of the LTMP for cod have stimulated national authorities and fishers to adopt measures that minimize cod catches through technical modifications to gears or the application of closed areas. In both cases, individual countries must now provide adequate data to demonstrate that cod catches are below threshold levels, if they are to remain outside the effort-control scheme.

A recent year-long trial involving Danish fishing vessels is a good example of how a comprehensive approach to reversing the burden of proof may be taken within the cod LTMP. Based on the assumption that total catches (landings + discards) would be deducted from future fishing quotas, the vessels were fitted with cameras to record any discarding, and in return they received increased quotas (Kindt-Larsen *et al.*, 2011). That research found that discard and catch levels could be determined accurately by viewing the electronic-monitoring records onshore. It was also found that the cost of verifying discards in this way was significantly less than that of on-board observers, and that the fishers involved were incentivized actively to avoid areas where there could be much discarding, particularly of juvenile cod.

In situ and *ex situ* indicators, and management objectives

Before looking at the types of fishery impacts, which are likely to be audited in a reversal of the burden-of-proof scenario, it is useful to consider two fundamentally different approaches to how they may be measured, and how the choice between them depends on the underlying management objective. In the context of results-based management, the choice of *in situ* (direct observation or monitoring of vessel activities) or *ex situ* (indicators of fish stocks or the

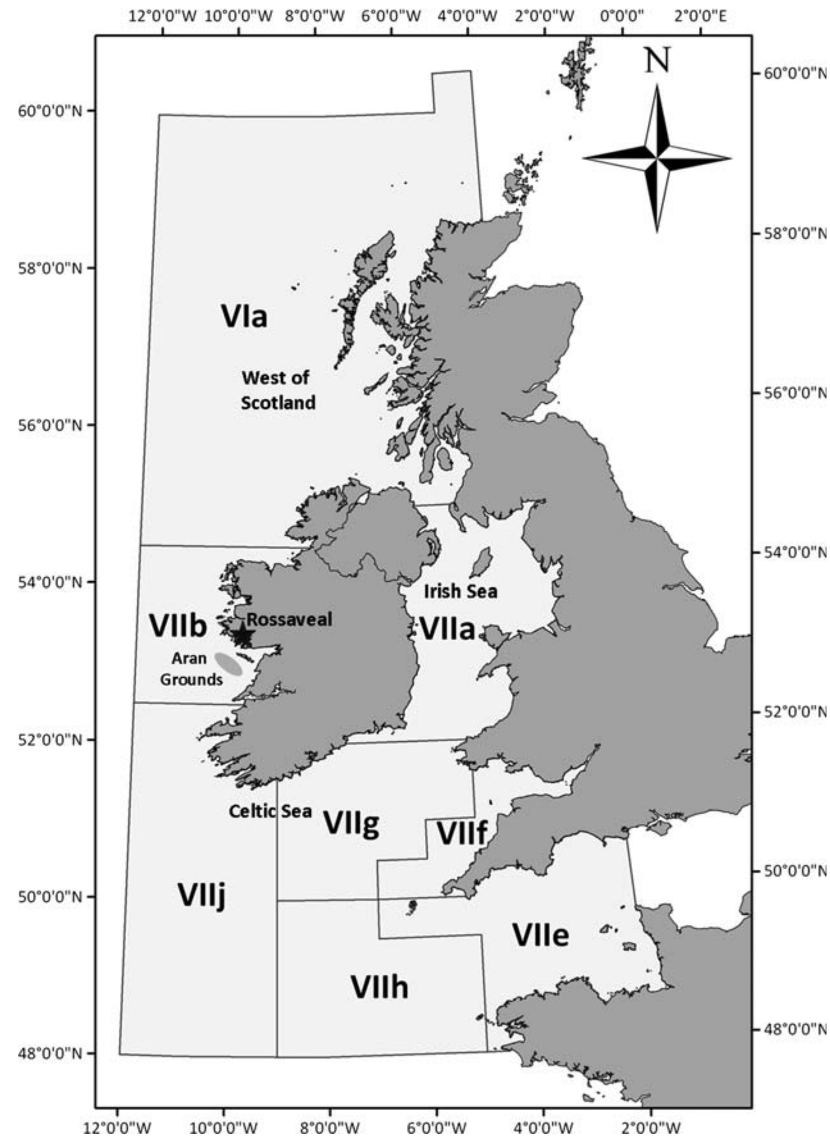

Figure 1. Map showing ICES Divisions in Irish waters and relevant fishery areas and grounds.

wider ecosystem) measures to assess the industry response to a particular goal depends on the overall management or policy objectives, and the agreed tools used to audit the objectives (Lassen *et al.*, 2008). The latter identified four levels of management. At higher levels, objectives covering sustainability, control, and enforcement were deemed as unsuited to reversal of the burden of proof, so these should remain a governmental responsibility. In this context, the information needed for management would generally be *ex situ*, e.g. the state of the stocks or levels of fishing mortality, or in an ecosystem context, impacts on seabed habitats or biodiversity. However, reversal of the burden of proof was considered feasible at the more operational levels of setting acceptable exploitation rates or direct impact assessment. In those cases, the more appropriate data would be *in situ*. Examples here might include fishing effort, discards, or bycatches of protected or vulnerable species.

The choice of objectives will, to a considerable extent, determine the choice of metrics, and whether these should be *in situ* or *ex situ*. If the objective is to achieve sustainably exploited stocks, e.g. fishing at MSY, evaluation cannot be at a vessel level but would require *ex situ* metrics, i.e. fish-stock biomass and fishing mortality. If the objective is to manage, for example, fishing effort, this can be evaluated at the vessel level, and would require *in situ* metrics such as can be provided by a vessel-monitoring system (VMS).

Discarding is an excellent example of where there is agreement that reduction is desirable, but not on the objectives of that reduction and therefore the choice of *in situ* or *ex situ* metrics. Discarding of commercial fish can be seen simply as an issue of waste, e.g. loss of protein or revenue, or undesirable effects on the stock dynamics, e.g. excess removals leading to increased depletion risk, or it can have wider ecosystem impacts, e.g. in changing the structure of fish communities such as the proportion of large fish (Daan, 2006).

If the objective is to minimize waste, then *in situ* measurements are the most appropriate method because the response of the fleet is measured directly. However, if the objective is maintaining healthy fish stocks, it should be possible to consider both *in situ* and *ex situ* measures. As with the waste issue, direct monitoring of reduced discarding from vessels allows us to infer an improved state of the stock using standard stock-assessment techniques. Alternatively, the link between reducing discards and better stock health suggests that *ex situ* measures of the latter could possibly be a proxy for demonstrating that discards are indeed falling. However, the concept of a metric to determine discarding is problematic. A key attribute of a useful index (Rice and Rochet, 2005) is that it should be specific to the pressure we are aiming to manage. Fish-stock indicators are responsive to many other pressures, so they may be inappropriate for establishing whether or not discarding has reduced.

Finally, if the objective of discard reduction is to achieve a particular ecosystem or fishery objective, such as sustainability, then *ex situ* measures would be the only possible approach. Ecosystem indicators potentially linked to discarding include the large fish indicator (LFI; Greenstreet *et al.*, 2011), a range of biodiversity indices, and the trophic dynamics of the ecosystem—"fishing down the food web" (Pauly *et al.*, 1998). There is reasonable evidence of links between many of these indicators and commercial fishing activities, but there is less evidence linking them to discarding on its own. Again, it is likely that a wide range of other external factors will affect many of these indicators, making evaluation of the ecosystem effects of changes in discarding practices difficult.

Both approaches, *in situ* and *ex situ*, have advantages and disadvantages. *In situ* measures are direct, generally at-sea measurements of an activity, and are available almost in real time. The response of the fleet to the policy can be assessed quickly, providing valuable and timely feedback to managers and the fishers. The choice of objectives and monitoring the achievement of those objectives should be relatively straightforward. In a comprehensive system, it should also be possible to identify non-compliance at the level of an individual vessel. However, the key disadvantage of the *in situ* approach is that it is likely to be labour-intensive and requires a substantial change in how most fisheries are run. If on-board observers are used, then depending on the precision requirements of a results-based management audit, it is likely that the coverage of the fleet would need to rise considerably. In Irish waters, only ~1% of fishing trips are currently covered by observers. There is also the question of how representative the observed vessels are of the whole fleet (Benoît and Allard, 2009). Ideally then, one would want universal observer cover as applies in the Canadian Pacific groundfish fishery (Townsend *et al.*, 2008). Alternatively, new technologies would be needed to measure discard rates remotely, such as the video-monitoring techniques used in Canada (Townsend *et al.*, 2008) and Denmark (Kindt-Larsen *et al.*, 2011).

The main advantage of *ex situ* measures is that their collection is independent of commercial fishing activities, and generally involves alternative data sources such as research surveys or stock assessments. Additionally, the formal inclusion of some of these metrics in the EU Data Collection Framework, the Marine Strategy Framework Directive, and the CFP means that they will be more monitored routinely in future. *Ex situ* metrics target those issues that we most wish to manage, be they at single-stock or ecosystem levels. *In situ* measures tend to address the discarding in and of itself, not the impacts thereof. *Ex situ* metrics are also less invasive of fisher activities, because they can be monitored remotely.

The key disadvantages of the *ex situ* approach are the lack of specificity, and the delay between the activity and quantifying its impact on the stock or ecosystem. As discussed above, for the most part *ex situ* indicators can be adversely affected by many other factors. For indicators based on stock assessments, these generally depend on the landings in the previous year, so would tend to be rather out of date. In some cases, however, more timely stock estimates may be available from fishery-independent surveys. Ecosystem indicators, although often derived from research-vessel surveys, may take some time to respond to changes in fishing pressure, e.g. up to 15 years for the LFI for the North Sea (S. Shepherd, pers. comm.). Another disadvantage is that the *ex situ* approach can only operate at the overall fleet level, which has implications for compliance and potential rogue activities by individual vessels.

This leads to the conclusion that to monitor the performance of a discard-reduction policy for a given fishery adequately, it is necessary to use *in situ* performance measures that directly observe the level of discarding on individual vessels, not the *ex situ* proxies. This has implications for the tractability of policy objectives in results-based management and the associated audits required to monitor success. The current 1% observer coverage in Irish waters implies a difficult and expensive 100-fold increase to achieve full monitoring. Another important conclusion is the vital need to understand the purpose and objectives of a discard-reduction policy before it is implemented, to decide sensibly between *in situ* or *ex situ* metrics.

Environmental impacts of fishing and burden-of-proof implications

The main environmental impacts from fishing have been identified in a Quality Status Report as the removal of commercial or other species, and habitat damage and loss (OSPAR, 2010). A similar evaluation was made for Australian fisheries (Pascoe *et al.*, 2009), where the key environmental pressures were bycatch and habitat damage. The primary objective stated by Pascoe *et al.* (2009) was to minimize environmental impacts. The implications of reversing the burden of proof for each of the more specific impacts noted above are considered below.

Removal of commercial fish and shellfish

In its current form, EU fishery management focuses on the removal of commercial fish species. The declared objective is to exploit stocks at maximum sustainable yield using biomass (B) and fishing mortality (F) as the main *ex situ* indicators. The scope for results-based management and co-management lies in the way the TACs might be taken (Lassen *et al.*, 2008), as in the proposed sustainable-fishing plans to be developed by industry (Commission of the European Communities, 2010). *In situ* indicators would involve on-board monitoring of catches and catch rates. Reversal of the burden of proof would require a monitoring and auditing scheme robust to manipulation by fishers.

Removal of non-commercial fish and shellfish

Essentially, this pressure concerns organisms caught while fishing, but then discarded. There is little or no stock information for many of these species, and often a poor understanding of their role in the ecosystem, making the development of robust indicators very difficult. For a few species, it may be possible to estimate B and F, but with the attendant problem that they are also subject to non-fishing factors such as recruitment, growth, natural mortality (including predation), and disease. Therefore, fishing would not be the only factor affecting B and F, and it would seem likely that only *in situ* indicators, i.e. rates and weights of discards by vessel, would be appropriate.

Habitat damage and loss

Pascoe *et al.* (2009) showed that habitat damage had a broadly similar weighting to bycatch issues across a wide range of stakeholder perceptions. The key problem for the development of objectives, indicators, and management strategy is the difficulty in quantifying the impact of fishing on seabed habitats. There have been many local, usually short-duration, studies aimed at quantifying this impact (Kaiser *et al.*, 2006). Based on these studies, it would be theoretically feasible to develop a range of habitat indicators that could be monitored to evaluate fishing impacts, e.g. on functional epibenthos groupings (de Juan *et al.*, 2009). There are several difficulties in this approach to fishery management. First, as with other *ex situ* indicators, various factors can change the indicator levels. Second, there may again be a considerable delay between the pressure and the indicator response. Most critically, however, it would almost certainly be prohibitively expensive to monitor such indicators routinely and reliably, e.g. using research vessels.

An alternative way to reverse the burden of proof for fishery-related habitat damage would be to use the spatial and temporal pattern of fishing activity as the indicator. If the main objective is to minimize habitat damage, it may not be necessary to know the exact state of these habitats. Fishing-effort data are available via VMS (Lee *et al.*, 2010; Gerritsen and Lordan, 2011), which determine when a vessel is fishing. Model-based approaches linking fishing activity to the benthos (e.g. Hiddink *et al.*, 2006) could then allow the predicted impact of the observed fishing activity on benthic biomass and production to be calculated. This could also include assessments of the sensitivity of particular habitat types to disturbance by fishing (Hiddink *et al.*, 2007). The calculations could be partitioned by gear type, ranging from dredges, through beam and otter trawls, to seines and passive methods. This indicator would be relatively simple to use for management purposes, and it is immediately available. There would be considerable scope for co-management, because there would often be several possible routes to a mutually agreed objective. Given a matrix of habitat and gear types, and an objective of reducing habitat damage, a number of management options (e.g. allow only low-impact gears on sensitive habitats, reduce fishing effort) could be explored using the VMS data and models to predict what each option might achieve in terms of the objective. The burden of proof would require industry to develop fishing plans capable of delivering the objective, and VMS would allow compliance to be demonstrated at the level of an individual vessel. This approach could form part of the pre-approval process for the industry's proposed sustainable fishery plans in a new CFP. The key to this approach probably lies in all parties being willing to trust the models. However, even that may not be essential, provided they were willing to agree on interpretations. For instance, it would probably be relatively easy for everyone to agree that deploying beam trawls on *Lophelia* beds is more environmentally damaging than fishing crab pots on sand.

Some Irish fisheries and the potential for reversing the burden of proof

The herring fishery in the Celtic Sea (ICES Areas VIIj, VIIg, and VIIa south; Figure 1) targets autumn and winter spawning aggregations. It is almost completely an Irish fishery with 86% of the TAC. Approximately 72 Irish vessels ranging in size from 10 to 45 m currently participate in the fishery.

The fishery has shown typical pelagic boom and bust cycles; it is managed under a system of weekly individual-vessel quotas and seasonal closed areas. Since 2007, a rebuilding plan jointly developed by scientists and the Celtic Sea Herring Management Advisory Committee (CSHMAC) has been in place. The stock has shown signs of recovery, with significant quota increases in each of the past 2 years. The rebuilding plan may soon be replaced by an LTMP, which is in the process of development through the CSHMAC.

The fishery is already co-managed to a certain degree through the CSHMAC, which has an industry–science partnership structure to facilitate the development of new management measures. As the incentive for discarding or slipping fish has largely disappeared with the decline in the market for herring roe, the main bycatch concerns are accidental catches of protected species, although these are believed to be rare (ICES, 2009a, 2010a). The fishery is currently in the Marine Stewardship Council (MSC) evaluation process, and as part of this, an observer programme is being developed to monitor cetacean bycatch and fish discards. There is also a sentinel fishery that involves small vessels fishing to a limited extent within an otherwise closed spawning area, supplying scientists with valuable samples of the spawning component of the stock.

Therefore, given the strong industry participation in management and research, limited discard problems, and the nascent observer programme, the Celtic Sea herring fishery appears to be an excellent candidate for reversing the burden of proof.

Aran *Nephrops* fishery

The *Nephrops* fishery on the Aran Grounds in Area VIIb (Figure 1) is well established, having been exploited since the mid-1970s, but it has been exclusively an Irish fishery only since around 1988. Currently, there are 12 large whitefish vessels (>15 m) and another eight smaller, weather-dependent vessels in the fleet. Most of these operate from the port of Rossaveal on the west coast of Ireland (the star in Figure 1). Landings from the Aran Grounds in recent years have been ~700–900 t.

Currently, a single TAC is applied to the overall *Nephrops* fishery in Area VII, which includes stocks (classified by ICES as functional units) in the Irish Sea, Porcupine Bank, SW Ireland, and the Celtic Sea in addition to the Aran Grounds (Figure 1). Despite the adoption of various technical measures, the gear used is still largely unselective for the target species, *Nephrops*, as well as for the most common bycatch species such as haddock and hake.

There is just one target species in the fishery, which operates in a well-defined inshore area, and the participating vessels land mainly into a single port and through one cooperative. The major problem in the fishery is the substantial discarding of fish and small *Nephrops*. The *Nephrops* assessment is based on an underwater TV survey, the length composition of catches, and the landings per unit effort (ICES, 2010b).

Compared with Celtic Sea herring, there are more significant discard issues in the Aran *Nephrops* fishery. Nevertheless, the latter could be managed using a results-based approach because of its relatively simple structure, i.e. it has a single target species, is spatially confined, and the vessels are based mainly in one port. The main incentives for reversing the burden of proof in this fishery would be increased autonomy for fishers, who would have more control of their local fishery, a reduced need for top-down micromanagement, and the potential for facilitating certification from a body such as the MSC.

Celtic Sea whitefish

The whitefish fishery in the Celtic Sea, located in ICES Areas VIIg and VIIj (Figure 1), is highly diverse, and targets mainly cod, haddock, and whiting. Many vessels from Ireland, France, the UK, and Belgium are involved, ranging in size from 10 to 40 m, using a variety of gears including otter trawls, beam trawls, gillnets, and Scottish seines. Currently, the fishery is managed by TACs and quotas. In addition, since 2005, there have been seasonal closures of three ICES statistical rectangles because they contain important spawning areas for cod, as well as a range of gear-based technical measures. Discarding is believed to be considerable for all species, driven *inter alia* by restrictive TACs and poor gear selectivity (Rochet *et al.*, 2002; Borges *et al.*, 2005). The current scientific advice for the major whitefish stocks in this area is uncertain (ICES, 2009b).

Compared with the Celtic Sea herring and Aran *Nephrops*, this is a much more problematic fishery. The potential for implementing results-based management would be influenced by the target species, fleet, gear, and spatial and management structure complexity. There are, however, positive examples of co-management in the fishery. The seasonal closure currently in place was the result of a transnational industry initiative, and there are active discussions between industry and scientists, facilitated through the North Western Waters Regional Advisory Council in developing an LTMP for whitefish in the Celtic Sea.

Conclusions

In the report from a recent workshop on reversing the burden of proof (Lassen *et al.*, 2008), a hierarchy of objectives was described, and the appropriateness of the approach was assessed. The workshop concluded that reversing of the burden of proof was only appropriate at lower operational levels, but that at higher levels, the burden should be a governmental or societal responsibility. Building on that concept and the analysis of the issue presented here, a similar sliding scale is evident as regards the reversibility of the burden of proof, when moving from the operational level (*in situ* or vessel) to the ecosystem level (*ex situ*). In any situation where an ecosystem impact requires assessment and monitoring, it is difficult to see how the fishing industry alone can deliver a satisfactory demonstration of sustainability. This has obvious consequences for the gradual implementation of an ecosystem approach to fishery management, and begs some questions in relation to terminology. The phrase "reversal of the burden of proof", although having a very specific meaning in legal usage, is misleading in both intent and its applicability in fishery management. It could be more helpfully and accurately substituted with "sharing the burden of proof", or the less ominous but more aspirational "shared demonstration of sustainability".

Discussions with fishers and industry representatives have revealed that at least two factors are important when determining the capacity for a reversal in particular fisheries: (i) the complexity and multispecies nature of the fishery, and (ii) the pre-existing management regime and the extent to which industry is already involved in quota management. Industry representatives felt that because the complexity and capacity for self-management varies greatly between fisheries, results-based management cannot be considered as a universal solution, so its application should be considered on a fishery-by-fishery basis. Additionally, the cost of implementing more-comprehensive observer or electronic-monitoring programmes and the issue of who would bear that cost burden are important concerns for the industry. The implications of the above conclusion may be that reversing the burden of proof could be introduced on an incremental and experimental basis, building on progressive fisheries that have already done this to some extent, whether voluntarily or as a result of legislative or market drivers.

The issue of geographic scale is an important consideration in reversing the burden of proof. At too large a scale, particular issues relevant to local fisheries may be missed, with the result that affected fishers may not see any incentive in assuming greater responsibility. At too small a scale, e.g. where national approaches differ markedly within a single fishery, there is more potential for conflicts between fishers and managers. However, such a situation may go some way towards answering questions about industry attitudes towards results-based management compared with the more traditional top-down scenario. Should the implementation of results-based management be at the discretion of individual EU Member States within the new CFP, at the very least an interesting natural experiment in fishery-policy analysis will have been created.

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