



NSRAC Position Paper: February 2011

Development of a coherent and logical approach towards Maximum Sustainable Yield (MSY)

This Position Paper sets out to define the position of the NSRAC on Maximum Sustainable Yield. It is intended for the Commission, Member States and the Parliament. The paper points out that MSY has long been recognised by scientists and economists as a flawed concept. There is a need to redefine it more carefully, in operational terms.

In 2010 ICES provided an MSY option within its advice for North Sea stocks, aimed at achieving an MSY target by 2015. A single target value was selected for fishing mortality. ICES made it clear that its advice was based upon single-species or stocks. The advice ignored that fish are caught together with others in a mixed fishery. It ignored that fish eat other fish.

Whilst we fully support the principle that fisheries should be managed in a sustainable way, we have concerns that some significant issues, raised by ICES scientists themselves, are not being taken into account in the move to achieve MSY targets. We highlight these concerns, and suggest a way forward consistent with Member States' commitments. We also comment on the importance of social and economic factors in achieving sustainable fisheries.

The NSRAC proposes that North Sea fisheries should be managed in the future through carefully prepared long-term management plans. Targets to achieve sustainability should be set fishery-by-fishery as part of plans agreed by stakeholders. A regional or local approach is also required. Our vision is that long-term management plans should be developed for the different fisheries within the North Sea, taking account of the mixed nature of these fisheries.

We believe such plans can be implemented before 2015 and would welcome the support of the Commission, Member States and Parliament in bringing this about.

1. Context

- 1.1 In November 2010 a draft paper on MSY, prepared with assistance from independent scientists, was considered by the NSRAC Demersal Working Group. The Working Group agreed that the move by the Commission towards MSY by 2015 would imply a series of severe quota reductions over a short time period. This may not have been envisaged when Ministers agreed to adopt MSY in 2002.

- 1.2 The focus of the current proposals for implementing MSY is based on fishing mortality rates (F_{MSY}) calculated for single stocks in isolation. The practical reality is that different species are caught together in mixed fisheries, and the capture of one species affects the capture of others. An imposed decrease in fishing mortality for one species will inevitably result in a decrease in fishing mortality for other species, which may be more abundant. Moreover, one species of fish eats another, and any increase in the numbers of predators will affect the abundance of prey and *vice versa*. Any increase in biomass of the predator will lead not only to an increased yield of that species but also to decreases in the F_{MSY} of its prey, confronting management with decisions between the exploitation levels required for different species. Single species F_{MSY} targets will not be achieved simultaneously.
- 1.3 It has long been recognised by scientists and economists that MSY is a flawed concept. Sidney Holt, in a report prepared for the WWF¹ has pointed out that scientists and economists have for decades strongly – and rightly – challenged MSY. He suggests that there is a need to redefine the MSY concept and the notion of sustainability, in operational terms. However, MSY has found its way into the wording of international legislation, and some way has to be found to conform to that legislation. The current proposals from ICES ACOM, questioned by many ICES scientists but endorsed by the Commission, fail to take account of major fishery and biological interactions, and the values themselves are subject to significant uncertainty. Even within a single species fishery, there is considerable variation in the estimated level of fishing mortality that will achieve MSY in the long term and ICES has noted that a range of values applies. This approach is illustrated by a figure produced by Michel Goujon.

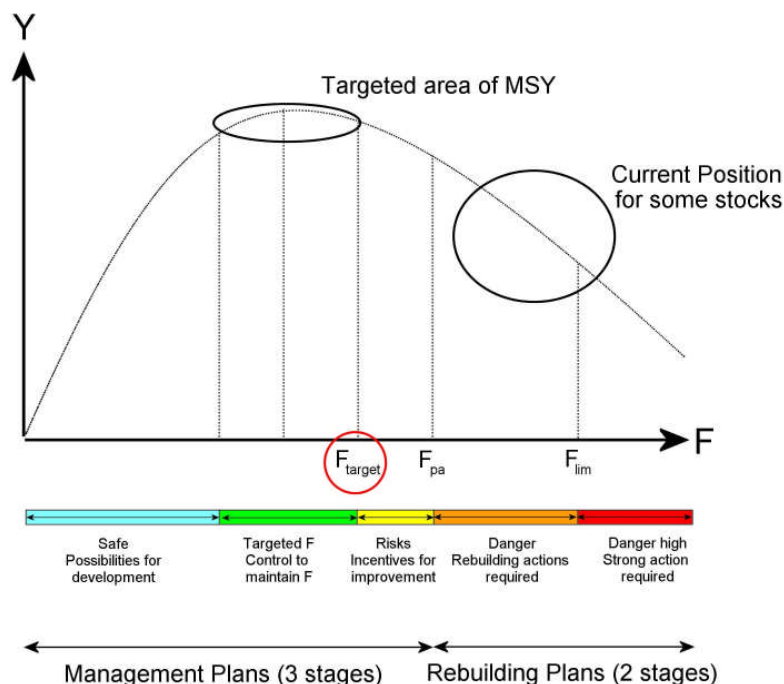


Figure 1. It is important to agree robust harvest control rules with stakeholders, which will move fisheries in the desired direction by defining an area, with upper and lower boundaries, to aim for. Absolute values are not important; it is the direction of travel that is paramount.

¹ Sidney Holt (2007). New Policy Objectives and Management Procedures for EU Fisheries. A briefing paper prepared for the European Policy Office of the WWF

- 1.4 The NSRAC has considered the MSY concept in detail. At a Focus Group in August 2005 the NSRAC supported a move towards a long-term approach to fisheries management: an approach that moved away from large reactive changes in management towards a more stable regime based on fishery management plans. The Group endorsed the benefits of moving towards low F, high yield fisheries. However, it pointed out that the Commission was placing too much emphasis upon single stock management. The Commission should embrace the need to manage the fisheries that exploit the stocks and should take multi-species interactions into account. Each fishery should be looked at on a case-by-case basis, focusing on strategic objectives for each of them. Annual management to hit F_{MSY} targets by TAC limits would almost certainly fail. It would be better to agree robust harvest control rules with stakeholders, which would move fisheries in the desired direction. As progress is achieved it would be important to provide incentives for fishers to move further in that direction.
- 1.5 Subsequently, a Joint Working Group on Long Term Management Plans with the North West Waters RAC in September 2006 decided that MSY was not a satisfactory target for mixed fisheries. Larkin and others had discredited the concept. A paper written by JJ Maguire for that Working Group noted that MSY was impractical. MSY was not stable over time and could not take account of multi-species interactions. It had limited value in the context of the mixed fisheries of the North Sea. The Group concluded that:
- Lower fishing mortalities (F) would generally bring higher yields. We should therefore be preparing long-term management plans for the major fisheries to achieve lower F values
- However, F_{MSY} offered too simplistic a target for practical use. A more satisfactory framework would be necessary.
- 1.6 The draft paper presented to the Demersal Working Group in November 2010 endorsed the approach already developed by the NSRAC. It proposed that fisheries should be managed through carefully prepared long-term management plans. The NSRAC sees the process of developing these LTMPs differently from the Commission. The Commission appears to be focusing only on the Harvest Control Rules; a small element of such a plan. We have emphasised the difference and the need to involve stakeholders in the preparation of the plans to facilitate better governance and greater buy-in from fishers. A regional or local approach is also required. Our vision has always been that LTMPs should be developed for the different fisheries within the North Sea, taking account of the mixed nature of these fisheries. We anticipate sustainable fishing rates being agreed that are appropriate for mixed fisheries and for multispecies assemblages exploited by a complex of fleets. To achieve this aim the NSRAC will need to work regionally with scientists to explore the implications of MSY for mixed and multispecies fisheries in a wider context than the current single stock approach.

2. The Commission's aim of achieving fisheries at MSY levels

- 2.1 The European Community and its Member States have subscribed to an international political commitment at the World Summit on Sustainable Development at Johannesburg (September 2002) to maintain or restore stocks to levels that can produce the maximum sustainable yield (MSY), with the aim of achieving these goals for depleted stocks on an urgent basis, and where possible not later than 2015. Other States within the North Atlantic fisheries region have made similar commitments.

- 2.2 In practice, this has been widely interpreted as the maintenance of stocks at a healthy size, fished at a rate that will, on average, deliver MSY i.e. F_{MSY} ; where MSY is defined as the largest average catch or yield over the long term that be taken from a stock under existing environmental conditions.
- 2.3 The Marine Strategy Framework Directive establishes a framework for Member States to take steps to achieve or maintain good environmental status in their marine waters. Good environmental status is to be determined on a regional seas basis. From a fisheries standpoint the Directive requires that populations of all commercially exploited fish and shellfish are to be within safe biological limits, exhibiting a population age and size distribution that is indicative of a healthy stock. Achieving or maintaining good environmental status requires that F values are at the very least equal to or lower than F_{MSY} , the level capable of producing MSY.
- 2.4 In 2010, ICES provided advice with options to achieve F_{MSY} by 2015. The advice is based upon either equal 20% reductions in current fishing rates to achieve F_{MSY} , or else an approach further moderated by additional reductions if the stock size is, in effect, below the precautionary biomass reference level (B_{PA}). To apply this model in determining the advice an actual value for F_{MSY} has to be selected.
- 2.5 Whilst we fully support the principle that fisheries should be managed in a sustainable way, we have concerns that some significant issues, themselves raised by ICES, are not being taken into account in the potential move to achieve F_{MSY} levels. We highlight these concerns, and suggest a way forward consistent with Member States' commitments. We also comment on socio-economic aspects of implementing measures to achieve MSY objectives.

3. Issues associated with implementation of the ICES model for achieving MSY by 2015

- 3.1 The ICES position is that MSY is a broad conceptual objective aimed at achieving the highest yield possible over the long term (an infinitely long period of time). The MSY concept can be applied to an entire ecosystem, an entire fish community, or a single fish stock. It is specific with respect to: (a) the biological unit to which it is applied; (b) the models used to provide scientific advice; and (c) the management methods used to achieve MSY. The choice of the biological unit to which the MSY concept is applied influences both the sustainable yield that can be achieved and the associated management options.
- 3.2 ICES say that for reasons which they will discuss later, implementation of the MSY concept will first be applied to individual fish stocks. They go on to acknowledge that in practice, MSY depends on:
- The production function of the unit, which describes the relation between productivity and the size of the unit (e.g., population biomass), which in turn depends on the growth rates, natural mortality rates, and reproductive rates of the members of the production unit;
 - Interactions between members of the production unit and interactions with other production units (intra- and inter- specific interactions);
 - Environmental conditions (e.g., climate, environmental quality), which affect the production function, and intra- and inter- specific interactions; and

- Fishing practices that determine the size and age composition of the catch (both the landings and the discards).

The F to be achieved

- 3.3 ICES scientists are developing models of fisheries interactions, and have now been doing so for some time. Earlier ICES work² has explored the sensitivity of North Sea stock sizes, and stock reference levels, to biological interactions; recent work by the ICES Mixed Fisheries working group has highlighted the complexity of managing mixtures of stocks. However, such studies have not yet informed the debate on appropriate F_{MSY} values.
- 3.4 ICES scientists make it clear that their advice is based upon single-species, or stock, considerations. The advice ignores that fish are caught together with others in mixed fisheries. It ignores that fish eat other fish. Numerous analyses, many by ICES, have shown that these issues have a significant bearing on the F_{MSY} of a stock. One study on North Sea roundfish³, found that application of an ecosystem model resulted in estimated F_{MSY} rates twice that of conventional F_{MAX} rates (i.e. the maximum of the yield per recruit curve), and estimated F_{MSY} results from the ICES MSVPA (multispecies VPA) model were twice the ecosystem rates of F_{MSY} . The study reaffirmed that in general F_{MSY} values will be higher for the main whitefish when biological interactions are included. It also concludes that single species MSYs are unlikely to be achieved through the simultaneous application of single species F_{MSY} rates.
- 3.5 Even within the estimation of single species, or stock, advice, there is considerable variation over the mean of the estimates of F_{MSY} . Two examples are given below.
1. For North Sea haddock, ICES offers a “provisional” value for F_{MSY} of 0.3. This is consistent with the Management Plan. But taking into account reasonable but different methods of estimation, ICES found other mean values of 0.25 to 0.43. These have a confidence range of 0.18 to 0.60.
 2. For North Sea cod, ICES offers a provisional value for F_{MSY} of 0.19. But they give a range of mean values of 0.16 to 0.43, stating that fishing mortalities within that range would be consistent with F_{MSY} . The current Management Plan strives for an F of 0.4.

We conclude from the above that the current proposals for single species targets fail to take account of major fishery and biological interactions, and the values themselves are subject to significant variation based on the state of the ecosystem and the models used.

- 3.6 Sidney Holt, in the paper previously mentioned, outlines the problems of trying to manage fisheries based on a classical definition of MSY, emphasising that the choice of the specific mathematical model has enormous consequences for management. He adds that there are rarely, if ever, sufficient data from nature to indicate which model is

² Report of the Study Group on Multispecies Assessments in the North Sea. ICES CM2003/D:09

³ Mackinson et. al. (2009) Mixed-fishery or ecosystem conundrum? Multispecies considerations inform thinking on long-term management of North Sea demersal stocks. Can. J. Fish. Aquat. Sci. 66: 1107–1129

most appropriate. He suggested that adaptive management procedures, properly applied to single stocks, aimed at both sustainability and stock recoveries, could be a major step forward (even if not the ultimate solution) provided that the idea of MSY and also the notion of sustainability are redefined; and that management objectives are precisely specified and accepted by stake-holders and management authorities.

The rate of approach to F_{MSY}

- 3.8 It is difficult to argue a case for achieving F_{MSY} levels over four years when the target is so unclear for the reasons given above. The rate of approach is further complicated by the Commission's wish to achieve reductions in F to F_{MSY} in five equal steps, as part of provisions which call for slower or faster cuts depending on the state of the stock. ICES scientists have also suggested greater cuts in F for stocks below B_{PA} .
- 3.9 ***The NSRAC position is that the rate for achieving any nominal F_{MSY} should be set on a fishery-by-fishery basis as part of an agreed long term management plan.***

4. Social and economic considerations

- 4.1 The rapid move, imposed by the Commission, to what are often much lower fishing mortality (F) rates than may be necessary, implies severe cuts in fishing opportunities. The economic position of much of the demersal fishing sector, already affected by severe restrictions as part of the implementation of the cod recovery plan, is not robust to years of further cuts.
- 4.2 In a report submitted to the NSRAC in 2006, commissioned from independent scientists⁴ emphasis was placed on the modern concept of sustainable development. FAO and others have stressed that it is only by taking account of ecological, economic, and social factors within an appropriate institutional structure that development can continue without exhausting natural resources. The modern concept of sustainability is seen as having at least four components: bio-ecological; social; economic and institutional. Prioritising one of the components of sustainability to the exclusion of others – for example targeting a high biomass or making profit maximisation the only goal – will not achieve sustainable fisheries. Where fishery management has been successful it has generally provided incentives to fishers, leading to behaviour that is consistent with conservation. The inclusion of objectives aimed at improving the economic and social components of sustainability should result in more rapid progress and should also bring benefits for conservation. The institutions of the Common Fisheries Policy are not well designed for achieving sustainability as they stand.
- 4.3 It is important that the social and economic position of the fishing sector be taken into account when implementing a policy that in practice is difficult to define with any certainty. As an alternative to the current MSY approach, which is seen as imposing unnecessary hardship, the NSRAC is proposing that future management of the North Sea fisheries should be based on long term management plans which take account of

⁴ Pope J, Hawkins AD, Tingley D, Mardle S, Cattermoul N. (2006) Long-term Management of North Sea Fisheries: A report to DEFRA and the North Sea Regional Advisory Council. Sea Fish Industry Authority.

the economic health of the fishery and market considerations as well as biological considerations.

- 4.4 One of the great benefits to accrue from the development of long-term management plans would be to shift emphasis from the tactical to the strategic and to limit the involvement of political actors to the development of long-term objectives rather than year to year adjustments. There is already some basis for dialogue with the Commission to develop long term management plans, and for some species we already know the direction we wish to move in. We now need to prepare more carefully thought out management plans, with an input from stakeholders. Such plans are likely to be multi-annual, regularly reviewed and based on clear analysis of the state of each fishery. Such plans will take account of the economic health of the fishery and market considerations as well as fishing mortality and other biological parameters.

5. The way forward

- 5.1 We note that the Commission is in favour of management plans from its position set out in COM(210)241: the Commission's policy for fisheries management in 2011. Some of the current management plans have been developed with input from the fishing industry. However we see the process of developing long-term management plans rather differently from by the Commission. There are three key considerations the NSRAC thinks are essential for the success of management plans. These elements are:

- Full stakeholder participation in their preparation
- Their development within regional sea basins, like the North Sea
- Adequate support in terms of scientific and economic advice

- 5.2 The NSRAC has already embarked upon the preparation of long-term management plans for the *Nephrops* and whiting fisheries of the North Sea – with extensive stakeholder participation. Only by consulting those affected by the management measures can we produce plans with industry buy-in, with adequate incentives for fishers to accept conservation measures, and with full analysis of the social and economic consequences.

- 5.3 A key theme in the discussions surrounding CFP reform is to provide greater opportunity for delegated responsibilities to regions and the fishing industry. This will facilitate better governance, and result in plans that are tailored to specific regional sea conditions. We see management plans being developed for fisheries within particular regional seas, taking account of the mixed nature of those fisheries. We see sustainable fishing rates being agreed that are appropriate for mixed fisheries and for multispecies assemblages with a complex of fleets. Those plans should be adaptive and take account of lessons learned.

- 5.4 The NSRAC already has experience of taking management plans round the fishing ports and discussing them with the fishers who will be affected by their provisions. That experience has demonstrated the value of integrating scientists and economists into that process; in part to explain the proposals and in part to help develop ideas that come forward from fishers themselves. Currently, the RACs do not have the resources to achieve the level of scientific and economic support that is required.

- 5.5 Additional scientific effort is also required to take the current concept of MSY, which is limited to a single species context, and to extend its relevance and applicability to mixed fisheries, taking account of multispecies interactions, and ecosystem, economic and social factors. As Sidney Holt has pointed out there is a need for a redefinition of the MSY concept and the notion of sustainability in operational terms. Such a redefinition is essential if future management plans are to have sensible and appropriate objectives.
- 5.6 Management plans developed by the RACs for particular regional seas would include a set of fishing mortality rates consistent with the requirements of fish stocks and the fishing fleets. The plans would deliver sustainable catches within a redefined concept of MSY. The plans would also have full regard for the economic health of the fisheries and conditions on the fish markets. The instruments and measures within the plan would be developed with the participation and support of all the interested parties. We believe such plans can be implemented before 2015 and would welcome the support of the Commission, member States and Parliament in bringing this about.

6. Summary

- 6.1 The NSRAC welcomes the Commission's aim of restoring fish stocks to achieve yields that are sustainable. However, it does not support current proposals for implementing MSY based on fishing mortality rates (F) for single stocks. Such proposals fail to take account of the mixed nature of the fisheries and do not accommodate biological interactions. The target values for fishing mortality chosen have been selected arbitrarily and the values themselves are subject to significant uncertainty. The rapid move, imposed by the Commission to much lower fishing mortality (F) has resulted in severe cuts in fishing opportunities with adverse consequences for fishers.
- 6.2 The Commission, with help from ICES scientists must seek a workable approach to the MSY concept. The way MSY is currently being handled is inappropriate and must be modified. The consideration of sustainability must be widened to take social and economic factors into account. The Commission should embrace the need to manage the *fisheries* that exploit the stocks, looking at each fishery on a case-by-case basis, and focusing on developing strategic objectives for each of them. The NSRAC position is that the rate for achieving any nominal F_{MSY} should be set fishery by fishery as part of an agreed long term management plan.
- 6.3 Many benefits will accrue from the development of long-term management plans. Not least, there would be a shift in emphasis from the tactical to the strategic and from the short-term to the long-term. Year to year adjustments would be minimal.
- 6.4 The Commission has already announced that it is in favour of management plans in its policy for fisheries management in 2011. We must now go ahead and develop those management plans.
- 6.5 The first requirement is to seek the full involvement of stakeholders. The NSRAC has already embarked upon the preparation of long term management plans for *Nephrops* and for whiting – with extensive stakeholder participation. It has already taken the *Nephrops* plan around the fishing ports and discussing them with the fishers who will be affected by their provisions.
- 6.6 The second requirement is to develop the plans within actual sea basins, and to provide greater opportunity for delegated responsibilities for the management of fisheries to the regions. Our vision is one of management plans being developed for

fisheries within particular regional seas, like the North Sea, taking account of the mixed nature of those fisheries.

- 6.7 The final requirement is to integrate both biological scientists and economists into the process of developing the management plans. Currently, the RACs do not have the resources to obtain the level of scientific and economic support that is required. Expert advice is needed to extend the relevance and applicability of MSY to mixed fisheries, taking account of multispecies interactions. The plans must also have full regard for the economic health of the fisheries and conditions on the fish markets and therefore requires assistance from economists.
- 6.8 The NSRAC aims to implement the new fishery management plans for the North Sea before 2015 and seeks the support of the Commission, Member States and Parliament to achieve this end.