

Implementing Maximum Sustainable Yield in EU fisheries

At the World Summit on Sustainable Development (WSSD) in Johannesburg in 2002, EU member states committed themselves to maintaining or restoring fish stocks to levels that can produce Maximum Sustainable Yield (MSY) no later than 2015. The philosophy behind this approach is to obtain the maximum long term catch, ensuring that stock size is kept large enough to maintain productivity.

In accordance with this, the EU has issued a number of recent communications outlining their proposals on how to implement this objective. It proposes a series of long-term plans which will bring all major EU fish stocks in line with this target. In the short-term however, if these targets are to be realised, this will need considerable reductions in fishing mortality from current levels for the majority of the stocks exploited by Irish vessels.



What does this concept mean? In general terms, when a stock level is low, the amount that can be harvested is limited because of a lack of adult fish, which in turn produces too few fish that are able to replenish those that have been removed (recruitment overfishing) or where the recruits to a fishery are caught before they reach maximum or commercial size (growth overfishing). On the opposite end of the spectrum, when a stock is excessively large yield is restricted; the growth of the stock slows down due to competition for food, cannibalism or the limitations in the carrying capacity of the environment. In between these two states lies a stock size at which the sustainable catch is at the highest level – the maximum sustainable yield.

Due to inherent problems of estimating the biomass required to reach MSY; because of uncertainties in the relationships between stock size and recruitment and general variability in the marine environment, MSY is difficult to estimate. The EU are likely to adopt the more pragmatic

approach of using F_{msy} or $F_{0.1}$ for a proxy for F_{msy} (see glossary for definition) the level that provides the maximum yield-per-recruit. Fishing mortality that produces the maximum yield from one recruit is termed F_{max} .

In its overview of European stocks, the European Commission identified 81% (35 out of 43 assessed stocks) as being overfished in respect to MSY. The extent of overfishing in European fisheries, using fishing mortality relative to F_{max} or $F_{0.1}$, is on average from two to five times the level of fishing mortality needed to result in maximum yields. Therefore only eight of the stocks assessed currently meet the MSY criteria. Of interest to Irish fisheries, Irish Sea plaice, West of Scotland Herring and Mackerel are close to or at the F_{msy} .

So what does this mean in practice? The principals outlined above are conceptually fine when considered in a steady state, single species context. However, when considering multi-species fisheries, which encompass the majority of Irish demersal fisheries, it is not possible to fish all species at F_{msy} simultaneously. Some of the stocks exploited by the Irish fleets are relatively healthy (close to or at $F_{msy}/F_{0.1}$) while others, taken in the same fisheries are subject to recovery plans because of poor stock health. Irish Sea plaice is at MSY while the stock of sole is giving cause for concern yet they are both taken in the beam trawl fishery, similarly *Nephrops* are exploited at a sustainable level while cod, which is taken as a by-catch, has been subject to a recovery plan since 2001. In such circumstances, the yield from the healthy stock will be limited (below MSY) in order to bring down the fishing rate on the other.

Given the status of some Irish stocks it is impractical within the time frame of 2015, to expect that all stocks will achieve the goal of being fished at $F_{0.1}/F_{msy}$. For example West of Scotland cod, is highly unlikely to reach this target as current advice only predicts stock recovery to B_{pa} by 2015, based on zero catch.

However, as an overall long-term management goal, the objective of exploiting stocks at F_{msy} will result in greater catch stability and therefore more stable year on year profitability for the fisheries. However, in order to reach this, fishing mortality for many Irish stocks caught in mixed fisheries will have to be reduced substantially in the medium term and during this time less than maximum yield will be derived from those that are comparatively healthy. These stocks are highlighted in the general overview of stocks shown in table 1.

Table 1 State of fisheries resources of Irish interest with respect to highest sustainable yield.

Species	ICES Evaluation of exploitation in relation to long term yield	ICES Area	Recent Fishing Mortality	F0.1	Fmax
Anglerfish <i>L.piscatorious</i>	Overexploited	VIIb-k, VIIIa,b	0.211	0.051	0.086
Anglerfish <i>L.budegassa</i>	Overexploited	VIIb-k, VIIIa,b	0.226	0.086	0.135
Anglerfish	Unknown*	VI, IV	-	-	-
Cod	Overexploited	VIIe-k	0.807	0.207	0.333
Cod	Overexploited	VIIa	1.03	0.18	0.31
Cod	Overexploited	VIa	~1.100	0.132	0.191
Haddock	Unknown*	VIIb-k	-	-	-
Haddock	Overexploited	VIIa	-	0.19	0.35
Haddock	Overexploited	VIb	0.65	0.18	0.43
Haddock	Overexploited	VIa	0.493	0.118	0.176
Herring	Unknown*	VIaN	-	0.16	-
Herring	Sustainable	Norwegian SS	0.096	-	-
Herring	Unknown*	VIIaN	-	-	-
Herring	Unknown*	VIIaS VIIg VIIj	-	-	-
Herring	Unknown*	VIaS VIIb	-	-	-
Hake	Overexploited	Northern	0.237	0.095	0.165
Horse Mackerel	Unknown	Northern	-	-	-
Horse Mackerel	Unknown	Western	-	-	-
Mackerel	Overexploited	NEA	0.26	0.19	-
Megrim	Unknown	VI*	-	-	-
Megrim	Unknown	VIIb-k, VIIIc,b,d	-	0.161	0.269
Nephrops	Unknown	VIa	-	-	-
Nephrops	Unknown	VIIa	-	-	-
Nephrops	Unknown	VIIb,c,j,k	-	-	-
Nephrops	Unknown	VIIg,f,h	-	-	-
Norway Pout	Unknown	VIa	-	-	-
Plaice	Unknown	VIIb,c	-	-	-
Plaice	Unknown	VIIh-k	-	-	-
Plaice	Overexploited	VIIg,f	0.501	0.153	0.315
Plaice	Overexploited	VIIe	0.7	0.1	0.23
Plaice	Sustainable	VIIa	0.12	0.13	0.36
Saithe	Overexploited	IV, VI	0.24	0.1	0.22
Sole	Overexploited	VIIg,f	0.494	0.126	0.274
Sole	Unknown	VIIb,c	-	-	-
Sole	Unknown	VIIh-k	-	-	-
Sole	Overexploited	VIIa	0.298	0.208	0.401
Blue Whiting	Overexploited	Combined	0.48	0.2	-
Whiting	Overexploited	VIIe-k	0.533	0.16	1.36
Whiting	Unknown*	VIIa	-	-	-
Whiting	Unknown	VIb	-	-	-
Whiting	Unknown*	VIa	-	-	-

* the recent estimates of mortality are uncertain but FSS considers that the F is well above any potential F_{msy} proxy

The table indicates that recent fishing mortality is well above F_{msy} for most of the stocks of interest to Ireland.