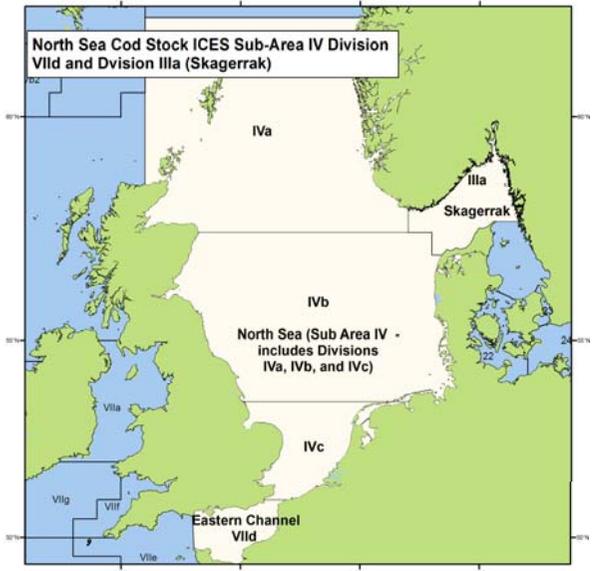


## Glossary

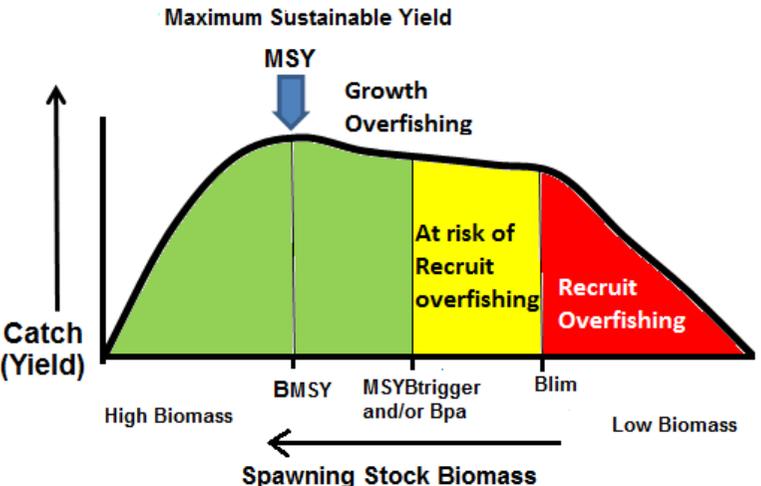
Term	Definition
Acoustic surveys	Acoustic surveys use sonar returns to estimate shoal size and abundance indices predominantly for pelagic stocks
Action point or trigger point or level	Level below which managers are expected to take action to reduce risk to stocks
Age determination	Age determination of fish is carried out by sampling and reading their otoliths or ear bones or other hard structure which lay down annual rings. The resulting determinations are used to estimate growth rates and age structures of stocks which are then used in analytical assessments
Benthic organisms or benthos	Organisms which live on or in the seabed. Epi-benthos live on the seabed, infauna live in sediments
Biogenic reefs	Biogenic reefs are made up of hard matter created by living organisms. The reefs are raised above the seabed. Reefs can grow to be several metres in height and diameter, providing important habitat for a number of species, contributing to biodiversity
BMSY	Biomass at Maximum Sustained Yield (MSY). Biomass corresponding to Maximum Sustainable Yield based on a stock assessment. Often used as a biological reference point in fisheries management, it is the calculated long-term average biomass value expected if fishing at FMSY. See Reference points for Biomass and Fishing Mortality and Maximum Sustainable Yield.
Bycatch	Or by-catch. Organisms affected incidentally in addition to the target species towards which fishing effort is directed. It may or may not be retained by the gear. Some of the bycatch may be returned to the sea as discards
Catch-per-unit-effort	Quantity of fish is caught per hour's fishing –catch-per-unit-effort (CPUE) - as an index of stock abundance. Research Vessels make estimates of abundance using constant units of effort over time. CPUE from commercial catches can also be used, but the units of effort may vary over time due to technical and behavioural changes in the fishery.
Confidence intervals	Confidence intervals (CI) consist of a range of values (interval) that act as good estimates of an unknown population parameter. Thus a '95% confidence interval' means that we have estimate that a parameter is somewhere between these limits. However there is a 5% chance that it is outside the limits
Control	Control describes management measures designed in place to protect the stock from overexploitation; effort and catch controls, closed areas and other measures; see also RASS scoring guidelines
Demersal	Fish that live on or near the seabed
Density dependent	When a population behaves in a different way at different densities. Density dependent growth; when there are high densities of a given population, average growth may be restricted due to reduced food or other resources available to individuals. There may also be density dependent effects on recruitment; high densities of larvae and young fish may

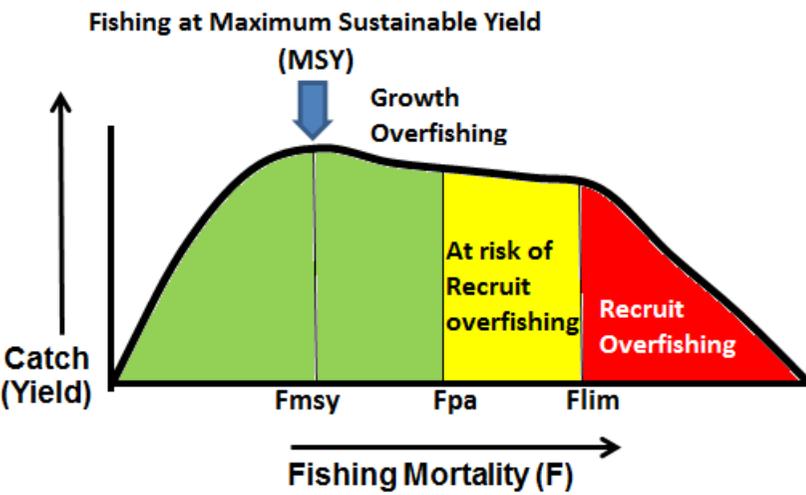
Term	Definition
	experience higher mortality, so recruitment of young fish may not always be proportional to the Spawning Stock Biomass.
Discards	Discards are those components of a catch thrown back after capture. Normally, most of the discards can be assumed not to survive. However, some species can survive capture and discarding and this is discussed in the specific profiles.
Ecoregion	Areas of relatively homogeneous species composition, clearly distinct from adjacent systems. The species composition is likely to be determined by the predominance of a small number of ecosystems and/or a distinct suite of oceanographic or topographic features.
Egg surveys	Egg surveys collect plankton samples of fish eggs at spawning time. The quantity of eggs is estimated across the whole of the spawning area. The fecundity (number of eggs per female) of the fish is estimated and the size of the Spawning Stock Biomass can therefore be estimated from these data and the sex ratio of the stock.
Exploitation rate	The proportion of the biomass removed by fishing in given time; eg an exploitation rate of 20% per annum means that 20% of the biomass is removed by fishing per year
FAO areas; sub areas; Divisions etc	FAO designates Major Fishing Areas for Statistical Purposes; see <a href="http://www.fao.org/fishery/area/search/en">http://www.fao.org/fishery/area/search/en</a> . For example the Northeast Atlantic is designated as FAO 27. Within these Major Fishing Areas, Sub Areas and Divisions are designated. Within the area covered by ICES assessments (Northeast Atlantic) the Sub Areas and Divisions are designated by Roman numerals and letters eg The North Sea is Sub Area IV and Divisions IVa, IVb and IVc. The divisions may be further broken down into Sub divisions using Arabic Numerals; the Baltic is divided into Sub divisions 24 to 32. Not all of the Major Fishing Areas are broken done to the same extent as the Northeast Atlantic and the use of Roman and Arabic Numerals is not universal; See Fish Stock; Management Stock
Fish Stock; Biological Unit Stock	A relatively homogeneous and self-contained sub population of a species, whose losses by emigration and accession by immigration are, if any, minimal in relation to the rates of growth and mortality. Fisheries scientists use various indicators such as data from tagging studies, morphological differences, genetic markers, to assess the characteristics migratory behaviour and other characteristics of biological unit stocks.
Fish Stock; Management Stock	<p>Ideally the management unit for fish stocks would be the biological unit stock, thus implying that the particular population is more or less isolated from other stocks of the same species and hence self-sustaining. However, fisheries' managers may manage fisheries on several biological stocks or species within an area as a combined management stock. In some cases biological stocks are split between management areas. Where these aspects are considered important in relation to stock assessment they are discussed in the assessment reports. For RASS the risks associated with the management stocks not coinciding with biological unit stocks are discussed under the 'Stock management' heading.</p> <p><b>Example of a management stock;</b> Cod in ICES Sub-area IV, Division VIId &amp; Division IIIa (Skagerrak). This refers to cod in ICES Sub area IV which is the North Sea, Division VIId which is the eastern English Channel Division IIIa which is the Skagerrak;</p>

Term	Definition
	
<p>Fisheries Management Organisation also described as a Regional Fisheries Management Organisation</p>	<p>Institution responsible for fisheries management, including the formulation of the rules that govern fishing activities. The fishery management organization, and its subsidiary bodies, may also be responsible for all ancillary services, such as the collection of information, its analysis, stock assessment, monitoring, control and surveillance (MCS), consultation with interested parties, application and/or determination of the rules of access to the fishery, and resource allocation. Also called: Fishery management arrangement.-</p> <p><i>Fisheries management authority</i> is the legal entity which has been assigned by a State or States with a mandate to perform certain specified fisheries management functions.</p>
<p>Fisheries Management Plan</p>	<p>A fishery management plan is a formal or informal arrangement between a fishery management authority and interested parties which identifies the partners in the fishery and their respective roles, details the agreed objectives for the fishery and specifies the management rules and regulations which apply to it and provides other details about the fishery which are relevant to the task of the management authority. For the many fisheries, parties exploiting the stock have management plans, and scientific advice is provided on catches that are compatible with such plans; eg fishing mortality corresponding that agreed in the the plan; <b>Fmp</b> or Biomass corresponding to that agreed in the plan <b>Bmp</b>.</p>

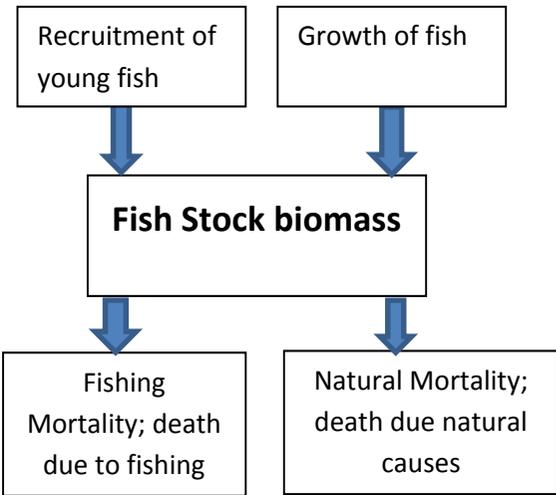
Term	Definition
Fishery	A fishery is an activity leading to harvesting of fish defined by the species caught, gear, sea area and species or group of species under a given management regime.
Fishing mortality (F)	A technical term which refers to the proportion of the fish available being removed by fishing in a small unit of time; e.g. a fishing mortality rate of 0.2 implies that approximately 20 percent of the average population will be removed in a year due to fishing. Fishing mortality can be translated into a yearly exploitation rate expressed as a percentage, using a mathematical formula.
FMSY	Fishing Mortality at Maximum Sustained Yield (MSY). Biomass corresponding to Maximum Sustainable Yield based on a stock assessment. Often used as a biological reference point in fisheries management, it is the calculated long-term average biomass value expected if fishing at FMSY. See Reference points for Biomass and Fishing Mortality, Maximum Sustainable Yield
Functional Unit (Nephrops)	Functional Units of Nephrops stocks are considered to be biological unit stocks (see biological unit stocks). However, some management stocks of Nephrops fisheries encompass several Functional Units; the implications of this are discussed in the appropriate profiles.
ICES	International Council for Exploration of the Sea; International Scientific body responsible for co-ordinating and carrying out stock assessments in the Northeast Atlantic. Also co-ordinates scientific research on other aspects of marine science; eg ocean circulation, contaminant levels and marine ecology to list a few of their activities.
Index of Mature Biomass	This is an index of the total weight of mature fish in the stock derived from catch-per-unit-effort data from research vessel surveys. It can be used as a proxy (substitute) for spawning stock biomass in data limited assessments
Individual Fishing Quota (IFQ)	See Quota.
Infauna	Aquatic animals that live in the substrate of a body of water, especially in a soft sea bottom
Maerl beds	Maerl is a collective term for several species of red seaweed, with hard, chalky skeletons. It is rock hard and, unlike other seaweeds, it grows as unattached rounded nodules or short, branched shapes on the seabed. Like all seaweeds, maerl needs sunlight to grow, and it only occurs to a depth of about 20- 30m. Maerl beds are an important habitat for many different types of marine life, which live amongst or are attached to the surface of Maerl, or burrow in the coarse gravel of dead maerl beneath the top living layer. Maerl beds can be of importance to sustainable fisheries, providing nursery grounds for commercial species of fish and shellfish and is important for biodiversity.
Maximum Sustained Yield (MSY)	The highest theoretical equilibrium yield (catch) that can be continuously taken (on average) from a stock under existing (average) environmental conditions without affecting significantly the reproduction process. Also referred to sometimes as

Term	Definition
	potential yield. For species with fluctuating recruitment, the maximum might be obtained by taking fewer fish in some years than in others. Also called: maximum equilibrium catch (MEC); maximum sustained yield; sustainable catch.
Monitoring	Monitoring describes the range of activities concerned with obtaining information on the status of the stocks. It ranges from collection of catch and other data on the fisheries activities, research vessel surveys to stock assessments; see also RASS scoring guidelines
NOAA	National Oceanic and Atmospheric Administration; American government agency responsible for stock assessments
Overfished	A stock is described as overfished when the biomass is below an agreed reference point; usually BMSY; see Reference points for Biomass and Fishing Mortality
Overfishing	Overfishing of a stock occurs when the fishing mortality is above an agreed reference point; usually FMSY; see Reference points for Biomass and Fishing Mortality
Pelagic	Fish that live in the mid water
Quota	An individual fishing <b>quota</b> (IQ or IFQ) is an allocation to a nation, individual (a person or a legal entity (e.g., a company)) of a right [privilege] to harvest a certain amount of fish in a certain period of time. It is also often expressed as an individual share of an aggregate <b>quota</b> , or Total Allowable <b>Catch</b> (TAC).
Recruitment	Recruitment is defined as the number of fish in the youngest age group of interest. Usually this is the age group corresponding to the youngest fish in the catch.
Reference points	Reference points are used order to inform Fisheries' managers of the implications of their decisions. Reference points used by ICES in the North East Atlantic and NOAA are described below, and their implications for stocks are described below.
Reference points for Biomass used by ICES; BMSY, MSYBtrigger, Bpa and Blim	<p>Current ICES advice on stocks is given on the basis of Maximum Sustained Yield (MSY) and the Precautionary Approach (6). MSY means fishing at a level that takes the maximum catch (yield) that can safely be removed from a fish stock, on a continuous basis, whilst maintaining its long-term productive capacity, and is achieved by keeping the Spawning Stock Biomass (SSB) above the biomass action points <b>MSYBtrigger</b> and/or <b>Bpa</b>.</p> <p>Figure 1 below illustrates this concept. At high Spawning Stock Biomass green section to the <i>left hand side</i> on the schematic in Figure 1, the stock is in good condition and can potentially be exploited at Maximum Sustained Yield; this reference point is known as <b>BMSY</b>; it is not always defined for ICES stocks. It corresponds to the stock size where the stock at its most productive. If the SSB is low (to the <i>right hand side</i> on the schematic in Figure 1) the stock 'Recruit overfished' in the red section, that is below <b>Blim</b>, and there is insufficient reproductive capacity to produce enough recruits to sustain a fishery; the stock is outside Safe Biological Limits and risks collapse. Because there is uncertainty in the estimate of SSB the stock is considered <i>at risk</i> of being outside Safe Biological Limits when it is below <b>Bpa</b> and/or <b>MSYBtrigger</b>, that is in the yellow</p>

Term	Definition
	<p>section in Figure 1. <b>MSYBtrigger</b> and <b>Bpa</b> are action points; when the SSB is below this level managers expect to take measures to reduce fishing mortality aiming for exploiting the stock at MSY.</p>  <p>Figure 1 Schematic showing biomass reference points in relation to Maximum Sustained Yield</p>
<p>Reference points for Fishing Mortality used by ICES; FMSY, Fpa and Flim;</p>	<p>The Biomass reference points described above have corresponding Fishing Mortality reference points. If the stock is exploited at a given fishing mortality it will, in the long term result in a corresponding Spawning Stock Biomass (SSB).</p> <p>The precautionary approach aims to limit fishing mortality (F) and catches to levels that avoid depleting the stock's reproductive capacity, keeping its SSB above its biomass reference level (defined as Bpa: see Fig. 1). These concepts are illustrated in the schematic (Figure 2), which shows how catches from an unfished stock would increase in line with exploitation (= fishing mortality, F), up to a point where the total mortality on the stock causes so many fish to be caught at a relatively small size (and discarded or landed) that the potential production of the stock due to growth of individual fish is not realised ("growth overfishing"). The peak of this curve represents MSY and indicates where <b>FMSY</b> lies.</p>

Term	Definition
	<p style="text-align: center;"><b>Fishing at Maximum Sustainable Yield (MSY)</b></p>  <p>Figure 2 Schematic for Fishing Mortality reference points</p> <p>However, providing sufficient fish survive to become adults and spawn, they may still have the reproductive capacity to replace themselves. There is a risk of stock collapse can occur when fishing mortality reaches a level (<b>Flim</b>) such that removals from a stock are so high, and its spawning capacity is so diminished, that fewer and fewer juveniles are produced. So, not only is the size of the stock being reduced by too high a level of exploitation, but there are fewer juvenile fish to replace those that are caught, and stock levels are likely to fall even lower (“recruit overfishing”). The yellow area between the green (inside safe limits) and red (outside safe limits) zones in the schematic represents levels of F or SSB (see Figure 1) that management should seek to avoid to ensure that the stock has a high probability of remaining sustainable.</p> <p>Scientific advice given under the twin MSY/ precautionary approach strategy will aim to either achieve catches consistent with fishing levels that would result in <b>FMSY</b>, or reduce fishing mortality to return the SSB to within safe biological limits (&gt; <b>Bpa</b> or <b>MSYBTrigger</b>).</p>
<p>Reference points used by NOAA in the USA under the Magnuson-Stevens act; BMSY, B30%, B35%, B40%</p>	<p>In the USA, biomass stock reference points relate to maximum sustainable yield (<b>BMSY</b>) or a proportion (usually 30, 35 or 40%) of the un-fished biomass with average long-term recruitment (<b>B30%</b>, <b>B35%</b>, <b>B40%</b>). There are no fishing mortality reference points as such (or safe biological limits), but advice on sustainable exploitation is given as fishing mortality rates calculated to move stock status towards BMSY, which are in turn used to determine and the corresponding acceptable</p>

Term	Definition
	harvest (or range of harvests) for a given stock, the Allowable Biological Catch (ABC), and also the overfishing level (OFL - defined as any amount of fishing in excess of a prescribed maximum allowable rate).
Research Vessel Surveys	Research Vessel Surveys are used to provide fishery independent data to enhance stock assessments. They can provide long time series of data dating back several decades, collecting information on fish abundance through trawl surveys, acoustic surveys and egg surveys.
Safe Biological Limit; or Precautionary limit	A value of a critical biological indicator (e.g. spawning biomass) considered as the limit below which the stock sustainability cannot be ensured, or below which the probability of a negative outcome (e.g. stock collapse) is unacceptable. See Reference Points
Seagrass beds	These unusual marine flowering plants are called seagrasses because in many species Seagrass beds occur in shallow and sheltered coastal waters anchored in sand or mud bottoms. They are considered important for biodiversity
Spawning Stock Biomass (SSB)	An estimate of the total weight of the fish in a stock that is old enough to spawn. Abbreviated as SSB.
Stock Assessment	The process of collecting and analysing biological and statistical information to determine the changes in the abundance of fishery stocks in response to fishing, and, to the extent possible, to predict future trends of stock abundance. Stock assessments are based on catch statistics, resource surveys; knowledge of the habitat requirements, life history, and behaviour of the species and include the use of environmental indices to determine impacts on stocks. Stock assessments are used as a basis to assess and specify the present and probable future condition of a stock and advise on the management of the fisheries on that stock. See below for various types of stock assessment.
Stock assessment methods; Data limited	For many stocks there are insufficient data to make a full assessment. This has led to the development of 'data limited' methods mostly based around indexes of catch-per-unit effort, usually of research vessel surveys, an index of stock abundance. The methods mostly aim to keep the fish stock at equilibrium; there is continuing development in this field.

Term	Definition
Stock Assessment models; Analytical	<p>Analytical stock assessment models use estimates from catch data and research vessel surveys, of the growth, recruitment, fishing and natural mortality of a stock. The inputs and outputs into the stock are modelled as shown diagrammatically below;</p> <div data-bbox="734 331 1290 826" data-label="Diagram">  <pre> graph TD     A[Recruitment of young fish] --&gt; C[Fish Stock biomass]     B[Growth of fish] --&gt; C     C --&gt; D[Fishing Mortality; death due to fishing]     C --&gt; E[Natural Mortality; death due natural causes]           </pre> </div> <p>To keep the stock at equilibrium growth and recruitment of young fish must at least balance the outputs due death due to fishing and natural mortality. The scientists can make predictions of what the likely effects of different management options (for example total catches, selectivity measures) would be on the fish stock biomass.</p>
Stock assessment models; Production	<p>Production models are used when information on size or age structures and growth rates is not available; many tuna stocks are assessed using this method. These models simplify populations to unified biomass (all ages combined) and use the quantity of fish is caught per hour's fishing –catch-per-unit-effort (CPUE)- as an index of stock abundance. This reveals how biomass is changing in response to fishing pressure and other potential variables, such as predation and environmental change. In general terms, as the biomass is removed by fishing the remaining biomass becomes more productive. The location of MSY is estimated by locating the biomass and fishing mortality of maximum productivity.</p>
Stock Recovery Plan	<p>A strategy of selecting fishing mortality rates or equivalent catches that will increase the status measure (e.g. biomass) above some minimum standard threshold within a specified period of time.</p>
Surveillance	<p>This includes the surveillance of fishing activities and enforcement of regulations; see RASS scoring guidelines</p>
Target reference point (TRP)	<p>Corresponds to a state of a fishery and / or a resource which is considered desirable. Management action, whether during a</p>

Term	Definition
	fishery development or a stock rebuilding process should aim at bringing and maintaining the fishery system at this level. In most cases a TRP will be expressed in a desired level of output for the fishery (e.g. in terms of catch) or of fishing effort or capacity and will be reflected as an explicit management objective for the fishery. See Reference points
Total Allowable Catch (TAC)	The <b>total allowable catch</b> (TAC) is a <b>catch</b> limit set for a particular fishery, generally for a year or a fishing season. TACs are usually expressed in tonnes of live-weight equivalent, but are sometimes set in terms of numbers of fish.