June 2012 ICES advice – Commentary on discards (taken verbatim from ICES text)

Covers: North Sea, Celtic Sea and West of Scotland, Baltic Sea

REGION	ICES COMMENT
	COD
ECOREGION: North Sea **STOCK: Cod in Subarea IV (North Sea), Division VIId (Eastern Channel), and IIIa West (Skagerrak)**	**Figures** Cod discards relative to catch have declined from the highest on record in 2008 to a just above the historical average in 2011 (from 50% to 25%, weight of cod discarded from the total estimated cod catch). In 2011, 82% of 1-year-old, 66% of 2-year-old, 19% of 3-year-old, and 6% of 4-year-old cod were discarded. **Considerations** The proportion of discards is still high relative to the historical period. Cod are taken by towed gears in mixed demersal fisheries. Cod are targeted by some fleets, but are also caught as part of a mixed fisheries catching haddock, whiting, Nephrops, plaice, and sole. Mixed-fisheries considerations are of primary importance for the management of North Sea species including cod. Single-stock management is a cause of discarding in mixed fisheries, because individual management objectives may not be consistent with each other. As such, the TAC of one species may be exhausted before the TAC of another, leading to catches of valuable fish that cannot be landed legally. Surveys indicate that the year classes are depleting faster than one would expect from the catches, and point to unaccounted removals. There is no documented information on the source of these unaccounted removals; while it has been previously assumed that these removals originate mostly from fishing activities, changes in natural mortality may also have an influence. Plausible fishery-based contributions to these unaccounted removals are discards (undersized cod, highgrading, and over-quota catches) that do not count against quota, and mis- and under-reporting of catches. The recorded landings from 2005–2011 fluctuated between 40% and 62% of the estimated total removals, indicating that the management system has not been effective in controlling the removals.
ECOREGION: Celtic Sea and West of Scotland **STOCK: Cod in Division VIIa (Irish Sea)**	**Figures** A large but variable proportion of the catch of 1-year-old cod is discarded, and 2010 data suggest an increased number of discarded 2-year-old fish. **Considerations** Additional measures to protect incoming year classes were advised in 2011 to ensure that they contributed to the rebuilding of the stock. There is no evidence of cod avoidance or changes in selection that would reduce fishing and discard mortality rates on the immature cod. The industry is reporting even higher levels of highgrading during the first quarter of 2012. It is necessary to reduce all sources of mortality of cod resulting from fishing to as close to zero as possible if the stock is to recover above Blim. To minimise the impact of cod recovery measures on fisheries not targeting cod,

	there will be a need for gear designs and cod avoidance measures that can be proven effective in reducing bycatches of cod to as close to zero as possible. Council Regulation (EC) 1342/2008 states that member states should introduce new mechanisms (developed in cooperation with the fishing industry) to encourage fishers to engage in cod-avoidance programmes, exercising their power to devise ways of fishing for cod stocks that result in more selective fishing and are less harmful to the environment. Despite evidence that the measures are having an impact in the North Sea, this is not occurring in the Irish Sea. However, considering the low SSB and low recruitment over the last decade, it is not possible to identify any non-zero catch which would be compatible with the MSY approach. Also, bycatches including discards of cod in all fisheries in Division VIa should be reduced to the lowest possible level and further technical measures to reduce catches should be implemented.
ECOREGION: Celtic Sea and West of Scotland **STOCK: Cod in Divisions VIIe-k (Celtic Sea Cod)**	**Figures** Total catch (2011) = 7.3 kt, where 65% were landings (76% otter trawl, 12% beam trawl, 4% gillnets, and 8% other gears) and 35% discards (70% highgrading). **Considerations** Misreporting, discard practices, and highgrading are the main cause of uncertainty affecting the assessment (ICES, 2009), especially when quotas are particularly restrictive (2003–2008, 2011). Most of these issues have been quantified and included in this year's assessment. Cod in Divisions VIIe–k are caught in a range of fisheries, including gadoid trawlers, Nephrops trawlers, otter trawlers, beam trawlers, and gillnetters. Other commercial species that are caught by these fisheries include haddock, whiting, Nephrops, plaice, sole, anglerfish, hake, megrim, and elasmobranchs. The large 2009 year class was not anticipated in the 2010 advice; the TAC set for 2011 (4023 t) led to unusually high levels of highgrading for all fleets. Subsequently there was an in-year TAC revision increasing the 2011 TAC to 5,379 t. TAC for 2012 is set to 10,059 t, which should prevent further highgrading. Technical measures applied to this stock are a minimum mesh size for beam and otter trawlers in Subarea VII and a minimum landing size (MLS) of 35 cm. Minimum landing sizes do not prevent cod from being discarded, but might prevent the targeting of juvenile cod. Recent sampling programmes in countries exploiting this stock indicate that the discarding pattern is variable. Highgrading appears and becomes the most prominent discard practice when quotas are restrictive. This situation, which can account for 40–60% by number of all fish caught, has occurred in French fisheries since 2003 and has also been apparent in UK fisheries since 2007. It has then decreased since 2008 to a few tonnes in 2010. In 2011, the initial low TAC in regards of the abundance of the 2009 year class has led to exceptionally high levels of highgrading for all fleets during the first part of the year. In response, the 2011 TAC has been strongly increased as cod catches being part of mixed fisheries, any measures would have not avoided a high level of catch of marketable fish and a too low TAC would have resulted in highgrading. All highgrading since 2003 has been corrected for in the assessment by the inclusion of highgrading estimates in the catch numbers-at-age.
ECOREGION: Celtic Sea and West of Scotland **STOCK: Cod in Division VIa (West of Scotland)**	**Figures** Total catch (2011) = 6364 t, where 8% are reported landings and 92% discards. The 2008 year class is estimated to be more abundant and is estimated to have been discarded in large quantities at age 3 in 2011. **Considerations** Due to changes to the Scotland survey design and gear after 2010, later surveys

	have to be considered as a new abundance series (UKSGFS-WIBTS-Q1 Q4). No fisheries-independent abundance series were available for 2011. Predicted catch is divided into landings and discards. Discard information is imprecise compared to landings data because of lower sampling coverage. Because catch is now dominated by discards it is very important to maintain the highest possible sampling (observer) coverage of vessels in Division VIa. Scottish landings and discards (from 2006) are adjusted by estimates of misreporting. The misreporting estimates will have uncertainty associated with them. Implementing surveys giving estimates of consumption by seals would give greater confidence in natural mortality estimates. The stock is suffering impaired recruitment. Estimated mortality is increasingly due to discards. SSB is very low. It is necessary to reduce all sources of fishing mortality to recover the stock above Bpa as quickly as possible. Management measures taken thus far have not recovered the stock. There is a zero TAC for this area in 2012 and a 1.5% bycatch by live weight limit. This 1.5% rule applies to the retained part of the catches and therefore does not constrain discards.
ECOREGION: Baltic Sea **STOCK: Cod in Subdivisions 25-32 and 22-24**	**Figures** Discards estimated at 7%. **Considerations** Although discards appear at present not to be a problem in relation to limiting fishing mortality, a management plan should include explicit rules for addressing discards. This could be implemented by defining the TAC as total allowable catch and by ensuring that all catches (landings as well as discards) are counted against the TAC. Highgrading has been prohibited since 1 January 2010 in all Baltic Sea fisheries. To decrease discards, a “Bacoma” codend with a 120 mm mesh was introduced by the International Baltic Sea Fisheries Commission (IBSFC) in 2001 in parallel with an increase in diamond mesh size to 130 mm in traditional codends. The expected effect of introducing the “Bacoma” 120 mm exit window was nullified by compensatory measures in the industry. This was to some extent explained by the mismatch between the selectivity of the 120 mm “Bacoma” trawl and the minimum landing size. In October 2003, the regulation was changed to a 110 mm “Bacoma” window. This was expected to enhance the compliance and to be in better accordance with the minimum landing size, which was changed from 35 to 38 cm in the same year. On 1 March 2010 the “Bacoma” 120 mm was re-introduced along with an extended “Bacoma” window (5.5 m) to further decrease discarding, and the minimum landing size was kept at 38 cm. Sampling for discards is insufficient and raising procedures have been problematic in the recent past. This led to revisions in this year’s assessment of the strength of incoming year classes. Predicted discards for 2012 are based on the average proportions discarded per age in 2009–2011. Relatively strong year classes are entering the fishery from 2010 onwards. This may lead to increased discarding of juveniles. http://www.ices.dk/committe/acom/comwork/report/2012/2012/cod-2532.pdf
HADDOCK	
ECOREGION: Celtic Sea and West of Scotland **STOCK: Haddock in Division VIb**	**Figures** The discard ratio averages around 60% (by weight) over 1991–2003 and 20% in the recent period (2004–2011). Some countries land the whole catch while others discard part of the catch. For the latter, discard rates on observer trips in the past were as high as 52–87% in numbers.

(Rockall)	**Considerations** Also, bycatches including discards of haddock in all fisheries in Division VIb should be reduced to the lowest possible level. Further management measures should be introduced to reduce discarding of small haddock in order to maximize their contribution to future yield and SSB. In later years the discards ratio has declined as a result of the poor year classes and decreasing number of small haddock. It would be beneficial to develop and introduce into fisheries practices measures aimed at preventing discards of haddock.
ECOREGION: Celtic Sea and West of Scotland **STOCK: Haddock in Division VIa (West of Scotland)**	**Figures** The total catch for haddock is estimated to be 3,227 tonnes; 46% of these are discards. Splitting discards by fleet shows that Nephrops vessels (TR2) are responsible for ~80% of all discards while landing only 80 tonnes, less than 5% of the total landings (1,742 tonnes). **Considerations** Special attention needs to be given to the sporadic nature of the haddock recruitment and how to manage periods of low recruitment interspersed with large, occasional pulses. In recent years around 50% of the total catch in weight has been discarded, so restricting landings alone may not achieve the necessary increase in SSB. As in previous years the majority of discards occurred in the Nephrops fleet (TR2) (~80% of all discards). Any measure to reduce discarding and to improve the fishing pattern should be actively encouraged.
ECOREGION: Celtic Sea and West of Scotland **STOCK: Haddock in Division VIIa (Irish Sea)**	**Figures** The discard rates for Nephrops fleets (TR2 70–99 mm mesh size) in 2011 were 99–100% for one-year-olds, 63–94% for two-year-olds, and 3–21% for three-year-olds by number. **Considerations** Discarding is high and additional technical measures should be introduced, for example the use of sorting grids or large square mesh (>120 mm) panels in Nephrops fisheries. Discard estimates are very variable, being large in some years. Management measures should be introduced in the Irish Sea to reduce discarding of small haddock in order to maximize their contribution to future yield and SSB. TAC uptake has been less than 71% since 2008 and is not restrictive for any country. Discarding at younger ages is a serious problem for this stock. An increase in mesh size to reduce discarding will be beneficial to this stock and could increase future yield. Reduced selectivity on younger ages would reduce discarding and promote stock increase when strong year classes occur. Some fleets are using 80 mm mesh to target Nephrops, 90 mm mesh in mixed fisheries, and 100+ mm to target gadoids and other species. Recent gear trials have shown that square mesh panels can significantly reduce discards of undersized haddock (BIM, 2009). ICES notes that there have been a number of industry and national initiatives to reduce discarding associated with Nephrops fisheries. The Northern Irish fleet have voluntarily introduced novel square mesh panel designs (Briggs, 2010). STECF evaluated this measure and concluded that based on the experimental trials, the proposed gear should lead to a large reduction in the discarding of haddock and whiting < 20 cm (STECF, 2012). The Irish Nephrops fleet have expanded the use of sorting grids and separator trawls as the use of more species-selective gear is now mandatory. Such initiatives should lead to significant reductions in discards if effectively implemented in the fisheries. It is

	important that the effectiveness of these devices and their impact on discards and landings are monitored and evaluated. Current TAC management measures are not responsive enough considering the dynamic nature of changes in stock abundance. The increase in abundance from 2005–2008 created increased catch opportunities. During this period the TAC remained relatively constant and resulted in increased discarding of older fish (particularly in 2007). The TAC for 2009 was increased based on the increasing trend of stock abundance, in spite of evidence of weaker recruitment and possible decreasing abundance.
ECOREGION: Celtic Sea and West of Scotland **STOCK: Haddock in Divisions VIIb-k**	**Figures** Total catch (2011) = 26.8 kt, of which 47% are landings (all fleets combined) and 53% discards. **Considerations** Recruitment of the 2009 year class was exceptionally good, and catches have increased since 2010. However, most of the increase in catch is being discarded because these fish were under the minimum landing size (mainly in 2010) and over-quota (mainly in 2011). There is considerable uncertainty around the estimated discard numbers-at-age due to the diverse fishing (and discarding) practices and relatively low numbers of discard samples. Improving discard estimates would require a significant increase in the number of observer trips or other monitoring means. Management by TAC is inappropriate for this stock because landings, and not catches, are controlled. Haddock are caught in a mixed fishery, so TAC management can lead to discarding of over-quota fish in addition to the already considerable discarding of undersized fish. Discarding is a serious problem for this stock; over the last ten years 81% of the catch (in numbers) has been discarded (49% by weight). The TAC appears to have been restrictive in 2011 and since 2009 the national quotas of Ireland and Belgium appear to have been restrictive. The catches are likely to exceed the TAC in 2012, resulting in continued high levels of discarding. Technical measures can reduce discarding and could increase the yield considerably. ICES notes that the NWWRAC have recently supported the introduction of square mesh panels in all trawl fisheries operating in ICES Divisions VIIf,g. These measures have already been introduced by the main fleets operating in this area. It is important that these are fully implemented and their effectiveness in reducing discards and impact on commercial catches are monitored and evaluated.
NEPHROPS	
ECOREGION: North Sea **STOCK: Nephrops in Division IV North Sea**	**FU 6** The minimum landing size for Nephrops in the North Sea is 25 mm carapace length. Discarding rates of Nephrops are fairly stable between 2007 to 2011 at around 25% by number. **FU 7** The minimum landing size for Nephrops in the North Sea is 25 mm carapace length. Discarding of both undersize and poor quality Nephrops sometimes takes place at a low rate in this FU. Values have fallen in recent years, from about 10% in the early 2000s to around 5% by number in the period covered by the Y/R analysis (2008–2010); in 2011 there were zero discards of Nephrops. Discard rates in this FU have historically been low compared to other North Sea functional units because of the generally larger size of Nephrops found at the Fladen. The reduction in the discard rate since 2000 appears to be caused partly by

	increased retention of small individuals (lower mean sizes of the < 35 mm component of the landings for part of the time-series) and possibly, in the most recent years, by a period of reduced recruitment which has led to some changes in the size composition of the catch. **FU 8** The Nephrops fishery in the Firth of Forth is dominated by UK (Scotland) vessels, with low landings reported by other UK nations. Nephrops discard rates are high (for example, 30% by number and 17% by weight in 2010) and unwanted bycatch of haddock and whiting occurs. There is a need to reduce these and to improve the exploitation pattern of the 80 mm fisheries. Estimated discarding rates of Nephrops are 20% by number in the Firth of Forth in 2011. This arises from the use of mainly small-meshed (80 mm) nets and the population size structure, which appears to arise from slower growth. Local markets for small whole Nephrops are seasonally important. The effects of regulations The minimum landing size for Nephrops in the North Sea is 25 mm carapace length. The apparent small size of Nephrops in this area results in higher discard rates than in some other areas around Scotland. **FU 9** Discarding rates averaged over the period 2006–2010 for this stock were about 10% by number, 7% by weight. This represents a reduction in discarding rate compared to the average for the period 2003–2005. This may arise from the increasing use of larger mesh sizes in the northern North Sea, although reduction in recruitment may also account for this change.
ECOREGION: North Sea **STOCK: Nephrops in Division IIIa**	**FU 3 & 4** As a consequence of the current MLS of 40 mm carapace length, the amount of discards is large. Cod, sole, and plaice are bycatch species in these fisheries in Division IIIa. Catch distribution Total catch (2011) = 6.8 kt, where 58% are landings (93% trawling, 7% creels) and 42% undersized/discards. The main reason for the high amount of discards (47% in numbers, 31% in weight in 2011) is the high minimum landing size and low mesh size. Discards of Nephrops are known to be very high and any improvement of the size selectivity in the trawls would benefit the stock and the medium-term yield. Discard mortality is assumed to be 75% (Wileman et al., 1999).
ECOREGION: Celtic Sea **STOCK: Nephrops in VIa**	**Considerations** Regulations and their effects The minimum landing size for Nephrops is 20 mm carapace length (CL), and usually very few of the landed animals are under this size. The average discard rate of Nephrops by number over the last five years is 20%. In 2009 the mesh size was increased from 70 mm to 80 mm. Under the Scottish Conservation Credits Scheme and the west coast emergency measures, Nephrops trawlers are required to use more selective gears. However, these gears are designed to release fish and do not significantly improve selectivity of Nephrops. Under the EU Cod Recovery Plan, trawl effort in Division VIa has declined significantly. So far this has mainly affected effort in the larger mesh gears (>100 mm), with effort in the Nephrops fisheries remaining relatively stable. **FU11** The minimum landing size for Nephrops in Division VIa is 20 mm carapace length. Discarding of both undersize and poor quality Nephrops sometimes takes place in this FU. Discard rates have been variable but generally lower than 20%. The mean sizes in the length compositions of larger individuals (>35 mm CL) are stable, but the mean weight in landings has increased markedly in the last three years. The time-series average (1999–2011) was used as input for the mean weight in landings for the catch forecasts.

	The Nephrops (TR2) fleet has been observed to have high discard rates of haddock and whiting in recent years. The selectivity for this fleet needs to be improved. In 2009, under the west coast emergency measures a square-meshed panel of 120 mm was required in the Nephrops trawlers and the minimum mesh size is now 80 mm. This is likely to have had little effect on Nephrops selection. Twin-rig vessels tend to use a 200 mm square-meshed panel (with a 100 mm codend). This means that they do not catch bulk quantities and this leads to Nephrops of larger average size and better quality. Reported effort by all Scottish Nephrops trawlers has shown a gradual decreasing trend since 2000. **FU12** The minimum landing size for Nephrops in Division VIa is 20 mm carapace length. Discarding of both undersize and poor quality Nephrops sometimes takes place in this FU. Discard rates have been variable but generally lower than 30%. The mean weight in landings has increased markedly in the last three years. Therefore the time-series average (1999–2011) was used as input for the mean weight in landings for the catch forecasts. The Nephrops (TR2) fleet has been observed to have had high discard rates of haddock and whiting in recent years. The selectivity for this fleet needs to be improved. In 2009, under the west coast emergency measures a square-meshed panel of 120 mm was required in the Nephrops trawlers and the minimum mesh size is now 80 mm. This is likely to have had little effect on Nephrops selection. Twin-rig vessels tend to use a 200 mm square-meshed panel (with a 100 mm codend), and some of them are slightly bigger than that. This means that they do not catch bulk quantities and this leads to Nephrops of larger average size and better quality. Reported effort by all Scottish Nephrops trawlers has shown a gradual decreasing trend since 2000. **FU13** 20% discard rate. The minimum landing size for Nephrops in the Division VIa is 20 mm carapace length. Discarding of both undersize and poor quality individuals takes place in Clyde.
ECOREGION: Celtic Sea **STOCK: Nephrops in Division VIIa (Irish Sea)**	Discarding by the Nephrops trawl fishery is around 50% of the total catch by weight. The main species that are discarded by weight are blue mouth-red fish, blue whiting and argentines (Anon., 2011). **FU15** The Nephrops trawl fishery takes bycatches of other species, especially plaice, but also, whiting and cod. Selectivity of this fishery needs to be improved to reduce bycatches of cod, whiting and undersized plaice. **FU17** Discarding by the Nephrops trawl fleet is around 47% of the total catch by weight. The main discards are small Nephrops. The main fish species discarded are dogfish, haddock, whiting and megrim (Anon., 2011). **FU 19** Nephrops fisheries in this area are fairly mixed also landing megrim, anglerfish, haddock and other demersal species. Around 44% of the total catch by weight is discarded. The main discarded fish species are haddock and boarfish (Anon., 2011).

	FU 20 – 21 Nephrops fishery in FU20–21 has high bycatches of cod, whiting, and to a lesser extent haddock and hake. Discards rates in this fishery are relatively high. **FU 22** The Nephrops trawl fleet operating in VIIgfh discards around 38% by weight. Small Nephrops are the main species comprising the discards. The main fish species discarded are whiting, haddock and dogfish (Anon., 2011). In recent years several newer vessels specialising in Nephrops fishing have participated in this fishery. These vessels target Nephrops on several other grounds within the TAC area and move around to optimise catch rates. Since the introduction of effort management associated with the cod long term plan (EC 1342/2008) there have been concerns that effort could be displaced towards the Smalls and other Nephrops grounds where effort control has not been put in place. However, information on mean sizes in landings, discard rate, abundances provided by UWTV survey suggest no major change in the status of this stock.
PLAICE	
ECOREGION: North Sea **STOCK: Plaice in Division IV (North Sea)**	**Figures** This mesh size catches plaice under the minimum landing size of 27 cm, which causes high discard rates (in the range of 50% by weight). The discard ratio in the catch has declined in recent years. Catch distribution Total catch (2011) = 108.523 t, where 63% are landings (60% beam trawl, 36% otter trawl, and 5% other gears), 37% are discards and <1% industrial bycatch. **Considerations** Plaice is predominantly caught by beam trawlers in the central part of the North Sea with a minimum mesh size of 100–120 mm depending on area. A mixed fishery with sole in the southern North Sea takes place with a minimum mesh size of 80 mm. Plaice is predominantly caught by beam trawlers in the central part of the North Sea and in a mixed fishery with sole in the southern North Sea where sole has become relatively more abundant.Technical measures applicable to the mixed flatfish beam-trawl fishery affect both sole and plaice. The minimum mesh size of 80 mm selects sole at the minimum landing size. However, this mesh size generates high discards of plaice with a larger minimum landing size than sole. Discard estimates increased until the early 2000's to above 50% in catch by weight, followed by a slight decreasing trend. Mesh enlargement would reduce the catch of undersized plaice, but would also result in loss of marketable sole. ICES has developed a generic approach to evaluate whether new survey information that becomes available in September forms a basis to update the advice. If this is the case, ICES will publish new advice in November 2012.
ECOREGION: Celtic Seas and West of Scotland **STOCK: Plaice in Division VIIa (Irish Sea)**	**Figures** Catch distribution Catch (2011) 1198 t where 50% landings, 50% discards. Landings: 594 t where 70% beam trawl and 30% otter trawl. ICES estimates of discards: 604 t where 49% beam trawl and 51% otter trawl. **Considerations** A very high proportion of the catch is discarded. In the eastern Irish Sea plaice are caught by the mixed demersal fishery, largely UK otter trawlers, and as a bycatch in targeted sole beam trawl fisheries, dominated by Belgian trawlers. Total effort (hours fished) in the UK fleets targeting plaice have declined to the lowest levels recorded. Total effort by the Belgian beam trawl fleet has declined steadily from a peak in 2002. In the western Irish Sea, plaice are caught by the Irish and UK Nephrops fisheries: effort by these fisheries is greater than in the

	mixed demersal and beam fisheries combined. The regulations affecting plaice and other demersal stocks in Division VIIa remain linked to those implemented under the Irish Sea cod long-term management plan. The high level of discarding (typically up to 80% in number) in this fishery indicates a mismatch between the minimum landing size and the mesh size of the gear being used. Measures, such as the introduction of grids to Nephrops trawlers, which reduce discarding will result in increased future yield potentials. Gear selectivity trials and monitoring from four Irish Nephrops trawlers using grids since 2009 indicate a potential 75% drop in fish bycatch (BIM, 2009). The absolute level of catch estimates compared to independent estimates of spawning stock biomass using the Annual Egg Production Method, confirm that plaice in the Irish Sea is lightly exploited. SSB estimates for 2006–2010 were 14–15 kt compared to catch estimates 2–3 kt (which also include significant amount of discarded juvenile fish). Up to 2010 ICES carried out an assessment using landings-at-age data. Discard sampling studies have indicated variable discarding rates up to 80% by number. This year, an assessment model that includes discard data since 2004 was explored, and it was not considered appropriate to assess SSB and fishing mortality trends because of the reversal of the recruitment trend after the inclusion of the 2011 data. The high discard and catch estimates for 2007 and 2010 are downscaled by the assessment model, while the low discards estimate in 2011 has not been tracked by the model. The discard data are noisy and the assessment would benefit from increased sampling intensity. Estimation of partial fishing mortalities due to the landed and discarded component indicates that the fraction of fishing mortality due to discarding has increased since 2004. Considering the high level of discarding observed in this stock, gear selectivity regulations have had little effect. The closures of cod spawning-grounds that have been in force since 2000 are unlikely to have had a significant impact on catches by the plaice fishery. In 2000, the closure covered the western and eastern Irish Sea. Since then, the closure has been mainly in the western part, whereas the majority of the plaice fishery has taken place in the eastern part of the Irish Sea.
ECOREGION: North Sea **STOCK: Plaice in Division VIId (English Channel)**	**Figures** Survey information indicates percentages of discards up to 50% in number, depending on the trip and on fishing practices. **Considerations** Plaice is mainly caught in 80 mm beam-trawl (Belgian and English) fisheries for sole or in mixed demersal fisheries using otter trawls (mainly French). There is also a directed fishery during parts of the year by inshore trawlers and netters. Fisheries operating on the spawning aggregation in the beginning of the year catch plaice that originate from the North Sea, Divisions VIId and VIIe components. Since the 80 mm mesh size does not match the minimum landing size for plaice (27 cm), a large number of undersized plaice are discarded. The time-series of discards is not yet long enough to be used in an analytical assessment. There is also uncertainty about the stock structure due to large migration between this area and the North Sea and the western Channel during the spawning period. Stock structure and mixing rate during the spawning period might be refined by new tagging, genetic or studies based on the shape of the otoliths. Due to the minimum mesh size (80 mm) in the mixed beam-trawl fishery, a large

	number of undersized plaice are discarded. The 80 mm mesh size is not matched to the minimum landing size of plaice (27 cm). Management measures directed at sole fisheries will also impact the plaice fisheries. In previous years, effort from the beam-trawl fleet has hardly been restricted. The effort reductions implemented by EU Council Regulation (EC) Nos. 43/2009, 53/2010, 57/2011 and 43/2012 vary between countries at around 5–10% each year, in line with the effort reductions applied in the North Sea for the sole/plaice management plan (Council Regulation (EC) N° 676/2007).
ECOREGION: North Sea **STOCK: Plaice in Division VIIe (Western Channel)**	**Figures** Technical measures include mesh size and minimum landing size (MLS, 27 cm) for this species. There is some discarding, in particular of fish below the MLS in the first two quarters, but this is relatively low compared to other plaice stocks. **Considerations** Effort management is implemented for beam trawlers (> 80 mm) and for static demersal nets including gillnets, trammel nets, and tangle nets on an annual basis in the EC TAC regulations. Otter trawlers contribute to a large proportion of the landings, but are not under effort restrictions. Council Regulation (EC) No. 509/2007 establishes a multi-annual plan for the sustainable exploitation of sole in Division VIIe. Reductions in fishing mortality for sole will likely also reduce fishing mortality in plaice. The UK has introduced a single area licensing scheme in November 2008 which appears to be effective at enforcing the required reductions in effort.
ECOREGION: Celtic Sea and West of Scotland STOCK Plaice in Divisions VIIh–k (Southwest of Ireland)	**Figures** Plaice are mainly taken as by-catch in mixed inshore fisheries in Division VIIj. Discard rates are very high >60% by weight. Catch distribution Total landings (2011) 180 t, Discards ~ 200 t.
ECOREGION: Celtic Sea and west of Scotland **STOCK: Plaice in Division VIIf and g (Celtic Sea)**	**Figures** There is a high rate of discarding in both beam and otter trawl fisheries. Catch distribution Catches (2011) = 1528 t where 28% landings (421 t), 72% discards (1107 t). Discards are substantial (mainly below the minimum landing size) and have ranged from 30% to 70% in number. **Considerations** The mixed plaice and sole fishery is dominated by beam trawls and otter trawls, with bycatch of both commercial and non-commercial species. The main fishery occurs in the spawning area off the north Cornish coast, at depths greater than 40 m, about 20 to 25 miles offshore. Although plaice are taken throughout the year, the larger landings occur during February–March after the peak of spawning, and again in September. In 2011 discards have been included in the assessment for the first time. The time series of discard data available is short and consequently the revised assessment estimates are considered relative. Additionally, low levels of at sea sampling attribute to uncertainties. Estimation of partial fishing mortalities due to the landed and discarded component indicates that the fraction of F due to discarding has increased since 2004 and is considered high but uncertain during 2011. The advice is based on the relative trends in SSB derived from the Aarts and Poos (2009) assessment model. The harvest control rules are expected to stabilize stock size, but they may not be suitable if the stock size is low and/or overfished. The methods applied to derive quantitative advice for data limited stocks are expected to evolve as they are further developed and validated.

SOLE	
ECOREGION: North Sea **STOCK: Sole in Division VIId (Eastern Channel)**	**Considerations** The 80 mm mesh size for sole is not matched to the minimum landing size of plaice. Measures to reduce discarding of plaice in the sole fishery would greatly benefit the plaice stock and future yields of plaice, but would also result in loss of marketable sole landings.
ECOREGION: North Sea **STOCK: Sole in IV (North Sea)**	**Figures** The minimum mesh size in the mixed beam-trawl fishery in the southern North Sea means that large numbers of undersized plaice are discarded. **Considerations** Sole are mainly caught in a mixed beam-trawl fishery with plaice and other flatfish using 80 mm mesh in the southern North Sea. There are indications that in recent years sole discarding has increased. Reasons for the increase are unclear and should be investigated. Measures to reduce discarding in the mixed beam-trawl fishery would greatly benefit these stocks. An increase in the minimum landing size of sole could provide an incentive to fish with larger mesh sizes and would therefore mean a reduction in the discarding of plaice. The minimum landing size of North Sea sole is 24 cm. An increased mesh size in the fishery would reduce the catch of undersized plaice, but would also result in a loss of marketable sole.
ECOREGION: North Sea **STOCK: Sole in VII f, g (Celtic Sea)**	**Figures** Although discard rates of sole are low in beam trawl fisheries (about 2–5% in weight), discard rates of other (commercial and non-commercial) species can be considerable. **Considerations** Beam trawling, especially using chain-mat gear, is known to have a significant impact on the benthic communities, although less so on soft substrates and in areas which have been historically exploited by this fishing method. Benthic drop-out panels have been shown to release around 75% of benthic invertebrates from the catches.
ECOREGION: North Sea **STOCK: Sole in VIIa (Irish Sea)**	**Figures** Although discard rates of sole are low in these fisheries, discard rates of other (commercial and non-commercial) species can be considerable. **Considerations** Beam trawling, especially using chain-mat gear, is known to have a significant impact on the benthic communities, although less so on soft substrates.
ECOREGION: North Sea **STOCK: Sole in Division VIIe**	**Figures** Discarding in the towed gears using 80 mm mesh sizes, which are responsible for the large majority of the landings, is very small (<5% by number) and small (5–10%) for the much smaller gillnet fishery. Other spatially or temporally restricted métiers that show higher values of discarding (10–40% averaged over years) have very limited effort and hence contribute only a small percentage to the landings (<5%). **Considerations** Beam trawling, especially using chain-mat gear, is known to have a significant impact on the benthic communities, although less so on soft substrates. Discard rates of non-commercial species and commercial species of unmarketable size are substantial. Some beam trawlers are experimenting with benthic drop-out panels that release about 75% of benthic invertebrates from the catches. Full square mesh codends are being tested in order to reduce the capture of benthos

	further and improve the selection profile of gadoids. Sampling levels by fleet are sufficient to provide high precision in the assessment, though some improvement in the age sampling in France would be desirable. Discarding in the fishery, though minor, where present is sporadic and most frequently a result of the minimum landing size. A more detailed examination of the discard practices in the French fleet may improve our understanding of the frequencies of and the portion of the stock affected by such stochastic events. A catch quota scheme implemented for beam trawlers in the UK in 2010 and 2011 is based on discard rates of 30% by weight, which is in excess of the estimates of discarding in the fishery. In 2012 5–6 UK beam trawlers have joined this scheme which may potentially increase F slightly above the level assumed in the interim year in this assessment, though it is likely to remain below FMSY. The gears used to target sole are highly selective for fish above the minimum landing size, and only a few sporadic cases of highgrading (included in the numbers above) have been observed.
WHITING	
ECOREGION: Celtic Sea and West of Scotland **STOCK: Whiting in Divisions VIIe-k**	**Figures** Total Landings (2011) were 8.6 kt where an estimated additional 5.7 Kt was discarded. Preliminary figures suggest 85% of the total international catch discards are from the otter trawl fleets, 1% seiners, <1% beam trawlers and 14% others. **Considerations** Historically, discarding of this stock for different fleets is substantial and highly variable. ICES notes that the NWWRAC have recently supported the introduction of square mesh panels in all trawl fisheries operating in ICES Divisions VIIfg. These measures have already been introduced by the main fleets operating in this area. It is important that these are fully implemented and their effectiveness in reducing discards and the impact on commercial catches is monitored and evaluated.
ECOREGION: Celtic Sea and West of Scotland **STOCK: Whiting in Division VIa (West of Scotland)**	**Figures** Total catch (2011) was 0.569 kt, where 40% were landings (230 t) and 60% discards. **Considerations** Effective technical measures should be implemented to improve the selection pattern and reduce discards in the Nephrops (TR2) fleet. There are strong indications that management control is not effective in limiting the catch. The proportion of fish discarded is very high and appears to have increased in recent years. More than half of the annual catch weight consists of undersized or low-value whiting which are discarded. Approximately 80% of these discards come from the Nephrops (TR2) fishery. Measures to reduce discards and to improve the exploitation pattern would be beneficial to the stock and to the fishery, particularly when there are indications that the 2009 year class is relatively strong compared to other recent recruitments.
ECOREGION: Celtic Sea and West of Scotland **STOCK: Whiting in Division VIIa (Irish Sea)**	**Figures** Raised discards from the main national fleets landing whiting show over 22 million whiting, greater than 1000 t in weight, were discarded in 2010. **Considerations** There is no remaining targeted whiting fishery in the Irish Sea. Whiting are bycatch (and discarded) within in the main Irish Sea fisheries. Otter trawlers

	utilising 70–90 mm mesh sizes are the primary gear associated with whiting landings. This incorporates the Nephrops fishery, which shows high discard rates of whiting. Discard rates are very high likely due to the low market value of this species, particularly for smaller sizes. Catches of whiting have substantially reduced from the 1980s. Discarding remains a substantial problem for this stock, with almost all whiting caught now being discarded. Of the onboard observer trips carried out in 2010 by the UK (E&W), UK (NI) and Ireland, negligible fish were retained on board while thousands of small fish were discarded. Raised discards from the main national fleets landing whiting show over 22 million whiting, greater than 1000 t in weight, were discarded in 2010. This focused on the two youngest ages, and to a lesser extent age 2. In some years up to age 4 fish are discarded. Any measure to reduce discarding. Any measure to reduce discarding and to improve the fishing pattern should be actively encouraged. These might include spatial and temporal changes in fishing practises or technical. These measures would also need to be evaluated in the context of other species caught in these mixed fisheries. ICES notes that there have been a number of industry and national initiatives to reduce discarding associated with Nephrops fisheries. The Northern Irish fleet have voluntarily introduced novel square mesh panel designs (Briggs, 2010). This measure has been evaluated by STECF who conclude that based on the experimental trials, the proposed gear should lead to a large reduction in the discarding of haddock and whiting < 20 cm (STECF, 2012). The Irish Nephrops fleet have expanded the use of sorting grids and separator trawls as the use of more species selective is now mandatory. Such initiatives should lead to significant reductions in discards (60–76% by weight (Anon., 2011)) if effectively implemented into the fisheries. It is important that the effectiveness of these devices and their impact on discards and landings are monitored and evaluated. Various technical measures have been introduced in the past to mitigate bycatch of whiting, particularly in the Nephrops fishery, which operates on the whiting nursery grounds. It has proven difficult to evaluate the success of measures, such as the mandatory use of square mesh panels in Nephrops trawls since 1994. A minimum landing size of 27 cm is applied to this stock. Discarding above minimum landing size occurs. In addition to area and species related minimum mesh size restrictions applicable to mixed demersal fisheries.
ECOREGION: North Sea **STOCK: Whiting in Subarea IIIa (Skagerrak – Kattegat)**	**Figures** Whiting are taken as bycatch in the demersal fisheries, which mostly are discarded. ICES estimates of discards are 794 tonnes in 2011 which is three times higher than last year's estimate. Total catches (2011) 906.9 t comprising 7.6% landings, 88.6% discards and 4.8% industrial bycatch.
ECOREGION: North Sea **STOCK: Whiting in Subarea IV (North Sea) and Division VIId (Eastern Channel)**	**Figures** Total landings (2011) = 31.3 kt, where 18.4 kt are landings (~39% demersal trawls and seine with mesh >= 100 mm North Sea, 28% demersal trawls mesh size 70–99 mm North Sea, 28% demersal trawls mesh size 70–99 mm Eastern Channel, and 5% other gears), 11.8 kt discards, and 1.1 kt industrial bycatch. **Considerations** The minimum mesh size was increased to 120 mm in the northern area in 2002 and this may have contributed to the substantial decrease in landings. Landing compositions from the northern area, in 2006 to 2009, indicate improved survival

	of older ages. In addition, the total number of fish discarded appears to have been reduced since 2003, from around 60% in 2003 to around 47% in 2009. However, because of the restrictive TACs discard rates increased in 2010 and are expected to have been high again in 2011. Discards were previously estimated based on data from Scotland, England, Denmark, and Germany and raised to the total international fleet in the North Sea. Since 2010, discard information from 2003 onwards has been incorporated into the assessment for a major component of the catch from French fleets fishing in Subarea IV and Division VIId. Discard age compositions are available from France for 2003 to 2007 and 2009 to 2010 for Division VIId. To include these data, discards from Division VIId were estimated for 1990 to 2002 and 2008 using an estimated ogive based on the 2003 to 2007 data. This resulted in a minor increase in the whole stock through a minor increase in recruitment estimates. Discards are an important component of the catch. The sensitivity of the assessment outcomes to the raising procedure of discard data has not been explored. Discards could consist of highgrading, over quota, and catches below minimum landing size. The sampling programme may not sufficiently cover these components, although the coverage of discard sampling programmes has expanded considerably in recent years. These data are incorporated in discard estimation in a transparent and métier-based way through the ICES InterCatch procedure since 2012.

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