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ICES ADVICE FOR THE EXPLOITATION OF BALTIC SEA FISH STOCKS IN 2011

On 28 May, ICES' Advisory Committee (ACOM) published their advice regarding the exploitation of the Baltic Sea fish stocks for 2011. The following provides a summary and comment on the assessments and advice.

MSY APPROACH

The ICES advice structure is currently shifting from the previously used precautionary approach to achieving MSY for EU fish stocks by 2015, in line with the EU commitment made in Johannesburg in 2002.[1]

Rather than focusing on avoiding an undesired outcome – as is the case with the precautionary approach – the MSY framework strives at *achieving a desired* outcome: a high sustainable long-term yield. Fishing mortality figures in line with the MSY target (F_{MSY}) are the levels where a maximised average long-term yield will be possible, and the biomass reference point used (MSY $B_{trigger}$) is a biomass level that will trigger a response when the biomass is estimated to fall below. As the present EU objective for fish stock conservation is to achieve MSY by 2015, ICES has chosen to use an approach they call a "transition to MSY", which essentially sets out stepwise changes in the current management aimed at reaching MSY in 2015. The fishing mortality (F) is a measure of the number of fish killed by fishing. The Spawning stock biomass (SSB) for the stock is the number of reproductively mature fish, measured in tonnes.

For this year's advice, ICES is presenting several options for each stock: one according to the scheme for the transition to the MSY approach, one according to the precautionary approach, and one according to the management plan, if there is one. As this is the first attempt to base the scientific advice on the MSY target, the analysis for many stocks is incomplete, for example, biomass reference points may not be provided.

COD

Since 2004, Baltic Sea cod is managed as two separate stocks – the Eastern and the Western stock. The stocks are biologically distinct from one another, although in recent years migration of fish between the areas has been increasing slightly. The Eastern stock is currently more than eight times larger than its Western counterpart.

In 2007, an EU multi-annual management plan for both cod stocks in the Baltic was adopted, which aims at restoring the fish stocks to sustainable levels. The plan was evaluated by ICES in 2009, determining it to be in accordance with the precautionary approach, but the MSY target for 2015 was not assessed at this time. The management plan will be reviewed by the Commission later this year, and as part of this process stakeholders will be consulted.

[1] Johannesburg Declaration, WSSD, 2002.

Subdivision 22–24, Western Baltic

The Western Baltic cod stock is a highly productive stock and has historically been much larger than it is today. In the seventies it was twice as big as today. For the first time in years, ICES suggested an increased landing quota for 2010 based on the current management plan, an 8.6 percent boost later agreed by the Fisheries Council. Both of the two management options given this year also translates into an increase of the TAC, but mortality will need to be decreased gradually over the next few years to achieve F_{MSY}.

This year ICES essentially provides two alternative management objectives, as the precautionary approach is not applicable to this stock:

1. Applying the scheme for a transition to the MSY approach, the total landings corresponding to TAC could be raised by 2.8 percent to 18,200 tonnes.
2. Applying the management plan, the total landings corresponding to TAC could be raised by 6.2 percent to 18,800 tonnes.

Formaterade: Punkter och numrering

Spawning stock biomass (SSB) for this stock has been hovering around what is acceptable according to the precautionary approach in recent years. As for recruitment, the two latest year classes have been close to the average for the preceding ten years, while the classes of 2004–2007 were weak. It should be noted that both the SSB and the total biomass for the stock are estimated to be slightly lower this year than in 2009.

The fishing mortality (F) has been decreasing since the 1990's, to around 0.7 in recent years. The management plan aims at a 10 percent reduction each year, until the target of F = 0.6 is reached.

This is how the options were calculated:

1. The ICES transition scheme towards applying the MSY approach implies a stepwise reduction in fishing mortality to F_{MSY} = 0.24 in 2015, resulting in F = 0.63 for 2011 and landings of 18,200 tonnes (F for 2010 is assumed to be 0.74).
2. According to the management plan, F should be lowered by 10 percent annually until the target of F = 0.6 is reached, resulting in F = 0.65 and landings of 18,800 tonnes for 2011.

However, this year's advice from ICES contains a number of uncertainties:

- Good recruitment data is lacking. The calculation of F_{MSY} is based on figures that do not take the recent increase in migration between the two Baltic cod stocks into consideration.
- Discards are included as a set percentage of the catches, but sampling needs to be improved according to ICES, and the problem may be significant when strong year classes enter the fisheries, increasing the incentives for highgrading. There have also been problems with age reading this year.
- When ICES found the management plan to be in accordance with the precautionary approach last year, it was under certain assumptions: that the

annual reduction in effort was achieved and that fishing mortality would decrease in line with that. ICES now finds that F has not been reduced as much as anticipated in the plan, which indicates that the current effort limitations are not effectively limiting the fishery. (The number of fishing days was reduced by 10 percent in 2009, and there were seasonal closures.)

An EU pilot study in 2007 found indications of considerable removals of cod in recreational fisheries, especially in the western Baltic. These catches are currently not included in the assessment.

In the past two years, a seasonal closure from 1–30 April has been in place to protect spawning cod. In addition, a small area ("the triangle") in the Sound has been closed for all fisheries in February and March since 2009.

Subdivision 25–32, Eastern Baltic

The Eastern Baltic cod stock has historically been much larger than it is today. Due to very favourable environmental conditions and extremely strong year classes towards the end of the 1970s, the stock reached its historically highest levels in 1980–1982, when it was almost three times larger than today. In the late 1990s to early 2000, the stock declined to its lowest levels on record as a result of overfishing and unfavourable environmental conditions (mainly low oxygen levels in recruitment areas due to low water inflow from the North Sea).

The stock biomass is currently on a level comparable to that in the mid-1960s, and both total biomass (B) and spawning stock biomass (SSB) have increased markedly in the past year. The management plan sets a fishing mortality goal for the Eastern stock of F = 0.3. In 2009, F was estimated to be below the target for the second year in a row (F = 0.23). As for recruitment, three recent year classes, those of 2003, 2005 and 2006, are above the average of the past 20 years, with the latter two the strongest since 1987.

This year ICES essentially provides two alternative recommendations as the precautionary approach is not considered to be applicable:

1. Applying the MSY approach, the total landings corresponding to TAC could be increased by 87 percent to 105,000 tonnes.
2. Applying the management plan, the total landings corresponding to TAC could be raised by a maximum of 15 percent and the ICES advice is for 2011 is 64,000 tonnes.

This is how the options were calculated:

1. The ICES transition scheme for the MSY approach is considered irrelevant in this case, as the current fishing mortality is already lower than the new F_{MSY} target of 0.30. ICES therefore suggests that a mortality corresponding to 0.30 could be applied directly, resulting in a landing quota (TAC) of 105,000 tonnes.
2. In the management plan, the target fishing mortality is F=0.30 – which is the same as the value now calculated for F_{MSY}. This has already been achieved, but the management plan also restricts TAC change to ±15 percent per year. This is the basis for the proposed landing quota for 2011 of 64,000 tonnes. It is expected to lead

to a decrease in fishing mortality to 0.17 and an increase in SSB to 453,000 tonnes in 2012.

Besides the TAC system, the stock is also managed through restrictions in effort and seasonal closures:

- In subdivisions 25–28.2 (the southern part of the Eastern Baltic, excluding the Gulf of Riga, up to a line roughly between Estonia and the southern limit of the Stockholm archipelago), fishing has been limited to 160 days per year since 2009.
- A seasonal closure for targeted cod fishing is applied in the Eastern Baltic from 1 July to 31 August to protect spawners.
- Areas of importance for spawning – parts of the Bornholm Deep, the Gotland Basin and the Gdansk Deep – are closed to all fishing from 1 May to 31 October.

All these measures, as well as a highgrading ban enforced in all Baltic fisheries from 2010, have contributed to a marked decline in fishing mortality, according to ICES. (Highgrading is the discarding of marketable fish to make room on the vessel for specimens that have a higher sales value.)

ICES does comment on the greater risks for both highgrading and discards that results from an increase in catching opportunities, while limits on fishing effort (days at sea) remain the same. In addition, two apparently strong year classes – those of 2005 and 2006 – are entering the fisheries, further raising the stakes. So far, managers have responded with the highgrading ban and rules that improve the selectivity of gear.

A remaining weak point in the data is the issue of unreported catches. The estimate used is still, in ICES' words, "rather uncertain". Unreported catches were believed to be as high as 32–45 per cent of the reported catches during the period 2000–2007. Data for 2008, used for the 2009 and 2010 advice, suggested a dramatic decrease – down to a mere 6 per cent. However, only some countries reported estimates, while others said they had no data to submit, since they did not have any illegal fishing. According to ICES, it will take a few years to be confident that F has really declined as much as the two latest assessments have indicated, but there is strong support for such a trend. However, the scientists point out that since some of the information on un- or misreported landing comes from the industry, the estimates are "minimum values".

Furthermore, ICES makes reservations for uncertainties surrounding discard figures and age-reading. Insufficient sampling has lead to revisions of assessments of the crucial incoming year classes, which in turn has led to uncertainties about levels of both discarding and illegal fishing. As for age-reading, it is unusually difficult to determine the age of individuals in the Eastern Baltic stock, since they lacks clear growth rings in the otoliths. (The otoliths are a part of the inner ear which scientists study in order to determine age.) The proportion of landings with no age information in 2008 was 28 per cent, which ICES claims is very high and probably leads to an underestimated fishing mortality. That problem has still not been solved.

HERRING

The Baltic herring is managed in four separate areas: the Western Baltic and Kattegat (joint management), the central Baltic, Gulf of Riga, and the Bothnian Sea and the Bothnian Bay (joint management). The ICES advice for the Western Baltic and Kattegat will be released later this year. A proposal for a long-term management plan for the Baltic pelagic stocks is also expected later this year.

Subdivision 25–29 and 32, Central Baltic, excluding the Gulf of Riga

After showing a steady growth since the beginning of the 2000's, the two latest assessments of this stock (for 2008 and 2009) indicate a decrease, with the stock size in 2009 at just 54 percent of the long-term average. The last strong year class was the one of 2002. The fishing mortality has been above what the precautionary approach allows since 2005, and last year's advice to reduce the landings to 103,000 tonnes was not followed by the Council.

As no management plan exists for this stock, ICES provides two recommendations:

1. Applying the MSY approach, the total landings should be decreased by 32 percent, resulting in TAC of less than 95,000 tonnes.
2. Applying the precautionary approach, the total landings corresponding to TAC should be decreased by at least 7.7 percent, resulting in a landing quota of less than 95,000 tonnes.

Formaterade: Punkter och numrering

The current F_{pa} is 0.19 – the same as the calculated F_{MSY}. However, ICES remarks that recent simulations show that F_{pa} needs to be revised. For this stock, ICES has elected not to follow the transition scheme for MSY, as this would result in a fishing mortality of 0.24 – higher than the figure used for the precautionary approach. ICES has instead chosen to use F_{pa}/F_{MSY} (0.19). According to the EC Communication on fishing opportunities for 2011 (COM(2010)241), this stock falls into category 3, which according to ICES would result in a TAC proposal of 102,000 tonnes.

It should be noted that herring is caught together with sprat in this area, resulting in imprecise landing data. Since 2005, EU vessels operating in the sprat and herring fishery are no longer allowed to land unsorted catches, unless there is a proper sampling scheme to monitor species composition. As most of the TAC has been taken in recent years, however, the incentive for misreporting herring as sprat may have increased, and the possible extent of that is not well known. Still, ICES regards the assessment as being good enough to base forecasts on. Looking back, however, ICES remarks that in most recent years fishing mortality has been underestimated and SSB overestimated.

Herring and sprat are the major prey species for cod and high exploitation of these fisheries can indirectly affect the cod stock.

Subdivision 28.1, Gulf of Riga

Following a number of mild winters, this stock is doing reasonably well with a spawning stock biomass (SSB) higher than the long-term average. With the fishing mortality for 2008 lower than the precautionary approach (F_{pa}) after exceeding it for several years, it was back above it in 2009.

This year ICES essentially provides one recommendation based on two alternative calculations:

1. Applying the scheme for a transition to the MSY approach, the total landings corresponding to TAC should be decreased by 9.3 percent, corresponding to landings of less than 33,000 tonnes.
2. Applying the precautionary approach, the total landings corresponding to TAC should be decreased by at least 9.3 percent, corresponding to landings of less than 33,000 tonnes.

Formaterade: Punkter och numrering

The precautionary approach for this stock results in F_{pa} = 0.40; F_{MSY} has been calcuted to be 0.35. Applying the transition scheme for MSY, results in the same fishing mortality as the precautionary approach for 2011: 0.40. According to the recent Communication on fishing opportunities for 2011 (COM(2010)241), this stock falls into category 3, which according to ICES would result in a TAC of 29,000 tonnes.

The strength of the year classes of this stock is highly dependent on environmental conditions (primarily ice cover), and it has benefited from the many mild winters since the end of the 1980s. The year classes of 2005, 2007, and 2008 are strong, while the 2006 year class is poor. Since the 2011 advice is based on the 2009 assessment, nothing is said about the possible consequences of this year's unseemly cold winter.

The Gulf of Riga is a semi-enclosed ecosystem and the low salinity restricts the occurrence of marine species. Herring is the dominant species in the Gulf, and the bycatch of sprat in this fishery is low. Cod has not been found in the Gulf of Riga for 25 years, since it only appears there when the cod stock is very large. Taken together, this makes predation mortality low for the Riga herring.

The Central Baltic and Gulf of Riga herring stocks mix to an extent: a very small fraction (0.7 percent) of the Gulf stock is caught in open waters, while some Central Baltic herring enter the Gulf to spawn, adding up to 10.1 percent to the catches there. The assessments and the advice are stock specific, while the TACs are set for the area where the fish is caught. Adjustments are made with those figures in mind, but since they are only averages and the variations from year to year are increasing, this makes for great uncertainty.

Subdivision 30, Bothnian Sea

The herring stock in the Bothnian Sea, since 2008 the biggest in the Baltic, is mainly exploited by Finnish trawlers, but also used to produce the Swedish speciality "surströmming". The spawning biomass of this stock tripled in the late 1980s, and has remained at a steady level since then, although the assessment for 2009 shows a slight decrease from 2008.

Fishing mortality has been below F_{pa}=0.21 for almost 40 years, and recruitment seems to be stable, with the positive exception of two extremely rich year classes in 2002 and 2006. Since there is no reference point for MSY for the stock, and no management plan, the ICES advice is based on the precautionary approach:

- Applying the precautionary approach, the total landings corresponding to TAC could be increased by 12 percent, which would result in 115,000 tonnes.

Catches have, however, been lower than the TAC in recent years. The top figure so far is 75,000 tonnes in 2007, and the prediction for 2010 is 82,600. The low exploitation is mainly explained by the lack of market growth. In addition, the size of the individuals in this stock has decreased substantially, most likely because of food chain changes. This has had financial consequences for the coastal Swedish fishery, mainly targeting the stock for "surströmming", as the production demands a greater size.

A potential problem for this stock is the dioxin concentration. No decrease in levels has been observed in herring from the Bothnian Sea since the 1990s. Since exploitation of the stock is low, the number of older specimens can be expected to increase. Older herring have accumulated larger amounts of dioxin, which may result in higher concentrations of dioxin in the stock and the catches. The present EU dispensation that allows Sweden and Finland to utilize fish with higher concentration of dioxin and PCB than the rest of the European Union expires after 2011.

Subdivision 31, Bothnian Bay

The available information for this stock is inadequate and the state of the stock is unknown, providing ICES with no basis for advice.

The only data available for the stock are landing figures, showing a decline in recent years. This stock is under joint management with the stock in the Bothnian Sea, with one TAC covering both stocks. This may not be appropriate if better information on the stock becomes available in the future.

According to the Commission's policy paper on fishing opportunities for 2011 (COM(2010)241), this stock is classified as category 11, which states that TACs should be adjusted towards recent catch levels, without any increase in fishing effort if relevant. Catches in recent years have been below 3,000 tonnes.

SPRAT

Sprat appears to be spread out all over the Baltic Sea and is managed as one single stock in subdivisions 22–32. This is the largest fish stock in the Baltic Sea. The stock is highly affected by the abundance of cod, its main predator, and therefore experienced a low spawning stock biomass (SSB) in the first half of the 1980s, when the Baltic cod stocks were very large. In the beginning of the 1990s, the stock started to increase and reached its maximum SSB ever recorded at 1.7 million tonnes in 1996–97. This was a result of low cod biomass and strong recruitment. The SSB in 2009 (84,200 tonnes) is around the long-term average, but fishing mortality is on the raise, estimated at F=0.54 in 2009, which is the second highest value ever recorded for the stock.

Since no fishing mortality for the MSY approach has been calculated for the stock and no management plan exists, the ICES advice is based on the precautionary approach, with a corresponding fishing mortality of 0.40:

- Applying the precautionary approach, the total landings corresponding to TAC should be decreased by at least 36 percent with a proposed total landing quota of less than 242,000 tonnes.

According to the EU policy paper (COM(2010)241) this stock belongs to category 3, which would result in a total TAC of 288,000 tonnes (EU + Russian catches), based on the proposed 30 percent reduction.

It should be noted that ICES admits that assessments show a retrospective pattern of constantly overestimating SSB and underestimating F. The overlap of herring and sprat in both distribution and fisheries contribute to the uncertainties.

The future development of the Baltic sprat stock is heavily dependent on the 2010 and 2011 year classes, but also on the development of the Eastern Baltic cod stock as sprat is an important food source for the cod. The current recovery of the eastern cod stock may require even further reductions in the sprat landing quotas in the future. The increase in the cod stock 2007–2008, for example, affected the biomass of the sprat stock through a 20 percent increase in predation mortality (a measure of the amount of fish eaten by other fish).

As with the Bothnian Sea herring, the mean weight of Baltic sprat at a certain age has decreased, most prominently in 1992–98, when it was reduced by around 40 percent. For both stocks, that may be explained by the diminishing access to zooplankton, while the the number of individuals competing for food were increasing.

SALMON

The Baltic salmon belongs to the Atlantic salmon species and its management is divided into two areas: the Main Basin and the Gulf of Bothnia (Subdivisions 22–31) and the Gulf of Finland (Subdivision 32). These management areas are then divided into subsequent assessment areas. A proposal for a long-term management plan for Baltic salmon is expected later this year.

The Baltic salmon is greatly affected by environmental conditions. River damming and habitat deterioration have had a devastating effect on salmon freshwater habitats and spawning grounds. In addition, very substantial restocking (release of reared salmon fry) takes place each year in order to compensate for the loss of naturally spawning salmon at hydro-power installations – in line with agreements made with the power companies responsible. The large amounts of reared salmon threaten the genetic variability of the wild stocks, and the restocking process is also very costly.

Baltic salmon has earlier suffered greatly from a reproductive disorder called M74. The occurrence of M74 has been decreasing since the mid-1990s to a current low level. The factors influencing the development of M74 are poorly understood, making it difficult to predict future mortality rates resulting from the disorder. M74 mortality has varied over the years and sudden changes in the incidence of the disease are likely to occur in the future.

Subdivisions 22–31, Main Basin and the Gulf of Bothnia

This area is inhabited by salmon wild stocks that are assessed by ICES in five different units, according to biological and genetic conditions. Management actions in the area started in 1997 with the IBSFC Salmon Action Plan, which has led to an overall increase in smolt production ("smolt" is the name of the early life stage of a salmon, when it starts to migrate from freshwater to the sea). Since 2003, the total wild smolt production in all of the assessment units combined has increased by more than 60 percent. In the two northernmost units, it has increased almost tenfold since the action plan was adopted.

Compared to the natural smolt production capacity, however, current smolt production is still low in many rivers. Out of 27 assessed rivers, 16 are "uncertain" or "unlikely" to reach the 50 percent potential capacity reference point. None is likely to reach the 75 percent reference point in 2010.

ICES also reports that the survival of post-smolt salmon (larger than the smolt stage) has been low in recent years, leading to a small number of feeding and maturing salmon. Post-smolt survival has been very low (around 10 percent) since 2004 and shows no signs of recovery. Recent analysis indicates that this downward trend has been even more pronounced than what was earlier believed.

The exploitation of Baltic salmon has decreased drastically in the last two decades, even though there was a slight increase from 2008 to 2009. Only 56 percent of the agreed TAC was utilized in 2009, and the 57 percent TAC reduction proposed by ICES last year from 2009 to 2010 was intended to reflect that: an adjustment to the real catch figures. This was not endorsed by the Fisheries Council, however. The quota agreed for 2010 was 294,246 individuals – a decrease of only 5.1 percent.

This year ICES provides the following recommendation:

In order to ensure recovery of the wild stocks, a TAC of less than 120,000 salmon individuals is advised. This is a further decrease compared with last year's advice, and would if followed result in a 59,2 percent reduction in fishing possibilities.

ICES adds that management should focus on the individual stocks in the rivers – where some are especially weak and some are stronger – since the effects of fisheries on the mixed natural/reared stocks along the coasts or in the open sea are more difficult to assess.

Subdivision 32, the Gulf of Finland

In this area a few small, wild populations as well as a number of mixed stocks (consisting of both reared and wild salmon) can be found. The wild salmon populations are genetically distinct from each other, which indicate that these are still original salmon stocks, meaning that they have not been mixed with reared salmon.

ICES states that only three wild populations remain in the area (all in Estonian rivers), of which two show very low smolt production. According to the ICES Working Group, wild salmon reproduction also occur the Luga River in [Baltic] Russia (the only Russian river with wild salmon) but the population there is supported by large, long-term releases. There has been no wild salmon production on the Finnish side since the 1950s.

As for the reared stocks, most of the salmon in the Gulf originates from the considerable smolt releases. Even so, catches have decreased markedly during the last few years, which indicates low post-smolt survival.

This year ICES provides the following recommendation:

ICES states that it is not possible to provide catch advice, since there is no analytical assessment model. ICES however adds that any increase in total catches from the present level should be prevented (last year's agreed quota was 15,000 fish, reared only). ICES adds that there should be no catch of Estonian wild salmon in the Gulf of Finland at all, and that coastal fishing at sites likely to be on the migration paths

from Estonian rivers should be prohibited. ICES also points out that poaching occurs in rivers running to the Gulf, and "must be stopped".

SEA TROUT AND OTHER SPECIES

According to ICES, the Baltic Sea contains approximately 1,000 sea trout stocks and about half of them are wild; ICES Working Group figures show that 881 rivers in the region contain sea trout, and that 471 of the stocks are estimated to be wild. The status of the stocks varies considerably, as does the habitat quality of the sea trout rivers.

ICES advices immediate fishing restrictions in the Gulf of Bothnia and in the Gulf of Finland, in order to safeguard the remaining wild sea trout populations there. Minimum mesh size and effort limitations should be enforced, but similar limitations should also be applied locally in the Baltic Sea as a whole to reduce the fishing mortality of the species.

For a number of other species occurring in the Baltic Sea, ICES concludes that a lack of data precludes any advice, which puts them in category 11 according to the Commission paper on fishing possibilities for 2011:

- Turbot: no TAC; estimated landings for 2009 are 385 tonnes.
- Plaice: agreed TAC for 2010 was 3,041 tonnes; estimated landings for 2009 are 2,235 tonnes.
- Dab: no TAC; estimated landings for 2009 are 1,268 tonnes.
- Flounder: no TAC; landings in 2009 of 15,650 tonnes.

WHAT HAPPENS NEXT?

The European Commission, after consulting the Scientific, Technical and Economic Committee for Fisheries (STECF), will publish its proposal for fishing opportunities in the Baltic Sea for 2011 in September. It will be discussed by the Council Working Groups prior to the Fisheries Council's meeting in October, where the 2011 quotas are likely to be agreed. In the meantime, the European Commission on behalf of the European Union will negotiate with Russia, which also fishes the Baltic.

The Lisbon Treaty which came into force on 1 January this year, gives the European Parliament co-decision powers on most EU fisheries matters, but the setting of annual catch quotas remains the Council's sole responsibility.