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# ICES advice for the exploitation of Baltic Sea fish stocks in 2010

On 29 May 2009, ICES' Advisory Committee (ACOM) published their advice regarding the exploitation of the Baltic Sea fish stocks for 2010. The following provides a summary and comment on the assessments and advice.

## Cod

Since 2004, the Baltic Sea cod is managed as two separate stocks: the Eastern and the Western stock. The stocks are biologically distinct from one another, although there is some migration of fish between the areas. The Eastern stock is currently more than seven times larger than its Western counterpart. In 2007, an EU multi-annual management plan for both cod stocks in the Baltic was adopted (EC 1098/2007), which aims at restoring the fish stocks to sustainable levels and keeping them there.

***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.

In this year's advice, ICES still classifies the stock as being at risk of reduced reproductive capacity.

*Despite this, ICES recommends an* ***increase*** *of the Total Allowable Catch (TAC) by 8.6 per cent, which is in line with the management plan.*

Compared to the preceding year's recommendation (the EU Council did not follow ICES' advice all-out), the increase is 27.7 per cent.

The main reasons for this are twofold:

- the previously mentioned management plan.
- revised figures for the earlier assessments of Spawning Stock Biomass (SSB) and Fishing mortality (F).

SSB is the number of reproductively mature fish, measured in tonnes. Fishing mortality (F) is a measure of the number of fish killed by fishing (as opposed to natural death, or death caused by environmental/medical factors).

The ICES advice for 2009 was based on the precautionary principle, but ICES had not yet evaluated the 2007 management plan. In March this year, ICES experts found the plan to be in accordance with the precautionary approach. It concluded, that provided that the implementation error – TAC or effort overshot, which includes illegal fishing and unallocated or misreported landings – is kept below 10 per cent, the stock is likely to rebuild to a size in accordance with the precautionary approach before 2010. For the fishing mortality (F) of the Western stock, the plan sets a target of 0.6. It stipulates that this goal should be reached by reducing F by 10 per cent year on year.

Furthermore, ICES this year adopted a new model for making assessments. The experts now say that earlier assessments have shown a consistent pattern of underestimating SSB and overestimating F.

Accordingly, the SSB estimates have now been revised upwards by 15 per cent compared to last year's assessment, and the fishing mortality estimate was revised downwards by 25 per cent for 2007.

This reflects the uncertainty of the assessment, but it also provides the basis for the calculation of the rather startling 2010 TAC increase: with the 2009 fishing mortality set to 0.82, a 10 per cent reduction means $F_{2010}$ = 0.74. That implies landings of 17.700 tonnes in 2010, an 8.6 per cent increase compared to the 2009 TAC (the full TAC is usually taken).

**Some other causes for uncertainty:**

- The positive future recruitment predictions are mainly based on just one strong year class, that of 2008 (the year classes 2004-2007 were among the weakest in the time series). The estimated level of the 2008 year class, which is expected to provide 50 per cent of next year's catches, contains "high uncertainties", ICES says.
- The assessment includes discards, but the advice refers to landings only.
- 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.
- The management plan also specifies a 10 per cent reduction in fishing effort (total fishing days at sea) per year until the target F has been reached. The compliance with this is assumed when advicing on the future TACs.

The Western stock is still categorised as being "overfished" with respect to the potential long term yield. This means that the stock could be much larger, and more fish could be caught in the future if fishing mortality was reduced, which is the goal of the management plan.

***Subdivision 25 -32, Eastern Baltic***

The Eastern Baltic cod stock has historically been much larger than what it is today. Due to very favourable environmental conditions and extremely strong year classes towards the end of the seventies, the stock reached its historically highest levels in 1980-1982, when it was more than four times larger than today. In recent years, the stock has declined to the lowest level on record as a result of overfishing together with unfavourable environmental conditions (mainly low oxygen concentrations as a result of eutrophication and low water inflow from the North Sea).

The stock biomass is still on a historically low level, but based on the most recent fishing mortality estimate (F = 0.24 for 2009, and predicted to be 0.16 for 2010), which is below the goal in the management plan, ICES no longer classifies the stock as "overfished" and sees it as sustainably harvested.

Three recent year classes, those of 2003, 2005 and 2006, are above the average of the past 20 years.

*For 2010, ICES recommends a 15 per cent TAC increase, which corresponds to catches of 56.800 tonnes (the Russian quota included).This is in line with the agreed management plan.*

The management plan sets a fishing mortality goal for the Eastern stock of F = 0.3. That would correspond to catches of 101.100 tonnes, more than double the agreed TAC for 2009. At the same time, however, the management plan limits the deviation in the TAC from one year to another to 15 per cent.

As for the Western stock, ICES has this year evaluated the management plan in terms of what the Eastern stock needs, and found it in accordance with the precautionary approach, if the implementation error is low. Accordingly, ICES now advices within the frame of the plan for both Baltic cod stocks.

Besides the TAC system, the stock is also managed through restrictions of effort and seasonal fisheries:

- 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 maximized to 160 days per vessel to limit effort.
- All areas in the Eastern Baltic are closed from 1 July to 31 August to protect spawning cod.
- Some parts of the Bornholm Deep, the Gotland Basin, and the Gdansk Deep are closed all year, also to protect spawners.
- Other areas are subject to closures from 1 May to 31 October.

All of these measures to reduce effort have contributed to an apparent decrease in the fishing mortality for this stock, ICES says.

Since the fishing mortality estimated and predicted for 2009 and 2010, respectively, are below the target in the management plan, no effort reduction is deemed to be required. This leads to a higher risk for discarding and high-grading (generally, discards are made to get rid of bycatches of fish which for quota or size reasons can not be landed; high-grading is the discarding of marketable fish to make room on the vessel for specimens that have a higher sales value). With the strong year classes of 2005 and 2006 – the latter entering the fishery this year – discards are likely to rise above the levels predicted.

Taking that risk into consideration, ICES recommends measures to improve the selectivity of fishing gear, for instance increased mesh size.

**Some other causes for uncertainty:**

- The estimate of unallocated (illegal) landings – included in the predicted fishing mortality (F) – is, in ICES' words, "highly uncertain". Such misreporting, or unreporting, was believed to add an extra 32-45 per cent to the reported catches during the period 2000–2007. Data for 2008, used for the 2010 advice, suggests that this figure has been brought down to a mere 6 per cent. Since only some countries reported estimates – others said they had no data to submit, since they did not have any illegal fishing – ICES says this information is highly uncertain. Accordingly, so is the 2008 estimate of the fishing mortality which the current advice is based on.
- Figures on discards are also uncertain, since ICES says sampling is insufficient. The predicted discard figure for 2010 is based on the estimate for 2008, but discards are likely to be higher for the reasons described above – strong incoming year classes, while the fishing effort remains the same.
- It is unusually difficult to decide the age of specimens of the Eastern Baltic cod stock, since it lacks clear growth rings in the otoliths. (The otoliths are a part of the inner ear which scientists study in order to determine the specimen's age.) The proportion of landings with no age information in 2008 was 28 per cent, which ICES says is very high and probably leads to an underestimated fishing mortality.
- In all, the problems with the catch and survey data and inconsistent age determinations make it difficult to precisely determine the strengths of the 2005 and 2006 year classes. Since the 2006 year class could make a major contribution to the catch in 2010 and the spawning stock in 2011, forecasts of catches and spawning stocks are especially sensitive to the estimated strength of that year class.

# Herring

The Baltic herring is managed in four separate areas: the Western Baltic and Kattegat, the central Baltic, Gulf of Riga, Bothnian Sea and the Bothnian Bay. The ICES advice for the Western Baltic and Kattegat will be released together with the North Sea advice on 26 June 2009.

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

This is the largest of the Baltic herring stocks. After showing a steady increase since the beginning of the 2000's, the latest estimate (2008) indicates a slight decrease, with the stock size at about 41 per cent below the long-term average. The fishing mortality has gone up to F = 0.25 and the last strong year class was the one of 2002.

Based on this, ICES now classifies the stock as at risk of being harvested unsustainably. The fishing mortality, using the precautionary approach, should be F = 0.19. This corresponds to landings of less than 103,000 tonnes (the TAC in 2009 was 143.6 tonnes).

*For 2010, ICES recommends a TAC of less than 103,000 tonnes – a 28 per cent decrease. This is in line with the precautionary approach.*

In this area, herring is caught together with sprat, resulting in imprecise landings. From 2005, Union 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. Since most of the TAC has been taken in recent years, however, the incentive for misreporting herring as sprat may have increased, but the possible extent of that is largely unknown. Still, ICES regards the assessment as being good enough to base forecasts on.

Since herring and sprat are the major prey for cod, these fisheries can indirectly affect the cod stock when exploitation is high.

***Gulf of Riga***

With the fishing mortality for 2008 lower than what the precautionary approach stipulates – after several years of exceeding it – ICES now classifies this stock as sustainably harvested. Its year classes are highly dependent on environmental conditions (such as ice cover). Since the end of the 1980s, the majority of winters have been mild, and this climate has been favourable for the reproduction of Gulf of Riga herring. The year classes of 2005, 2007 and 2008 are strong, while the 2006 year class is poor.

The Gulf of Riga is a semi-enclosed ecosystem of the Baltic Sea and the low salinity restricts the occurrence of marine species. Herring is the dominant species in the Gulf, and the by-catch 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 high. This makes predation mortality low for the Riga herring.

Since the Riga herring is not managed under a plan, ICES bases its recommendation on the precautionary approach. Using the precautionary approach, the fishing mortality should be F = 0.4, which leads to landings of less than 33,400 tonnes. This is more than last year's advice, but a slight decrease compared to the TAC agreed by the EU.

*ICES recommends for 2010 a TAC of less than 33,400 tonnes – a 4.3 per cent decrease.*

***Subdivision 30, Bothnian Sea***

The herring stock in the Bothnian Sea is mainly exploited by Finnish trawlers, but also used to produce the Swedish speciality "surströmming". In the past, ICES has only had fisheries dependent

data for this stock (ie figures reported from the fishery on catch and landings), but this year's assessment is based on two years of independent sampling as well, and is considered maybe the best assessment ever made for this stock.

- The spawning biomass of this stock tripled in the late 80s, and has remained at a steady level since then.
- The fishing mortality has fluctuated between F = 0.1 and F = 0.2 ever since this time series began in 1973 – the precautionary approach stipulates F = 0.21.

ICES classifies this stock as being harvested in a sustainable way.

Applying the precautionary approach, fishing should be below F = 0.21, which corresponds to landings of less than 109,600 tonnes. Compared to the 2009 TAC, this is an increase of 32.5 per cent. Compared to the ICES advice for that year, it is a 63 per cent increase.

*ICES recommends for 2010 a TAC of less than 109,600 tonnes – a 32.5 per cent increase.*

A potential problem for this stock is the dioxin concentration. With exploitation of the stock being low, the amount of older specimens in it can be expected to increase. Since older herring are likely to have accumulated higher amounts of dioxin, that may imply higher concentration 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 Union limit expires after 2011, and no decrease in levels has been observed in herring from the Bothnian Sea since the 1990s.

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 Swedish fishery, as the production of "surströmming" demands a greater size.

***Subdivision 31, Bothnian Bay***

Since the available information is inadequate, the state of the stock is unknown, and there is no basis for an advice. This is appears to be a small stock, however, with a limited fishery.

## Sprat

Sprat appears to be spread out all over the Baltic Sea and is managed as one single stock in subdivision 22–32 – basically the entire Baltic. This is the largest fish stock in the Baltic Sea. The stock is highly affected by the abundance of cod, its main natural predator. The stock therefore experienced a low spawning biomass in the first half of the eighties, when the cod stocks were very large. In the beginning of the nineties the stock started to increase and reached the maximum spawning stock biomass ever recorded at 1.7 million tonnes in 1996–1997. This was a result of low cod biomass combined with strong recruitment.

In recent years, however, fishing mortality has been higher than F = 0.40, which the precautionary approach sets as a target, and ICES classifies the stock as at risk of unsustainable harvesting.

The precautionary fishing mortality of 0.4 corresponds to landings of less than 306,000 tonnes – higher than the advice for 2009, but 93,000 tonnes less than the current TAC.

*For 2010, ICES recommends a TAC of less than 306,000 tonnes – a 23 per cent decrease.*

The future development of the Baltic sprat is very much dependent on this year's and next year's year classes, but also on the development of the Eastern Baltic cod stock. The reverse is true as well: the availability of sprat is likely to have an effect on the cod as it is an important food source.

This implies that a possible recovery for the cod stock may mean that exploitation of the sprat stock will have to be reduced. The increase in the cod stock in 2007–2008, for example, is estimated to

have affected the biomass of the sprat stock through a 20 per cent increase in predation mortality. (Predation mortality is 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, the most consistent development during 1992–98, when it fell by approximately 40 per cent. For both stocks, that may be explained by the diminishing access to zooplankton, while the stocks competing for those foods were growing.

## 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 divided into subsequent assessment areas.

The Baltic salmon is heavily dependent on environmental conditions, and river damming and habitat deterioration have had a devastating effect on salmon habitats and spawning grounds in its freshwater environments. As result of agreements made with power companies responsible for river damning for hydro power purposes, very substantial restockning (release of reared salmon fry) takes place each year in order to compensate for the loss of naturally spawning salmon due to blocked salmon migration. The reared salmon pose a risk of deterioration of the gentic variability of the wild salmon stocks. The process is also very costly.

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

### *Salmon in the Main Basin and the Gulf of Bothnia, Subdivisions 22 - 31*

This area is inhabited by stocks that are assessed by ICES in five different units, according to biological and genetic conditions. Management actions in this 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 young life stage of the salmon, when it starts to migrate between fresh water and the sea). Over the last five years, the total wild smolt production in all of the assessment units combined has increased by 50–60 per cent. 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. ICES 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.

In January 2008, a ban on the drift net fishery came fully into force and the catches have subsequently decreased. But partially because of the poor post-smolt survival and the weak production of some of the stocks, ICES recommends continously low catches.

*For 2010, ICES recommends a catch of 133,000 individuals – a reduction of 57 per cent. Since only a small part of the TACs have been utilized in later years – 35 per cent in 2008 – this is in practice an adjustment to current effort.*

ICES adds that management should be focused on the individual stocks in the rivers – where some are especially weak, and some are stronger – since fisheries on the mixed natural/reared stocks along the coasts or in open sea are harder to deal with.

### *Salmon in the Gulf of Finland (Subdivision 32)*

This area consists of a few small wild populations together with a number of mixed stocks (consisting of both reared and wild salmon). 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 says that the new data available for this area are too sparse to revise the advice from last year. That was a recommended TAC of 15,000 specimens – but only reared fish. ICES emphasizes that no catches of wild salmon should be allowed in the Gulf, adding that poaching takes place in some Estonian rivers and "must be stopped".

*For 2010, ICES continues to state that there should be no catch of wild salmon in the Gulf of Finland. Fisheries should only be permitted at sites where there is virtually no chance of taking wild salmon, and then a catch of 15,000 individuals is suggested.*

To improve selectivity of harvesting, coastal fisheries at sites likely to be on migration paths of wild salmon from Estonian rivers should be prohibited. Fishing in rivers and river mouths supporting wild stocks should be prevented.

## What happens next?

The European Commission, after consulting with their advisory Scientific, Technical and Economic Committee for Fisheries (STECF), will publish their proposal for catch limits in the Baltic. This is likely to take place during the summer. This will then be discussed in the Council working group, prior to the the Fisheries Council's meeting in October. Most likelty, the 2010 TACs and quotas, along with accompanying technical regulations, will be agreed at the October meeting, under the Presidency of the Swedish Minister. In the meantime, the European Commission on behalf of the Union, will negotiate with Russia, which also fish in the Baltic Sea.