**Data compilation of North Sea cod by sub-areas**

Assessment input data were compiled by four sub-areas, shown on Figure X. For the assessment analyses for two areas ( Northwest+South and Viking+Skagerrak) , catch data for respective areas were summed, and mean weights averaged.

*Landings*

Landings in tons information for the different sub-areas came from STECF database that includes landing information for EU countries by rectangles. Landings by rectangles from STECF are available for years 2003-2013. Norwegian landings from ICES WGNSSK report for area IV were allocated to the “Viking” sub-area.

*Landings at age*

Information on age distribution and mean weight at age in landings by sub-areas was available from England& Wales and Denmark, for 2003-2013. Additionally, age distribution data on Scottish landings in the entire North Sea were available for 2010-2013.

In Skagerrak (Sk), Denmark is taking approximately 70 % of landings, and Danish landings at age in this area were up scaled to match the total international landings in Skagerrak.

In Viking area (V), Denmark has taken an average of 23 % of total landings in 2003-2013, and Danish age compositions and mean weights at age in Viking area were used to distribute the total international landings in this area to numbers at age.

In Northwestern area (NW) no time series of age information coming from this particular area was available. Most of the landings in this area are taken by Scotland. For 2010-2013, age structure of Scottish landings for the entire North Sea and respective mean weights at age were used to distribute the total international landings in NW in these years to numbers at age. For 2003-2009, overall North Sea wide age structure of landings and mean weight at age (obtained from ICES WGNSSK) was used to distribute the total international landings in NW to numbers at age.

In Southern area (S), age composition data were available from Denmark and England & Wales, that together have taken an average of 44 % of the total landings in this area in 2003-2013. The combined relative age composition and mean weight at age from these two countries was used to distribute the total international landings in S to numbers at age

*Discards at age*

Total cod discards in the North Sea in weight (tons) were taken from ICES WGNSSK reports. The total discards in weight were distributed between the four areas, based on relative distribution of cod landings in these areas.

For Skagerrak area, discard numbers and mean weights at age in discards by age were available from Denmark for the years 2000-2013. The Danish discards at age in this area were up scaled to match the total international assumed discards (in weight) in Skagerrak.

For Viking area, discard numbers and mean weights at age were available from Denmark for the years 2003-2013. The Danish discards at age in this area were up scaled to match the total international assumed discards (in weight) in V area.

For Northwestern area, North Sea wide discard information from Scotland was used for years 2010-2013, assuming that a half of the Scottish discards occur in NW area. The ratio between Scottish landings and assumed discards numbers in NW was applied on total landings in this area, to derive a proxy for international discards in NW in 2010-2013. For 2003-2009, the ratio between total North Sea wide landing and discard numbers at age ( from ICES WGNSSK) by year was applied on landings at age in NW to derive a proxy for discards for these years.

For Southern area, discard in numbers and mean weight at age in discards from monitoring programs were available for England &Wales and Denmark for 2003-2013. The combined discards at age from these countries were up scaled to match the total international assumed discards (in weight) in S area.

*Survey indices*

IBTS Q1 and Q3 data were used to derive catch per unit of effort indices for the four areas. A Delta-GAM model approach for fitting numbers-at-age from DATRAS haul-by-haul exchange data was applied (Berg et al. 2013). The indices are obtained by adding filtered model predictions over a spatial grid. The presented model is able to account for changes such as different gears, steep depth gradients, ship/country effects, and spatial coverage. Such effects may be balanced out by the relatively stable survey design over the period considered, but indications of such effects are evident in simple residual plots.

The indices calculated in this way are generally similar to the ones following ICES approach that was used in the analyses where the number of sub-areas was reduced.

*Mean weight in the stock*

Mean weights at age in the stock for the four areas were estimated from IBTS Q1 data.

*Natural mortality and maturity at age*

The same values as used in combined ICES assessment were applied for all four areas.

**References**

Berg, C.W., Nielsen, A., Kristensen, K., 2013. Evaluation of alternative age-based method for estimating relative abundance from survey data in relation to assessment models. Fisheries Research,  
http://dx.doi.org/10.1016/j.fishres.2013.10.005.