Stock Annex: Turbot (*Scophthalmus maximus*) in Subdivisions 22–32 (Baltic Sea)

Stock specific documentation of standard assessment procedures used by ICES.

Stock:	Turbot (*Scophthalmus maximus*) in Subdivisions 22–32 (Baltic Sea)
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A. General

A.1. Stock definition

Lack of available information for turbot did not allow identifying stock structure for this species (ICES, 2010). The turbot is a coastal species commonly occurring from Skagerrak up to the Sea of Åland (Florin, 2005). Turbot spawns in shallow waters (10–40 m, 10–15 m in central Baltic) and the metamorphosing postlarvae migrate close to shore to shallow water (down to one meter depth) (Plikšs and Aleksejevs, 1998, Ojaveer *et al.*, 2003; Florin, 2005). Turbot fishery is mainly carried out in the westerly parts of the Baltic Sea, SD 22–26, and mean annual landings amounts to less than 500 tonnes during the 2000´s (ICES, 2010).

For turbot genetic data show no structure within the Baltic Sea (Nielsen *et al.*, 2004, Florin and Höglund, 2007), although Nielsen et al (2004) discovered a difference between Baltic Sea and Kattegat with an hybrid zone in SD 22. However, phenotypic parameters (morphometry of spermatozoa) suggests that at least two local turbot population in the southern Baltic Sea exist, one in SDs 24–25 and the second in SD 26 (Gosz *et al.*, 2010). Spawning site fidelity of this species confirms there is high possibility of creating local (at least phenotypic based) stocks of turbot. Three different tagging studies from three different parts of the Baltic Sea all show that turbot have high spawning area fidelity and that 95% of the fishes move less than 30 km from tagging site and few individuals show a displacements of more tha 100 km (Johansen, 1916; Aneer and Westin, 1990; Florin and Franzen, 2010). The study from Bornholm area (Johansen, 1916) is very small, however, and no information is available from the eastern part of the Baltic Sea, hence it is possible that turbot stocks in these areas behave in a different way.

To be able to elucidate the stock structure of turbot in the Baltic there is a need for tagging studies also from the southern and eastern parts. The investigations on spermatozoa morphometry should be checked for environmental influence and preferably sampling would be done also in the northern part of the Baltic Sea. Studies on salinity requirements for reproduction as well as phentotypic data including growth rate from different parts of the Baltic could be of great value. In addition there is still a lack of knowledge on larval exchange between different parts of the Baltic.

Additional information has been available based on the international coordinated Baltic International Trawl Survey (BITS) since 2001 where standard gear is applied and common survey design is used. Spatial distributions of turbot during BITS suggest that the turbot stock SD 22–32 is probably related with turbot in SD 21 (Figure 1, spatial distribution of turbot during BITS in quarter 4 2001).

Biological and fishery data of turbot for the Baltic Sea were available from different national fishery parameters like catch volume, discard volume, discard length distribution, discard age distribution, length distribution - commercial catches, length distribution – survey, catch at age in numbers, weight at age in the catch, fishing effort, commercial catch per unit of effort are available by quarter and subdivision for different periods (ICES, 2010).

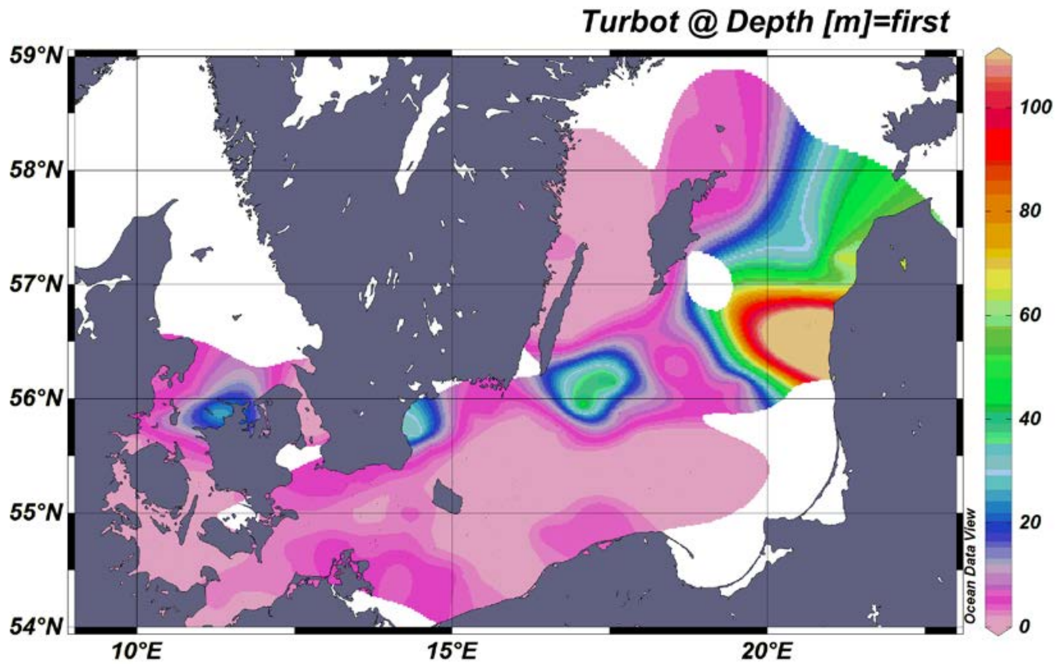

Figure 1. Spatial distribution of turbot during BITS in quarter 4 2001. Cpue of turbot is given in catch in number per hour in units of TVL with Conversion Factor between TVS and TVL = 1.4.

A.2. Fishery

Turbot is mainly captured as bycatch in the Baltic. Landings of less than 250 tons were reported before 1986 with decreasing proportion of landings in SD 24 (from ~ 90 % to ~ 30 %) (Fig. 2). Landings increased in the following years to more than 1000 tons between 1993 and 1997 (1998, 807 t). In the same period the proportion of landings in SD 24 decreased to ~ 15 % and the landings in SD 22 and SD 25 increased. Since 1999 the landings have been lower than 600 t with relative stable values around 300 t from 2006 onwards with increasing importance of the area SD 25–32.

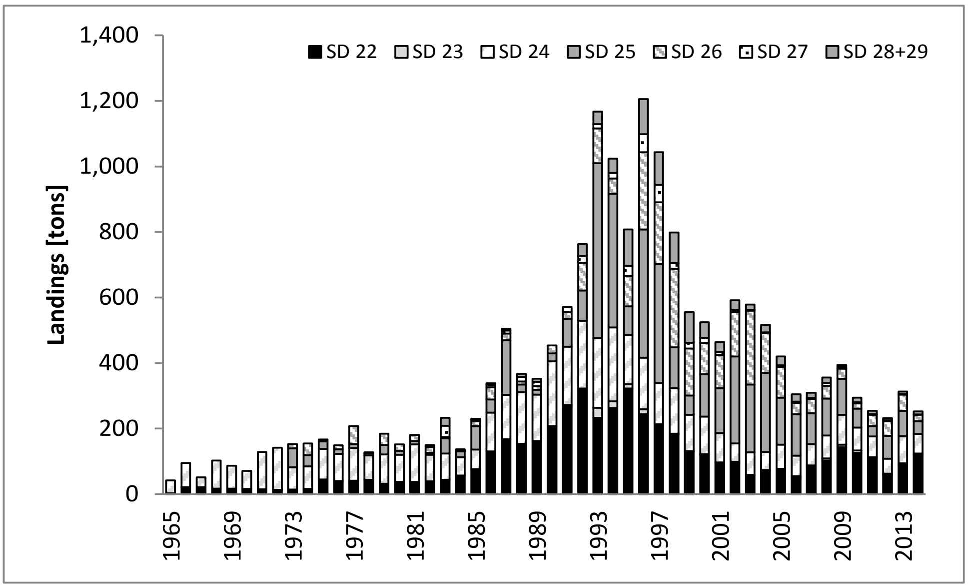

Figure 2. Landings of turbot (tonnes) by ICES subdivisions from 1970–2011

B. Data

B.1. Commercial catch

Landings by countries and ICES Subdivisions are available. Therefore the commercial catch data were not used for stock assessment.

B.2. Biological

Biological and fishery data for the Baltic Sea were only available from the German fishery. Parameters such as catch volume, discard volume, discard length and age distribution, length distribution and fishing effort are available from the commercial fishery. Data on catch at age in numbers, weight at age in the catch, commercial catch per unit of effort are available by quarter and subdivision from scientific surveys. Not all years within the time series have been covered (ICES, 2010).

B.3. Surveys (BITS in quarter 1 and 4)

National bottom trawl surveys were conducted in the Baltic Sea between 1978 and 2000 in quarter 1 and quarter 4. However, large parts of ICES SD 22 were not be covered by the surveys. Baltic International Trawl Survey (BITS) was established in 2001 which was coordinated by WGBIFS. A new design of the survey is applied which uses random selected station taken from Tow Database. Small and larger versions of standard gear (TVS and TVL), which are adapted to the different sizes of research vessels were used and conversion factors were estimated based in inter-calibration experiments to transfer the catch per unit effort data of TVS into units of TVL. The mesh size in the cod end of the standard gears is 10 cm suggesting that the catchability of turbot larger than 11 cm is not influenced by the cod end mesh size if it is assumed that the selectivity characteristics of turbot and flounder are comparable (Oeberst, 2007). The highest observed catch per hour was 7 turbot in SD 28 during BITS in quarter 4 in 2008. Minimum observed length of turbot during BITS was 9 cm and the maximum length was 54 cm. Truncation of length range for the stock assessment is not supported by the length distributions observed during BITS. Turbot was observed from SD 22 to SD 28. Highest cpue values were registered between 10 m and 60 m depth. Determination of age was realized for all BITS sampled specimens, but only in most cases only turbot captured in SD 22–24 was sampled. In addition, total catch of turbot was reported without length data in some cases.

C. Assessment: data and method

Landings by countries and ICES Subdivisions were presented. In addition, mean catch in numbers per hour of turbot ≥ 20 cm length based on BITS Q1+Q4 in SD 22–24 combined indices (arithmetic mean) are presented. Hauls which were realized between 10 m and 19 m depth (BITS stratum 8) were take into account. The mean cpue values were estimated according the procedures given in the BITS manual. Constant conversion factor of 1.4 was used to transfer the cpue values of the small standard gear (TVS) into units of the large standard gear (TVL).

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