

at survey time (October). These weights (Table 2.13) will, however, overestimate the stock biomass at the start of the year.

2.4.3 Natural mortality

A fixed natural mortality of 0.2 has been assumed in the assessment. However, in the Barents Sea cod cannibalism has been documented to be a significant source of mortality that varies in relation to alternative food and in relation to the abundance of large cod. This might also be the case for the coastal cod (Pedersen and Pope, 2003a and b). In the 2005 coastal cod survey 1125 cod stomachs were analysed (Mortensen, 2007). The observed average frequency of occurrence of cod in cod stomachs was around 4%. Other important predators on cod in coastal waters are cormorants, harbour porpoises and otters (Anfinsen, 2002; Pedersen *et al.*, 2007; Mortensen, 2007). Young saithe (ages 2–4) has been observed to consume postlarvae and 0-group cod during summer/autumn (Aas, 2007).

2.4.4 Maturity-at-age (Tables 2.10, 2.13, Figure 2.13)

The average maturity-at-age observed over the survey period 1995–2009 has been used in the assessment (Table 2.13), since there are uncertainties related to the annual variations seen in the survey observations of maturity (Figure 2.13b). The analyses based on back-calculation of spawning zones (Figure 2.13b) are relevant, but still preliminary.

2.5 Methods used for assessing trends in stock size and mortality (Table 2.13–2.18, Figure 2.16–2.18)

Earlier attempts to assess the stock using XSA analysis have shown retrospective problems. For several years the main basis for assessing the stock was the survey time-series (plotted in Figures 2.6–2.13), and SURBA was used for further analysing the survey trends.

In the 2010 WG mortality signals from the survey and from the catch-at-age data were analysed and an SVPA (“user-defined VPA” in the Lowestoft VPA95-menu) were run using the survey based estimate of F_{2009} (details described in Annex 10 in ICES CM 2010/ACOM:05) as terminal F . The same procedure was used this year: By using the survey indices for ages 2 to 8 (Table 2.6) a trial XSA (Tables 2.13–2.15) was run to obtain historic values of $F(4-7)$. Calculated survey mortalities (Table 2.16 and Figure 2.15) were regressed with XSA F s for the years 1996–2007 (Figure 2.15). This regression was used for converting the 2017 survey mortality to a VPA $F(4-7)$ (Table 2.16). A selection pattern for 2014 was estimated as the average pattern over the years 2014–2016 in the trial XSA, and F s on oldest true age was taken from the trial XSA. The SVPA, which is considered as the final assessment, was run by using the survey based $F(4-7)$ for 2017 combined with the selection pattern and oldest true F s described above. The same procedure was repeated for catch-at-age data including estimates of recreational catches, but the trial XSA for that dataset is not shown here.

The results are shown in Tables 2.17–2.18 and in Figures 2.16–2.18.