Appendix 5. Per- and polyfluorinated alkyl substances (PFASs)

Statistical methods and figure legends

Extreme values may have strong detrimental effect on the statistical power to detect trends but also affect the trend itself if the extreme value are situated in the beginning or at the end of the time series and thus exerting a strong leverage effect. Potential outliers are detected using the Tukey's outer fence (see e.g. Foreman, 2014). The inter-quartile range (IQR) is achieved from a given window of values, this reduce a potential trend (linear or non-linear) to cause deviating concentrations. To make the outlier detection less sensitive, the outer fence was moved from the suggested 3*IQR to 6*IQR. Only really extreme values are reported. Extremes have been excluded after checking the data. If so, this is mentioned in the figures.

Slope = reports the annual change in percent per year with a 95% confidence interval. This change is based on a log-linear regression analysis.

\[ \text{CV(lr)} = \text{Coefficient of variation for residuals around the log-linear regression line}. \]

\[ \text{LDT(d)} = \text{the smallest slope that can be detected with 80\% power during a 10-year period, using the average sample size per year}. \]

\[ \text{YRQ} = \text{minimum n of years required to detect a 5\% annual change with a power of 80\%}. \]

\[ \text{Y(17)} = \text{is the estimated geometric mean concentration year 2017, together with a 95\% confidence interval}. \]

\[ \text{r2, p=} = \text{the Coefficient of Determination (the proportion of the variation, explained by the regression: concentration over time) together with the corresponding p-value}. \]

An alternative to the regression line in order to describe the development over time is a smoothed line. The smoother applied here is a simple 3-point running mean smoother fitted to the annual geometric mean values. In cases where the regression line is badly fitted the smoothed line may be more appropriate. The significance of this line is tested by means of an Analysis of Variance where the variance explained by the smoother and by the regression line is compared with the total variance. This procedure is used at assessments at ICES and is described by Nicholson et al., 1998.

\[ \text{CV(sm), \%, p, \%= reports the Coefficient of Variation for the residuals around a smoother (3- or 5 point running mean). If the smoother explains significantly more than the regression line (p<0.05) it is considered significant and is plotted (red smoothed line)}. \]

\[ \text{Cp = , p=} = \text{reports results of a Change-Point analysis (Sturludottir et al., 2014) that tries to detect a significant change-point in the time-series. The year of the change-point and the p-value are reported}. \]

\[ \text{Pw(c) reports the power to detect a yearly change of 5\% for current time-series. Pw(d) reports the same thing but estimated for time-series of a fixed period of 10 years (with the same sample sizes as the current time-series)}. \]

Time series with too few years analysed or with too many analyses below LOQ have been excluded.

************


PFASs. Perfluorooctanoic acid (PFOA)

Fig. 1. PFOA. Individual blood serum samples from first-time mothers from Uppsala. PFOA (unadjusted): log-linear regression model with PFOA concentration as dependent variable and year as independent variable. PFOA (adj.): log-linear regression model with PFOA concentration as dependent variable and year of sampling, and maternal age, BMI, weight+, and weight- as independent variables.

Fig. 2. PFOA. Pooled blood serum samples from first-time mothers from Uppsala.
Fig. 3. PFOA. Pooled/individual human milk samples from Stockholm and Göteborg (NRM).

Fig. 4. PFOA. Pooled guillemot eggs from Stora Karlsö, the Baltic Sea.
Fig. 5. PFOA. Pooled autumn samples of herring liver from the Baltic Sea (Harufjärden, Ångskärsklubb, Landsort).

Fig. 6. PFOA. Pooled autumn samples of herring liver from the Baltic Sea (Utlängan) and from the Swedish Atlantic west coast (Fladen, Väderöarna).
PFASs. Perfluorononanoic acid (PFNA)

Fig. 7. PFNA. Individual blood serum samples from first time mothers from Uppsala. PFNA (unadjusted): log-linear regression model with PFNA concentration as dependent variable and year as independent variable. PFNA (adj.): log-linear regression model with PFNA concentration as dependent variable and year of sampling, and maternal age, BMI, weight+, and weight- as independent variables.

Fig. 8. PFNA. Pooled blood serum samples from first-time mothers from Uppsala.
Fig. 9. PFNA. Pooled/individual human milk samples from Stockholm and Göteborg (NRM).

Fig. 10. PFNA. Pooled guillemot eggs from Stora Karlsö, the Baltic Sea.
Fig. 11. PFNA. Pooled autumn samples of herring liver from the Baltic Sea (Harufjärden, Ängskärsklubb, Landsort).

Fig. 12. PFNA. Pooled autumn samples of herring liver from the Baltic Sea (Harufjärden, Ängskärsklubb, Landsort).
PFASs. Perfluorodecanoic acid (PFDA)

Fig. 13. PFDA. Individual blood serum samples from first time mothers from Uppsala. PFDA (unadjusted): log-linear regression model with PFDA concentration as dependent variable and year as independent variable. PFDA (adj.): log-linear regression model with PFDA concentration as dependent variable and year of sampling, and maternal age, BMI, weight+, and weight- as independent variables.

Fig. 14. PFDA. Pooled blood serum samples from first-time mothers from Uppsala.
Fig. 15. PFDA. Pooled/individual human milk samples from Stockholm and Göteborg (NRM).

Fig. 16. PFDA. Pooled guillemot eggs from Stora Karlsö, the Baltic Sea.
Fig. 17. PFDA. Pooled autumn samples of herring liver from the Baltic Sea (Harufjärden, Ängskärsklubb, Landsort).

Fig. 18. PFDA. Pooled autumn samples of herring liver from the Baltic Sea (Utlängan) and from the Swedish Atlantic west coast (Fladen, Väderöarna).
PFAs. Perfluoroundecanoic acid (PFUnDA)

Fig. 19. PFUnDA. Individual blood serum samples from first time mothers from Uppsala. PFUnDA (unadjusted): log-linear regression model with PFUnDA concentration as dependent variable and year as independent variable. PFUnDA (adj.): log-linear regression model with PFUnDA concentration as dependent variable and year of sampling, and maternal age, BMI, weight+, and weight- as independent variables.

Fig. 20. PFUnDA. Pooled blood serum samples from first-time mothers from Uppsala.
Fig. 21. PFUnDA. Pooled/individual human milk samples from Stockholm and Göteborg (NRM).

Fig. 22. PFUnDA. Pooled guillemot eggs from Stora Karlsö, the Baltic Sea.
Fig. 23. PFUnDA. Pooled autumn samples of herring liver from the Baltic Sea (Harufjärden, Ängskärsklubb, Landsort).

Fig. 24. PFUnDA. Pooled autumn samples of herring liver from the Baltic Sea (Utlängan) and from the Swedish Atlantic west coast (Fladen, Väderöarna).
PFASs. Perfluorododecanoic acid (PFDoDA)

Fig. 25. PFDoDA. Pooled blood serum samples from first-time mothers from Uppsala.

Fig. 26. PFDoDA. Pooled/individual human milk samples from Stockholm and Göteborg (NRM).
Fig. 27. PFDoDA. Pooled guillemot eggs from Stora Karlsö, the Baltic Sea.

Fig. 28. PFDoDA. Pooled autumn samples of herring liver from the Baltic Sea (Harufjärden, Ängskärsklubb, Landsort).
Fig. 29. PFDoDA. Pooled autumn samples of herring liver from the Baltic Sea (Utlängan) and from the Swedish Atlantic west coast (Fladen, Väderöarna).
PFASs. Perfluorotridecanoic acid (PFTrDA)

**Fig. 30.** PFTrDA. Pooled blood serum samples from first-time mothers from Uppsala.

**Fig. 31.** PFTrDA. Pooled/individual human milk samples from Stockholm and Göteborg (NRM).
Fig. 32. PFTDa. Pooled guillemot eggs from Stora Karlsö, the Baltic Sea.

Fig. 33. PFTDa. Pooled autumn samples of herring liver from the Baltic Sea (Harufjärden, Ängskärsklubb, Landsort).
Fig. 34. PFTrDA. Pooled autumn samples of herring liver from the Baltic Sea (Utlängan) and from the Swedish Atlantic west coast (Fladen, Väderöarna).
PFASs. Perfluorohexane sulfonic acid (PFHxS)

Fig. 35. PFHxS. Individual blood serum samples from first time mothers from Uppsala. PFHxS (unadjusted): log-linear regression model with PFHxS concentration as dependent variable and year as independent variable. PFHxS (adj.): log-linear regression model with PFHxS concentration as dependent variable and year of sampling, and maternal age, BMI, weight+, and weight- as independent variables.

Fig. 36. PFHxS. Pooled blood serum samples from first-time mothers from Uppsala.
Fig. 37. PFHxS. Pooled/individual human milk samples from Stockholm and Göteborg (NRM).

Fig. 38. PFHxS. Pooled guillemot eggs from Stora Karlsö, the Baltic Sea.
Fig. 39. PFHxS. Pooled autumn samples of herring liver from the Baltic Sea (Harufjärden, Ångskärsklubb, Landsort).

Fig. 40. PFHxS. Pooled autumn samples of herring liver from the Baltic Sea (Utlängan) and from the Swedish Atlantic west coast (Fladen, Väderöarna).
PFASs. Perfluorooctane sulfonic acid (PFOS)

Fig. 41. PFOS. Individual blood serum samples from first time mothers from Uppsala. PFOS (unadjusted): log-linear regression model with PFOS concentration as dependent variable and year as independent variable. PFOS (adj.): log-linear regression model with PFOS concentration as dependent variable and year of sampling, and maternal age, BMI, weight+, and weight- as independent variables.

Fig. 42. PFOS. Pooled blood serum samples from first-time mothers from Uppsala.
Fig. 43. PFOS. Pooled human milk samples from Stockholm and Göteborg (NRM).

Fig. 44. PFOS. Pooled guillemot eggs from Stora Karlsö, the Baltic Sea.
Fig. 45. PFOS. Pooled autumn samples of herring liver from the Baltic Sea (Harufjärden, Ångskärsklubb, Landsort).

Fig. 45. PFOS. Pooled autumn samples of herring liver from the Baltic Sea (Utlängan) and from the Swedish Atlantic west coast (Fladen, Väderöarna).