

OESTROGENIC ENDOCRINE DISRUPTION IN FLOUNDER FROM UK ESTUARIES: PRELIMINARY TEMPORAL TREND DATA

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Introduction

Oestrogenic endocrine disruption in UK populations of flounder (*Platichthys flesus*) has been studied by CEFAS since 1996. Exposure and response to environmental oestrogens, as measured by the yolk pre-cursor protein vitellogenin (VTG) in male fish plasma, is well established.

Surveys in 1996/97 showed mean VTG concentrations in male flounder routinely above 10^5 ng/ml in industrialised estuaries with peaks as high as 10^7 ng/ml. These concentrations were comparable to those expected in mature females and were highly elevated compared to those from reference estuaries (<100 ng/ml). The Mersey, Tyne and Tees estuaries were established as 'hotspots' of oestrogenic contamination.

Presented here are preliminary data from continued monitoring of VTG in male flounder as part of the UK Endocrine Disruption in the MARine environment (EDMAR) programme.

Methods

- In addition to 1996/97 four more surveys were conducted between 1999 and 2001.
- Surveys were conducted using fine meshed 2m beam trawls. Male flounder numbers ranged from 5-30 individuals from each site.
- Blood was removed within 2 hours of capture and plasma isolated by centrifugation. Plasma was cryogenically stored until analysis.
- VTG concentrations were analysed using established enzyme linked immunosorbent assay (ELISA) and radio-immunoassay (RIA) techniques.

Results

Alde

North of Orford (reference site)

Negligible inputs of industrial/domestic effluent. VTG concentrations at baseline levels throughout the survey period.

Tyne

Howdon

Elevated VTG levels are associated with an adjacent domestic sewage outfall. VTG concentrations remained high until early 2000. Subsequent sampling occasions showed a 2 order of magnitude reduction in VTG to near baseline levels.

Hebburn

High VTG concentrations (approx. 10^5 ng/ml), as at Howdon, were apparent in 1996/97 and associated with several diffuse industrial/domestic effluents. Subsequent data showed a downward trend with VTG concentrations at baseline levels by 2001.

St. Anthonys

Associated with general diffuse inputs and a small industrial outfall. Mean plasma VTG concentrations showed high levels of fluctuation but little evidence of any reduction.

Tees

Dabholm Gut

Associated with a discharge from an inlet receiving significant quantities of industrial and domestic effluents. Showed amongst the highest mean male plasma VTG levels (10^6 - 10^7 ng/ml) in 1996/97. Subsequent surveys in 2000 showed no clear reduction in concentrations from these levels.

Mersey

Eastham

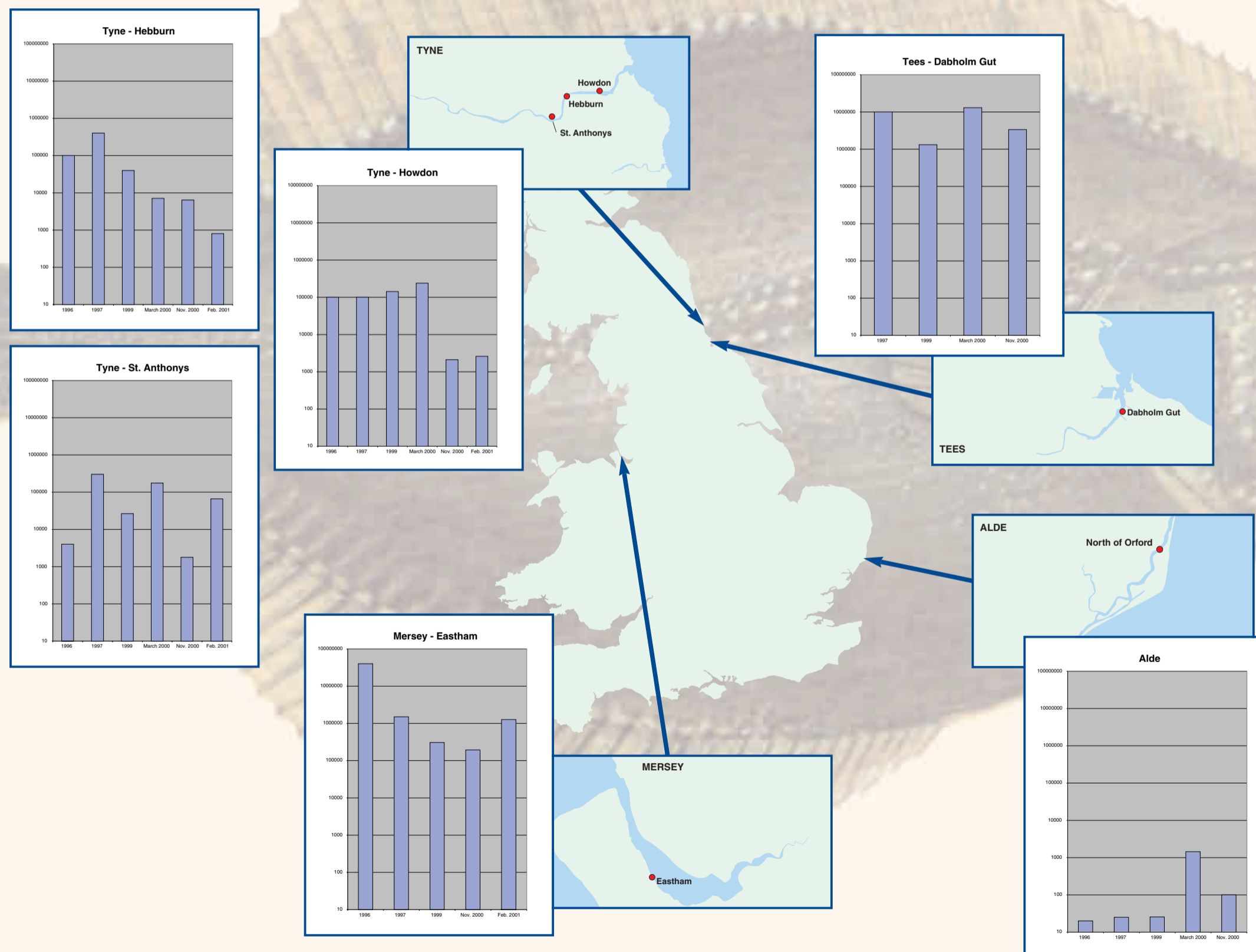
Associated with several diffuse industrial/domestic inputs and is adjacent to the Manchester Ship Canal entrance. Early

surveys established this site as showing the highest (> 10^7 ng/ml) male plasma VTG concentrations. Subsequent surveys showed a downward trend in concentrations while remaining high at 10^5 - 10^6 ng/ml.

Other estuaries

Plasma VTG data is also available for several other English estuaries with evidence of elevation in some including the Thames and Humber, however, there is not enough data to investigate trends.

Elevated VTG concentrations are also apparent at sites in the Scottish estuaries, the Clyde and Forth and these estuaries are part of continued trend monitoring plans.



Mean plasma VTG concentrations (ng/ml) in male flounder – Preliminary temporal trend data

Conclusions

- Oestrogenic endocrine disruption, measured by plasma VTG in male flounder, remains elevated in several UK estuaries.
- Certain high VTG 'hotspots' (e.g. Howdon and Hebburn - Tyne and Eastham - Mersey) have shown evidence of a downward trend over the study period.
- Fish from other sites (e.g. Dabholm Gut - Tees and St. Anthonys - Tyne) show little evidence of reduced VTG responses.

Recommendations

- Continued plasma VTG monitoring in male flounder is required to investigate these apparent trends. A 10 year time series would probably be required to draw firm conclusions.
- Establish time series for other markers of endocrine disruption. Both oestrogenic (intersex and morphological markers (e.g. morphologically intermediate papilla syndrome - MIPS in gobies)), and androgenic (spiggin in sticklebacks).
- Increased use of sedentary and/or non-migratory species would allow effects data to be better related to capture vicinity and point sources.
- Surveys of endocrine disruption markers should be integrated with effluent quality knowledge and treatment programmes. This will enable effluent assessment with respect to their environmental impact and would identify efficient treatment strategies.

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