



Research Information Note

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Assessment of the risk posed by toxic contamination to waterbirds on Special Protection Areas (SPAs)

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Introduction

English Nature (EN) has a statutory role to assess the condition of Special Protection Areas (SPAs) and to advise relevant authorities, such as the Environment Agency, about risks to site integrity associated with plans and projects (eg. from discharges). To help fulfil this role, a desk-based risk assessment project was commissioned by EN to evaluate the significance of toxic contaminant residues in prey items with respect to the interest features of two South West Special Protection Areas, the Severn Estuary SPA and Poole Harbour SPA. The study builds upon a previous screening level study by Crane *et al.* (2005) commissioned by Environment Agency Wales.

What was done

The present project further investigated the risks associated with the exposure of SPA waterbirds to chemical contaminants (through direct toxic effects), by:

- carrying out a screening risk assessment using new measurements of concentrations in prey items (supplied by the Environment Agency) to determine the key contaminants which could have toxic effects on waterbirds);
- developing, for the identified key contaminants, a detailed probabilistic assessment of the ratio of predicted concentration in prey to the concentration at which no observable adverse effects on reproductive endpoints in birds would be observed (PEC¹/PNEC² ratio). This detailed assessment was made on the basis of improved data on: prey contaminant levels, habitat use, foraging behaviour, and toxicity endpoints.

Results and conclusions

The results of the analysis were as follows:

- Of the organic and inorganic contaminants studied in the screening analysis of *Nereis diversicolor* samples, seven were found to potentially lead to PEC/PNEC values which exceeded 1 and hence presented a potential risk to birds. These compounds were all metals or semi-metals: zinc (Zn), lead (Pb), mercury (Hg), selenium (Se), iron (Fe), arsenic (As), and chromium (Cr).

¹ Predicted environmental concentration

² Predicted no effect concentration

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- Of these seven contaminants, four (Zn, Fe, Cr and As) were rejected from more detailed modelling following more critical examination of the limited toxicity data available:
- Detailed probabilistic modelling showed that:
 - There was a high probability that PEC/PNEC for Pb significantly exceeded 1 in both harbours for all species;
 - There was a high probability that PEC/PNEC for Hg significantly exceeded 1 for Hg in the Severn Estuary and a significant (>5%) probability that PEC/PNEC exceeded 1 for Poole Harbour;
 - There was a high probability that PEC/PNEC significantly exceeded 1 for Se in the Severn Estuary. There was no Se residue data available for Poole Harbour.
- The major source of uncertainty in predicting PEC/PNEC values for Pb was the large uncertainty in no observable adverse effect level (NOAEL) values for this element. Predictions for Hg and Se were less uncertain than for Pb, but uncertainty in both were significantly influenced by NOAEL. Presence of Hg in the form of methyl mercury (MeHg) was also an important source of uncertainty for Hg, and food intake rate (FIR) and prey concentrations were an important source of uncertainty for both Hg and Se.
- The attribution of contaminant residues to current point sources remains problematic and further measurements would be required before confident conclusions could be made concerning this. It appears likely, however, that Pb and Hg contamination of both estuaries is dominated by historic rather than current sources. We have insufficient information on Se sources to draw any conclusions for this element.
- There may be “hot spots” of contamination in both estuaries which could lead to high concentrations of contaminants to a small proportion of the bird population which could feed in these areas, though birds in general feed from a variety of sources in both estuaries.

The results of the probabilistic modelling suggest that on both of the study areas, Poole Harbour and the Severn Estuary, ingestion of Pb, Hg and Se residues within prey items poses a potentially significant toxic risk to wading birds, based on ecologically relevant endpoints. However, uncertainties in the risk assessment process make it difficult to accurately assess the risk posed to the integrity of the SPAs concerned. Opportunities for refining the risk assessment are discussed.

English Nature’s viewpoint

The methodology applied provides a useful way of assessing which estuarine SPAs are potentially at risk from toxic pollution, with respect to food chain transfer to birds. However, in this study the significance of PEC:PNEC ratios >1 in relation to the integrity of the site is difficult to predict with confidence for a number reasons. The limitations of this method, given the available input data, are discussed in the report, together with opportunities for refining the risk assessment and the value of extending the approach to consider other relevant SPAs.

Further information

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