

The German Environmental Specimen Bank – Part II: Environmental specimens

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The German Environmental Specimen Bank (ESB) is an important component of the German environmental policy: It is an archive of ecologically representative environmental and human specimens that can be used for the analysis and evaluation of environmental quality. Routine operation started in 1985. After two decades the ESB provides a continuous record of the chemical exposure of the environment and human populations providing temporal trends and spatial load differences.



All environmental specimens (~ 2 kg each) are **deep-frozen** in the gas phase over LIN (-196 °C) immediately after preparation and transported to the storage location. The specimens are first crushed and then divided into 200 sub-samples of about 10 g each. This procedure is carried out under cryogenic conditions (< -140 °C) to avoid any unwanted chemical modification of the samples.

Species	Matrices
Norway spruce (<i>P. abies</i>) and Scots pine (<i>P. silvestris</i>)	one year old shoots
Beech (<i>F. sylvatica</i>) and Lombardy poplar (<i>P. nigra italica</i>)	leaves without stalks
Bladderwrack (<i>Fucus vesiculosus</i>)	thallus
Common mussel (<i>M. edulis</i>) and Zebra mussel (<i>D. polymorpha</i>)	soft body
Bream (<i>A. brama</i>) and Eelput (<i>Z. viviparus</i>)	muscle + liver
Herring gull (<i>L. argentatus</i>) and Feral pigeon (<i>C. livia f. domestica</i>)	egg content
Roe deer (<i>C. c. capreolus</i>)	liver
Earthworms (<i>L. terrestris</i> , <i>A. longa</i>)	defecated body
Soil, sediment and suspended matter	

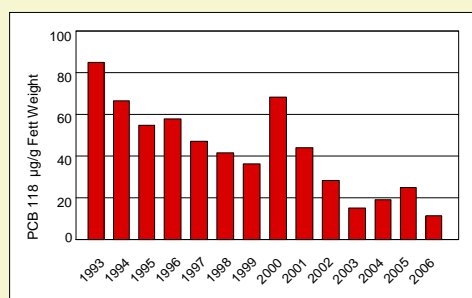
Every year, real-time monitoring (RTM) is performed for representative species collected from six ecosystem types in Germany. After sampling all specimens are assessed for a number of biometric parameters and thereafter stored on liquid nitrogen. Routine analysis currently covers 20 organochlorine compounds, 18 PAHs and up to 16 inorganic parameters, e.g. Hg, Cd, Pb. **RTM** demonstrates that concentrations of several air-borne substances (e.g., Pb, PAH, PCB) decreased significantly in terrestrial plants but remained nearly unchanged over time in marine biota.

The ESB performed **retrospective analyses** for a number of emerging contaminants, e.g. polycyclic musks, organotin compounds, alkylphenols. These data can be used in a number of ways: To support the monitoring obligations of international treaties, e.g. the Stockholm Convention.

To evaluate the success of substance specific regulations, i.e. ban of TBT, lead. To support ongoing risk assessments for substances and products, e.g. substances of high concern according to REACH annex XII. And finally, to serve as a screening tool for the identification of new emerging chemicals. At present, the German ESB is launching extensive retrospective analyses in environmental tissues of brominated and fluorinated compounds.

Current research activities focus on the use of **biomarkers** in stored samples and real-time monitoring. A key issue for the future is the integrated risk assessment of human and environmental ESB data. Information about specimen sampling, as well as biometrical and analytical data is publicly available at www.umweltprobenbank.de

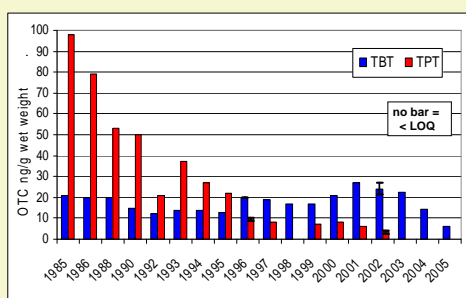
Selected Result - Real Time Monitoring



PCB 118 in *Feral pigeon* eggs (*Columba livia f. domestica*), Saarland conurbation, 1993-2006.

Exemplified to all investigated organochlorine hydrocarbons the results of the PCB 118 inquiries on Feral pigeon eggs from Saarland conurbation are represented. The time trend study shows excepting volumes 2000 and 2001 the continuous decrease of the PCB concentration. The higher values in this two years may result from mobilization processes in sediment deposits by the Saar river canalization.

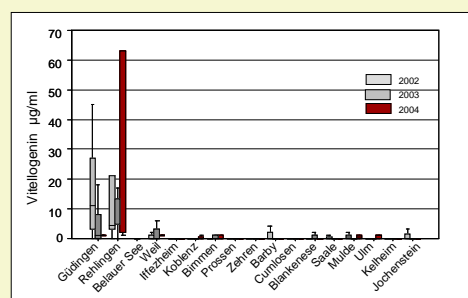
Selected Result - Retrospective Analysis



Organotin compounds in *Mytilus edulis*, North Sea, sampling site Jadebay, 1985-2005.

North Sea-mussels showed relatively constant TBT concentrations in the period 1985-2000. In 2003, the use of organotin-antifoulants in the European Union was banned. A follow-up study was initiated to verify the effectiveness of the ban. In 2004/2005 TBT-levels decreased significantly. It is concluded that the ban is successful. TPT levels decreased since its phasing-out in the mid-1980s (now < 3 ng/g). Rüdél et al. 2003, ES&T 37, 1731-8. SETAC platform presentation, Abstract 750.

Selected Result - Use of Biomarker



Vitellogenin (vtg) in blood samples of male breams from ESB sampling sites (2002-2004).

Vtg is used as a marker of estrogenic effects in blood plasma of bream (*Abramis brama*). Estrogenic disruptors like the alkylphenols 4-Nonylphenol and 4-Nonylphenolmonoethoxylate seems to effect fish in the small river Saar of Southwestern Germany because high concentrations of both the alkylphenols in muscle tissue and vtg in blood plasma were found compared to those from other sampling sites of the German ESB. Quack et al. 2006, 14th Conf. Env. Bioind., Maryland, poster presentation.