The German Environmental Specimen Bank – Part II: Environmental specimens

Martin Paulus 1, Diana Teubner 1, Michael Ball 2, Werner Körkel 2, Dirk Kreft 3, Asaf Pekdeger 4, Mathias Ricking 4, Heinz Rüdel 2 and Andrea Körner 5

1 University of Trier, Dept. of Biogeography, Germany; 2 ERGO GmbH, Hamburg, Germany; 3 Fraunhofer-Institute for Molecular Biology and Applied Ecology, Schmallenberg, Germany; 4 FU Berlin, Dept. of Earth Sciences, Berlin, Germany; 5 Federal Environment Agency, Dessau-Rosslau, Germany.

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.

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 organochlorine compounds, 18 PAHs and up to 16 inorganic parameters, decreased significantly in terrestrial plants e.g. Hg, Cd, Pb. To support ongoing risk assessments for substances and products, e.g. substances of high concern according to REACh annex XII. 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. 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. 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. To evaluate the success of substance specific regulations, i.e. ban of TBT, lead.

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.

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-Nonylphenolmonooxoylate 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.

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). Rüdel et al. 2003, ES&T 37, 1731-8. SETAC platform presentation, Abstract 750.