

ESTIMATING RADIOLOGICAL EXPOSURE OF WILDLIFE IN THE FIELD

Karine Beaugelin-Seiller¹, Jacqueline Garnier-Laplace¹, Nicholas A. Beresford²

¹Institut de Radioprotection et de Sûreté Nucléaire (IRSN), PRP-ENV, SERIS, LRTE, Cadarache, France – ² NERC, Centre for Ecology & Hydrology CEH Lancaster, United Kingdom

Abstract

The assessment of the ecological impact due to radionuclides at contaminated sites requires estimation of the exposure of wildlife in the field, in order to correlate radiation dose with known radiological effects. The robust interpretation of such field data asks for great care in sampling designs, in consideration of possible confounding effects (e.g., from the tsunami at Fukushima) and in an accurate and relevant quantification of radiation doses to biota. Generally, in field studies the exposure of fauna and flora has been characterised through measurements of the ambient dose rate or activity concentrations in some components of the environment, and only rarely in the exposed organisms themselves. The use of such data does not allow the establishment of a robust dose-effect relationship for wildlife exposed to ionising radiation in the field. Effects of exposure to radioactivity depend on the total amount of energy deposited into exposed organisms, by adding doses (or dose rates) for all radionuclides and pathways.

Realistic dose estimation needs to reflect the entire story of the organisms of interest during their whole exposure period. This talk describes the process of identifying and collecting all the related information that will allow answering “**W**” questions (**W**hich organisms are exposed, **W**here, **W**hen and ho**W**). Some parameters are well known to influence the dose (rate): the organism life stage, its ecological characteristics (habitat, behaviour...), the source term properties (e.g. emitting facilities, nature of radiation), etc.. The closer the collated data are to the ideal data set, the more accurate and realistic the dose (rate) assessment will be. This means characterising each exposure pathway (internal and external), the activity concentration in each exposure source, the time each organism spends in a given place, as well as the associated dose coefficients or the data required for their assessment. Most often, the only available information is the activity concentration per radionuclide in some abiotic components of the exposed ecosystem. The data set has to be completed such that it tends as much as possible to the ideal, making ecologically plausible assumptions. The whole process of data collation in view of dose reconstruction is illustrated for Japanese birds exposed to radioactive deposition following the Fukushima accident, from the work done by Garnier-Laplace et al. (2015), notably on the basis of ecological data gathered by Møller et al. (2015 a&b).

With respect to the Chernobyl Exclusion Zone we will also consider variability under field conditions, availability of relevant datasets and options for better estimating internal and external doses received by wildlife.

References

Garnier-Laplace et al. (2015). Radiological dose reconstruction for birds reconciles outcomes of Fukushima with knowledge of dose-effect relationships. *Sci. Rep.* **5**, art. no. 16594. Møller et al (2015a). Cumulative effects of on interspecific differences in response of birds to radioactivity from Fukushima. *J. Ornithol* **156**: 297-305. doi:10.1007/s10336-015-1197-2. Møller et al (2015b). Ecological differences in response of bird species to radioactivity from Chernobyl and Fukushima. *J. Ornithol* **156**: 287-296