

ASSESSMENT OF RADIATION EFFECTS IN BIRDS BREEDING IN RED FOREST AREA (2003-2005): PROBLEMS OF RESEARCH APPROACHES AND INTERPRETATION OF THE RESULTS

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Abstract

This ecotoxicological study was initiated in 2003 and initially led by Moller & Mousseau (published 2007) in order to get a sample of breeding birds chronically exposed to radiation with a range of the external doses from 'background' up to 100–200 $\mu\text{Sv/hr}$ (max values in natural habitats during that period). It was supposed to sample blood, sperm, feathers, eggs etc. to assess biological effects. Breeding success was also to be assessed and compared to radiation. More than 200 nest-boxes (NB) were put up in the 'Red Forest' (RF) in 2003 (dose rates 5–167 $\mu\text{Sv/hr}$), and the study took place in 2003–2005. There was no 'control' site outside of Chernobyl exclusion zone (CEZ) with a 'semi-control' site (C) being established in the CEZ in 2005: 70 NB, 0.9–2.4 $\mu\text{Sv/hr}$. Habitats in the RF are mainly represented by sparse young birch reforestation (where mature pine plantations were killed in 1986), remains of older birch undergrowth, some alder/aspen areas, some dry and wet grassy clearings, there are some mature pine plantations in marginal sub-lethal areas. Habitats of C site are mature pine plantations with deciduous undergrowth. Occupation of NB as a result of radiation impact was not considered initially, and was not taken into account in the study design. However it became a main point discussed in the article published by Moller & Mousseau (2007). The main conclusion was: 'birds prefer to breed in sites with low radioactivity with a stronger effect in flycatchers than in tits'.

We did not share or support these conclusions. Collaboration in framework of this study ceased in 2004. However in 2004-2005 we continued it independently including additional establishment of a semi-control site, collecting data on egg morphology, ^{90}Sr and ^{137}Cs live-monitoring in adult birds and nestlings, and studies of blood. Here we will talk only about the main, in our opinion, misleading conclusions of the Moller & Mousseau (2007) paper. In our view the reported study replaces comprehensive analysis of the habitat quality by formal and non-transparent mathematical computations, and in this way actually ignores habitat factors. Any bird species chooses habitats according to their biological preferences and demands. The RF which comprises sparse birch forest with a number of glades a priori offered distinct and poorer conditions for tree-dwelling birds compared with the mature coniferous, mixed or deciduous woodlands at other study sites. Without the NB there were almost no birds resident in the RF. Poorness of conditions in areas impacted by high doses causes the 'illusion' of radiation determined depletion of the bird population. Almost all breeding species are migrants including the most abundant GT and PF, and in theory have equal initial conditions in concern of experience to radiation. The great tit is more flexible in choice of habitats and occupies appropriate holes several weeks earlier than PF. Data analysis showed that the first nests of GT appear in wet birch forest with undergrowth, and the last – in dry pine plantations. Breeding success as a difference between number of laid eggs, hatched and fledged nestlings does not have any significant relation with radiation or habitat conditions. Mortality of eggs and nestlings was caused by human activity in the most of cases, with some predation. However variability of clutch size significantly grew with radiation. Also, elongation index of eggs shorten following radiation - they became more spherical. The birds breeding in the RF conditions had more abnormalities in blood cells compared with the control group. Thus these observations indicate different kinds of radiation stress in migratory birds arriving in RF for breeding. However, at conditions 20-25 years after the accident it did not cause significant depression of reproduction. This study was not able to give reliable answers due to simplified design, lack of samples, absence of some data (e.g. age of females), and ignoring natural history of local conditions and birds. A long-term study using pairs of identical habitats with distinct radiation conditions could better investigate this problem.