

RADIOACTIVE CONTAMINATION IN BIRDS

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It is perhaps hardly surprising that evidence is beginning to accumulate on the effect of radioactive contamination in birds. The first suggestion that birds were being affected by radioactive fallout was made by Mr. John Williams, Ornithologist to the Coryndon Museum, Nairobi, who wrote to *The Times* in December 1955 stating that certain wading birds had appeared that autumn in Kenya in what appeared to be fresh summer plumage, the species in question being Greenshank and Sanderling. He commented that "It makes one wonder if these birds have been in a radioactive area in northern Russia, which has somehow affected their moulting sequences."

On 9th November of that same autumn we had collected a female Redshank of the Icelandic race on the Medway Estuary in Kent (Harrison and Harrison 1956a), which was already in advanced freshly-moulted summer plumage, the breast and flanks being heavily spotted and streaked and the back, the head and neck showing the black streaks and barring of summer, the whole plumage being strikingly different from another female in normal winter plumage, which was shot on the same day. It is well known that some gonadal recrudescence occurs in autumn and this is responsible for autumn song and courtship, in such species as the Chaffinch, Song-Thrush, Dunlin, Redshank and Mallard, but we could not trace any record of a wading bird actually assuming summer plumage.

Following the exhibition of the Icelandic Redshank at a meeting of the British Ornithologists' Club, consequent upon Mr. Williams' remarks in *The Times*, arrangements were made with Dr. John Loutit of the Radio-biological Research Unit of the Atomic Research Establishment at Harwell for the examination of the bones of any further birds suspected of radioactive contamination. On 24th December, 1955 a further Redshank (Harrison and Harrison, 1956b) was obtained at Rye Harbour which showed incipient summer plumage and on dissection the ovary and oviduct were more fully developed than is normal in individuals collected at that time of year. Part of the skeleton was therefore sent to Harwell where it was dissolved in nitric acid and the presence of radioactive contamination was confirmed by Dr. G. E. Harrison and Mr. W. Raymond using a Veall Geiger Counter, and a graph prepared of the decay of the skeletal activity over the next two weeks. Dr. Loutit's report stated that "at least it proves that the bird had been exposed to some radiation," but he went on to add that of course in a series of one there is no control. The ovary and oviduct were submitted to Dr. A. J. Marshall who reported that "the slides show quite clearly that the bird has become sexually advanced. You will see that the oocyte diameter (in the largest cases) is somewhat in excess of what would be expected for an ordinary wintering bird. This probably connotes oestrogen liberation. The oviducal proliferation is of course a consequence of oestrogen liberation."

Dr. Loutit thought that the effect, although it appeared like a stimulatory action of radiation, was more likely to have resulted from an initial depression and a subsequent rebound phenomenon; the radiation first depressing cellular activity and thus delaying the assumption of summer plumage, and then as the effect wears off, the bird going into breeding plumage as a late phenomenon and out of its proper season.

The findings on Redshank although factual were still in a highly speculative category. Two further papers have recently taken the problem considerably further. Lofts, Marshall and Rotblat (1960) have reported on the experimental effects of whole-body irradiation on the breeding plumage of the Weaver Finch, *Quelea quelea*. This is a bird in which the male assumes a bright breeding plumage, but is at all other times of the year indistinguishable from the dull-coloured female. Six groups, each of six males in breeding dress and six females, were subjected to X-ray doses at 50 r., 200 r., 400 r., 800 r. and 1,000 r. respectively, the sixth group being used as a control. Feathers were plucked from the facial mask of all the birds which were then left four days for new feathers to begin to grow prior to radiation. In all cases except one the regenerated feathers in the males were of the black breeding plumage, the exception being the three survivors of the 1,000 r. group in which the regenerated feathers were of the drab non-breeding plumage. In the females, in which these feathers are pale and unpigmented, regenerated feathers in the 50 r., 200 r. and 400 r. groups showed a black central band of melanin deposition, thought to be due possibly to pituitary stimulation from the lower dosages. It would seem likely therefore that the radiation had upset the pituitary cycle, which regulates much of the sex characteristics of birds, and lends support to the theory advanced in the case of the Redshank.

In America, Willard (1960) has carried out a radioassay of tissues of birds living on the Oak Ridge White Oak Lake bed, an area contaminated by low-level atomic wastes, showing that the gross beta activity was highest in those species feeding close to the lake bed, in this case the Water-Thrush and Song-Sparrow and lowest in those species living in the higher vegetation, notably the Humming-Bird and Cardinal. In all species examined the gross beta activity could be correlated directly with known habitat selection of the species. Seasonal changes suggested the radioactive uptake was via food, particularly insects, in summer, while in winter the uptake was by ingestion of contaminated soil. Concentrations of Strontium 90 in Oak Ridge birds were found to be higher, both on average and maximum, than could be risked in man. Willard's paper contains no reference to interference with breeding cycles, but further experiments are taking place to determine the effects of various doses at different stages of the life cycle.

These are all problems of vital significance in every sphere of life. The risks to wildfowl populations are but one minute facet, but wildfowl may perhaps be particularly susceptible, especially those breeding in the far north, where the hazards from radioactive fallout may be at their greatest. The added risks from the disposal of radioactive industrial waste products may again render wildfowl and sea-birds more susceptible than other groups of birds.

References

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