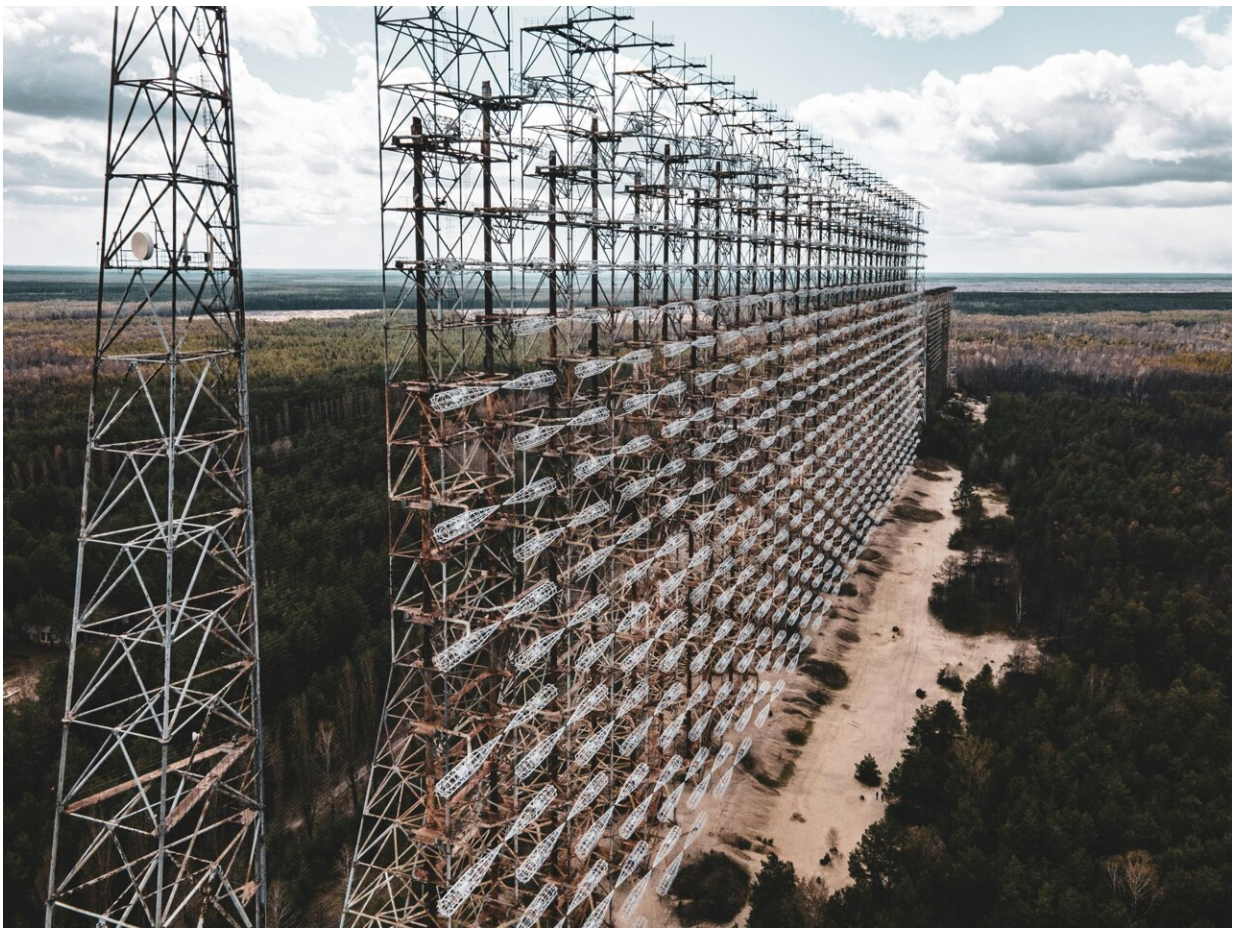
Exploring bird breeding behavior and microbiomes in the radioactive Chornobyl Exclusion Zone

July 3 2024



Credit: Unsplash/CC0 Public Domain

New research finds surprising differences in the diets and gut microbiomes of songbirds living in the radiation-contaminated areas of the Chornobyl Exclusion Zone, Ukraine. This study is also the first to examine the breeding behavior and early life of birds growing up in radiologically contaminated habitats.

The Chornobyl Exclusion Zone (Ukrainian), also known as the Chernobyl Exclusion Zone (Russian), is an area of approximately 2,600 km^2 of radiologically contaminated land that surrounds the Chornobyl Nuclear Power Plant. The levels of contamination are uneven throughout the zone.

"The consequences of radiological contamination to wildlife are still widely unknown, especially the risks posed to wildlife in early life," says Sameli Piirto, a Ph.D. researcher at the University of Jyväskylä, Finland. "Our hypothesis was that biodiversity in contaminated areas would be compromised, leading to changes in birds' breeding, diet and gut microbiome."

To examine the effects of radiological contamination on bird development, Piirto and his team investigated the breeding behaviors and physiologies of two common European songbird species, the great tit (Parus major) and pied flycatcher (Ficedula hypoleuca). These were selected due to their well-studied ecologies.

Nest boxes were placed in multiple areas that belonged to two categories within the Chornobyl Exclusion Zone: areas of high radiological contamination and areas of low contamination. The nestling and adult birds that used the nest boxes were then monitored, with DNA from fecal samples being used to study the birds' diets and characterize their gut microbial communities.

Piirto found that while nest occupancy rate was lower in contaminated

areas, there were no other major differences in breeding ecology or nestling health between the two levels of radiation contamination for either species. Surprisingly, nestlings of both species were found to actually have a higher diversity of insects in their diet in the contaminated areas.

While environmental radiation levels were not associated with bacterial diversity of the gut microbiome, radiation level was associated with the relative composition of the microbiome.

"These results create an interesting background for understanding avian ecology in radiologically contaminated areas," says Piirto. "They give us valuable novel information on the effects that radiation has on juvenile birds—an area of research that has been unclear until now."

This research can help to provide insights into the long-term effects of nuclear accidents on wildlife health.

"Radiological contamination creates an additional stressor that organisms must cope with, leading to a myriad of consequences that are not yet fully understood," says Piirto. "Studying the effects of it is crucial if humanity is to pursue an even more nuclear future."

This research is being presented at the Society for Experimental Biology Annual Conference in Prague on 2–5 July 2024.

Provided by Society for Experimental Biology