Electromagnetic noise leaves birds lost in migration, study reports

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European Robins, like the one in this photo, cannot use its magnetic compass when it is exposed to urban anthropogenic electromagnetic noise in the AM radiofrequency range. Credit: Henrik Mouritsen

Radio waves disrupt the magnetic "compass" in robins, according to a study published on Wednesday that is likely to fuel debate about the safety of electronic devices.

In a long and careful experiment, German scientists found that migrating robins became disorientated when exposed to electromagnetic fields at levels far lower than the safety threshold for humans.

The frequencies were in the medium-wave band used by AM radio—not the bands used by mobile phones, whose safety has been contested by some campaigners.

"For decades, it has been hotly debated whether man-made electric and magnetic fields affected biological processes, including human health," the authors, from Oldenburg University, wrote in *Nature*.

The tests show "a reproducible effect of anthropogenic [man-made] electromagnetic noise on the behaviour of an intact vertebrate."

Birds have long been thought to navigate using light and Earth's magnetic field.

Where their magnetic "compass" is and how it works remain unclear—research in homing pigeons suggests it may derive from an iron-rich crystal in their beaks called magnetite.

Seven years ago, the Oldenburg researchers were surprised to find that European robins (Erithacus rubecula) became confused when they made a stopover on the university campus.

Intrigued, the scientists prepared a wooden hut with aluminium sheeting on its walls and "earthed" by a cable to the ground. This virtually eliminated electromagnetic radiation in the range from 50 kilohertz to 20 Megahertz range but had no effect on Earth's magnetic field.

Over seven years, experiments showed that when the screening was in place, birds in the hut adopted their normal position for migration.

But when the screening was removed or the birds were exposed once more to a gadget emitting background electromagnetic noise, they were disoriented.

The disruption occurred from weak electromagnetic signals at levels equivalent to the bird flying at a distance of around five kilometres (three miles) from a 50-kilowatt AM radio transmitter.

This intensity is far below safety levels for humans set by the International Commission on Non-Ionizing Radiation Protection (ICNIRP), which sets down guidelines for electrical devices from radio sets to computers, power lines and mobile phones.

The researchers are convinced that the disruption was man-made and not from a natural source. Powerful solar storms—particles blasted out from the Sun that slam into the Earth's magnetic field—can cause radio noise that leaks through the ionosphere and disrupt homing pigeons, previous work has found.

The findings may ignite claims that electronic devices are unsafe or disruptive, said Joseph Kirschvink of the California Institute of Technology (Caltech) in a commentary carried by *Nature*.

"Modern-day charlatans will undoubtedly seize on this study as an argument for banning the use of mobile phones, despite the different frequency bands involved," Kirschvink warned.

Provided the German experiments are borne out in other tests, a more reasonable response, though, would be to gradually abandon use of any problem-causing parts of energy spectrum to help migrating birds find their way, he said.

More information: Paper: dx.doi.org/10.1038/nature13290