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Every citizen scientist will soon have the tools of a specialist



Spring watchers. Shutterstock

Ordinary citizens have become increasingly important to scientific research over the past decade. Today, mobile phone technologies, relatively cheap cameras and almost ubiquitous internet connectivity have opened up new opportunities for conservation organisations to engage with ordinary citizens and encourage citizen science.

A citizen scientist is a volunteer who collects and/or processes data as part of a scientific enquiry. This could mean noting the plants found on a day trip or more systematically recording wildlife in a special area. While citizen science projects can be in any branch of science, my focus is on wildlife research.

The list of citizen science projects is long. This year's [BBC Springwatch](#), which concludes this week, has highlighted a number of mass participation projects in which people can become involved, such as recording the first signs of spring. All such schemes are predicated on the idea that people will go out and report what they see.

But technological advances are also changing the way that professional scientists collect and record data on animals. These changes often require specialised equipment and resources

beyond the scope of most amateurs. Now that new technologies are changing the working practices of professional ecologists, what does this mean for citizen science?

DNA testing

Until recently, the way to ascertain the presence of great crested newts in a pond was to go and look. Because the newt is a protected species, disturbing it is illegal. But just looking for the adults or their eggs is not. Today, however, finding great crested newts and other aquatic animals can be done using [environmental DNA](#) (eDNA).

DNA is released into the water by plants and animals in a host of ways: from their skin, faeces, mucous, hair, eggs and sperm, or when they die. By simply collecting and analysing a water sample from the pond or stream, we can find traces of eDNA and identify the animals living there, even if they are hard to recognise.

[DNA barcoding](#) allows species to be identified using short genetic markers in an organism's DNA. And actually, these barcodes can be obtained from tiny amounts of tissue even by non-specialists. All that is required is the correct DNA processing and sequencing technology.



New tools of the trade. Shutterstock

Genetic identification is not the only way in which technological advancement is changing the way that we record the species around us. Noting the birds in a woodland is more often than not a case of listening and identifying the songs rather than seeing the birds themselves.

Eco-acoustics or [soundscape ecology](#) studies the relationships between animals and their environment based on sound. There are now technologies available that allow birds and amphibian communities to be identified [from sound recordings](#).

This means that it will soon be possible to place an audio recorder in the field and walk away while it records birdsong and other sounds over an extended period of time. The aim is that the recordings can be analysed automatically using software to draw up a species list for that area.

Raising standards

But if the collection of wildlife data is to reveal useful information, it needs to be done systematically. Recording the presence of a wildlife species only tells you that it was there at the time that it was recorded. To spot trends, the recording needs to be repeated in the same way over a number of years.

This can be difficult when relying on volunteers, but it is not impossible and there are many good examples of systematic surveys, but these are mainly carried out by people with a little more than basic knowledge.

In fact, technology is now progressing to the point that it can do the work of a specialist on behalf of any citizen, helping to standardise measurements and carry out complex analysis instead of just simple observations. For example, [a new app](#) enables visitors to the New Forest to search for cicadas - last sighted in the forest in 2000 - by analysing sound recordings of background noise captured with a mobile phone. It's not hard to imagine similar projects asking people to collect and study samples of eDNA or make regular recordings of the dawn chorus using easily available tools.

Mass recording of wildlife sightings such as those requested by the BBC and [the Mammal Society](#) are not simply about recording wildlife for scientific enquiry. They are about individuals, couples and families going outside, exploring and connecting with their environment. Discovering what is there and being part of a larger group of people. It is about making new discoveries together.

But with new technologies, the details of citizen science will change. Future technological advances will present new ways to continue our long established heritage of amateur natural history.