

**To protect everything, please click here: does a revolution in data collection
guarantee one in conservation?**

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An editorial published in Nature (2007) states that “... it can sometimes comes as a surprise for outsiders to learn how far removed the conservation biologist often is from actual efforts to save species”. For conservation biologists who are involved in practical conservation work particularly in countries where the national capacity and infrastructure for conservation is limited, it is clear that it will take more than technology to save the world. We observe an increasing emphasis on technology in the literature and among the research community and ask: How can a revolution in data collection best lead to one in conservation?

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An infinity of fascination remains for ecologists to discover about the natural world. The imperative to do so is urgent, both because many species may soon disappear and because new knowledge may inform their conservation. One way of accelerating the process is to grasp the burgeoning opportunities offered by new high-tech tools. Satellites and airborne sensors (Scholes et al. 2008), smartphones and handheld devices (Aanensen et al. 2009), remote cameras, high tech tracking collars (Markham et al. 2012), unmanned aerial vehicles (Marris 2013) are technological tools that help researchers to collect data cost-effectively. However, tools are only as good as the people using them or, more specifically, their thought processes. Now may be a timely moment to reflect that embracing technologies thoughtlessly can waste the opportunity, or worse (Elwood et al. 2007).

The bedrock of conservation is evidence (Macdonald et al. 2007), and the best tools are needed to collect the best evidence. However, as Macdonald and Amlaner (1980) warned ecologists three decades ago, greater technology and more copious data do not always lead straightforwardly to greater biological insight, nor necessarily lead to better conservation decisions. Some of today's problems can be solved by ingenious use of existing technologies, without waiting for the Brave New World technological solutions. Conservation biologists might learn from a recent global study (OECD 2015) that showed "Resources invested in ICT [*information and communication technology*] for education are not linked to improved student achievement in reading, mathematics or science." The OECD (2015) study shows that new technology is not a replacement for poor teaching in schools. Similarly, conservation policy suffers today as much from failure to use existing knowledge as from lack of new knowledge (Rands et al. 2010) that might be generated by new technologies. The understandable

excitement of scanning the horizon should not be used as an excuse for postponing effective communication with decision makers and better allocation of resources that would facilitate better use of what is, or could be, already known. The great advances in field biology have assuredly been hitched to technological breakthroughs (the inventions of binoculars, radio-tracking, DNA fingerprinting, GPS etc.), but the caveat remains that having a fancy pen doesn't necessary make for a better writer, nor wiser words.

Nonetheless, with that good-natured caution gently in place, the future will soon be upon us, bringing invisibility cloaks (Brumfield 2013) to enable fieldworkers to sneak up unseen (but perhaps not unsmelt) on elusive subjects, or biologists equipped with powered exoskeletons (Defensetech 2013) surveying remote sites in the company of all terrain robot mules (Ackerman 2012). Human enhancement approaches (The Academy of Medical Sciences 2012) such as cognitive training, brain stimulation and cognitive-enhancing drugs, can improve the sensory abilities of biologists to make better field observations. Whether these possibilities strike you as Utopian or dystopian, they are not fantastical - these technologies are already in use by the military and will, like the Internet and GPS before them, eventually percolate to civilian use. *Curiosity*, the NASA robot, is currently exploring Mars (NASA 2013) and others of its ilk may repair the damaged Fukushima nuclear plant (Moskvitch 2012), so they can probably be trusted to gather ecological field data. However, conservation is an inter-disciplinary amalgam of natural and social sciences generating evidence to be interpreted and acted upon in a political context, so while conservationists should rejoice when they recruit a new tool that is fit for their purpose, they should not forget that this will not absolve them from the need for wise

judgment. The weighty reality remains that conservation failures are more likely to be intellectual than technological. Conservation will be revolutionized when conservationists succeed in aligning human and conservation imperatives (Macdonald et al. 2007). New technology can inform, enrich and hopefully accelerate that process. Technological advances have revolutionized our lives reshaping culture and perhaps human nature too (Bostrom 2006; Oxford Martin School 2013). However, new technology cannot deliver it: that is the role of wise policy.

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