



## More biodiversity equals more tourists

Virginia Gewin

Protected areas that have more biodiversity, are near urban areas, and are located at higher elevations attract more tourists, according to a new study (*Ecosystem Services* 2018; doi.org/10.1016/j.ecoser.2018.09.004). The authors sampled 929 of the world's 220,274 terrestrial protected areas – specifically, 677 areas managed primarily for biodiversity conservation, including national parks, national monuments, or species management areas, and 252 areas managed for both nature and people – to compare numbers of species and of tourist visits for each.

In contrast with areas managed for mixed use, areas predominantly managed for biodiversity not only receive almost 35% more visitors but also are more biodiverse and have greater water supplies. In fact, for every 1% increase in biodiversity, there was a 0.87% increase in the volume of tourism. “Protecting biodiversity and fostering nature-based tourism is a global challenge, one that needs to be based on quantitative research like this,” says the study's lead author Min Gon



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Tourism is higher in more biodiverse protected areas, like the Great Smoky Mountains National Park, home to the American black bear.

Chung, an ecologist at Michigan State University (East Lansing, MI).

This paper is “a great first step toward being able to quantify this relationship globally,” according to Rose Graves, a postdoctoral fellow with both Portland State University and The Nature Conservancy (Portland, OR) who has studied cultural ecosystem services, such as tourism. “There is a need, especially for management, to try and understand the mechanisms behind that relationship.”

Chung agrees. He plans to explore different biodiversity indices, such as evenness or abundance, as well as other forms of nature-based tourism data, like using social media images as an alternative measure of

visitor interest. There are also ongoing endeavors to develop global datasets of nature-based tourism in protected areas.

Graves notes that a spate of recent papers aim to more fully explain how biodiversity contributes to ecosystem services, so that protected area managers can better target their efforts. “Based on our findings, we believe generating both biodiversity and nature-based tourism are possible, given appropriate conservation strategies,” explains Chung.

The Great Smoky Mountains National Park, located in the temperate, mountainous regions of Tennessee and North Carolina, and accessible from many large cities, is the most visited national park in the US. Home to black bear (*Ursus americanus*), spotted salamander (*Ambystoma maculatum*), and woodchuck (*Marmota monax*), it is a large, highly biodiverse protected area with more than 11.3 million visits in 2016, and over 19,000 species within its boundaries, says Chung. Understanding how attributes such as mountains, climate, and size of protected area influence both biodiversity and tourist interest is a major challenge for sustainability science. ■

## Reducing fishing impacts with lasers

Christie Wilcox

Bottom trawling – the industrial fishing practice of dragging a large net along the seabed to scoop up deep-dwelling catches – is considered one of the most destructive methods of fishing employed today, and yet it's the source of a substantial portion of marketed seafood. In addition to essentially clear-cutting benthic organisms in the drag path, the gear, which herds fish into the main catch area, is heavy and creates a lot of drag, increasing fuel costs. If trawling gear wasn't so cumbersome and didn't have to scrape the bottom, fishing the deep sea could be much more environmentally friendly. According to Icelandic researchers, that's where lasers could change everything.

Scientists with Innovation Center Iceland and the Icelandic Marine Research Institute, both in Reykjavik, have come up with a novel net design that fisheries scientist Trevor Branch (University of Washington; Seattle, WA) says “has the potential to be transformative for fishing”. The setup – patented about a decade ago – was highlighted in *Trends in Ecology and Evolution's* annual roundup of important conservation issues and developments (2018; doi.org/10.1016/j.tree.2017.11.006).

In place of heavy chains and other clunky fish-directing gear, the net has a more lightweight, hydrodynamic array of laser lights, supported by a rigid frame, which also allows the net to be lifted from the bottom when dragged. The patent notes that the lighting could be tailored to be most effective for the species being harvested, further reducing

bycatch. If it works, Branch believes, “the area impacted by nets is reduced to near zero”.

Lights are sometimes used in other fishing methods to attract fish, notes Boris Worm (Dalhousie University; Halifax, Canada), but using them to herd fish in the deep sea hadn't previously been considered. Preliminary tests on shrimp seem promising, but it won't replace more destructive designs if the economics don't add up. “It depends very much on how costly it is to acquire and run, and how the catchability of different species is for this gear versus conventional bottom trawls”, warns Worm. Sadly, it'll likely be a while before this will reduce the overall ecological impacts of deep-sea fishing. “My guess is that this is probably many years away from being widely used”, says Branch. ■