

WILDLIFE

# WHALE WATCHING

An aerial drone fitted with analytical equipment is helping marine scientists assess the health of endangered whale species

Above a surfacing humpback whale in the waters off New England, a six-rotor hexacopter hovers, waiting to be soaked by spray from the majestic creatures' spout.

On a nearby boat, marine biologists from the Woods Hole Oceanographic Institute patiently keep the specially-kitted drone in position. The drone's attached sponges will absorb the moisture - brimming with microorganisms, DNA, hormones and bacteria from the whale's respiratory tract. Once collected and returned to the lab, these samples will open up a wealth of data and can be used to determine family history, stress levels, and the whale's overall health. Meanwhile, a high-resolution camera is used to alert scientists to any skin lesions as well as indicate the whale's fat levels

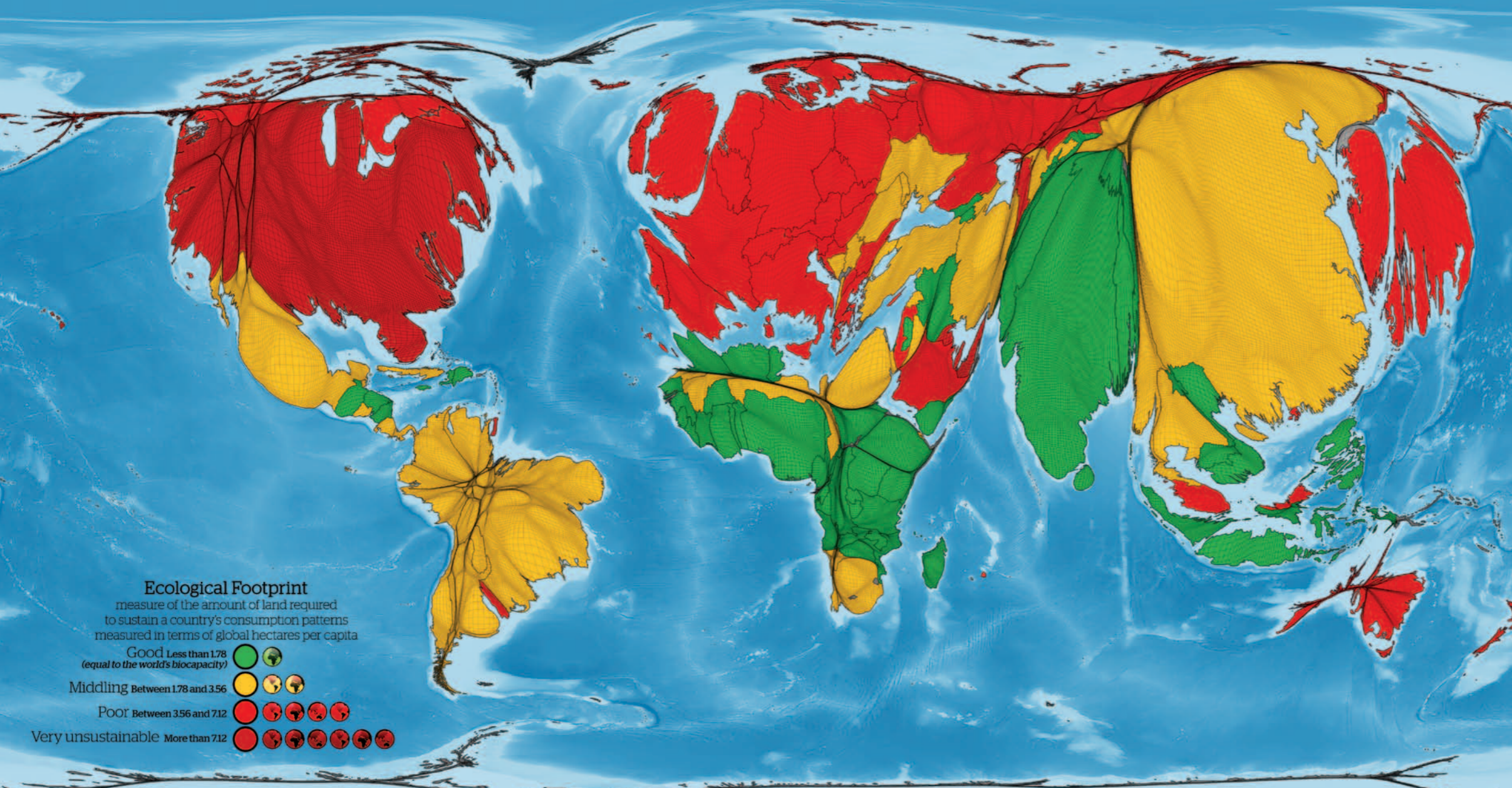
'With blue whales and humpback whales we have yet to detect any reaction when doing photogrammetry overflights at higher altitudes or with breath sampling at lower altitudes,' explained Michael Moore, director of the WHOI Marine Mammal Center. 'Interestingly, there are often seagulls around the drone. They are more or less the same size and the copter seems to blend in.'

After a successful test with humpback whales in Stellwagen, off the coast of New England, the biologists hope to take the drone to analyse the same species living near the Antarctic Peninsula. By analysing both sets of results, they will compare the health of humpbacks living in pristine conditions against those living nearer to shipping traffic, pollution and fishing.

'This will give us a new understanding of the relationship between whale body condition and health in the context of habitat quality,' said Moore.



WOODS HOLE OCEANOGRAPHIC INSTITUTE



CARTOGRAMS

# ECOLOGICAL FOOTPRINTS

BY BENJAMIN HENNIG

Humanity's demand for goods and services created from our planet's resources have for a long time exceeded what the Earth's ecosystems are capable of renewing. It is estimated that we exceeded this limit in 1970. According to calculations from the Global Footprint Network, it was in the first half of August that we went into ecological debt for this year, on a day known as Earth Overshoot Day.

The ecological footprint calculates the amount of land required to sustain a country's consumption patterns, including 'the land required to provide the renewable resources people use (most importantly food and wood

products), the area occupied by infrastructure, and the area required to absorb CO<sub>2</sub> emissions'. The measure also takes imports into account, so that the negative environmental impact of products is considered where these are consumed rather than where they are produced. The ecological footprint is expressed in global hectares which represent a hectare of land with average productive biocapacity.

There are various approaches to calculating this measure and to come to conclusions about the impact and implications of this concept. The Global Footprint Network estimates that taking the current global population into account, each person can sustainably use 1.8 global hectares for one-planet living, while humanity currently extracts resources much faster than they can be regenerated. At the current levels of consumption (and waste), humankind would need more than 1.5 Earth-like planets to sustain this standard of living.

While not being without criticism, the Ecological Footprint is one of the most comprehensive assessments of the global environmental impact that can be estimated on a global scale for all nations.

The above gridded cartogram visualises data published in the most recent Happy Planet Index which uses the Ecological Footprint as one of its indicators.

The map combines each country's average per capita ecological footprint with the global population distribution on a gridded basis. Each grid cell therefore is resized according to the total amount of land used by the population in that space according to their demand on nature. An area twice as large as another uses up twice as many global hectares.

In addition, a traffic light colour scheme shows the overall environmental impact of each country turned into numbers of planets that were needed if the world as a whole was to live such a lifestyle. The considerable differences between the nations become strikingly visible in this image.

While much of the wealthy world, especially in Europe and North America, lives a rather unsustainable life, the still growing populations on the African continent and those in the world's second most populous country of India still manage to live within Earth's environmental means. What example is the rich world providing these developing generations about the future of our planet?

*Benjamin Hennig is a senior research fellow in the School of Geography and the Environment at the University of Oxford. He is involved in the Worldmapper project and maintains the visualisation blog [www.viewsoftheworld.net](http://www.viewsoftheworld.net)*