Google Earth: going beyond finding your own backyard
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Today, freely available global satellite imagery from Google Earth (http://www.google.com/earth) is revealing areas that were once too remote or too expensive—even prohibited—to access, and making them ripe for scientific investigation. Google Earth’s potential to answer scientific questions is quickly pushing the boundaries of science and in some cases, allowing scientists to venture into new disciplines.

Ground-truthing aquaculture [1], estimating forestry biomass [2] and assessing looting at archeological sites [3] are just a handful of the types of research made possible thanks to this tool. Health researchers are also using Google Earth to tackle epidemics. In Bluefields, Nicaragua, for example, researchers have compiled and overlaid contributing factors of dengue fever, such as the locations of tire dumps, cemeteries, large areas of standing water, etc., in order to prioritize specific neighborhoods for targeted control interventions.

As for marine science research, predator/prey interactions have been studied by using Google Earth to examine “grazing halos,” rings of bare substrate around patches of reef created by herbivorous fish eating the surrounding algae. In a study published in 2011, Madin and colleagues used Google Earth to locate these halos in the Great Barrier Reef and subsequently ground-truthed the areas to determine the distances herbivorous fish and urchins were willing to venture away from their refugia while risking predation [4]. The authors suggested that sequential satellite images over time could potentially be used to

An example of what one can see using Google Maps—a tool similar to Google Earth that employs the same imagery—to view the coastline of the Persian Gulf. The author, a PhD candidate with the Sea Around Us Project, is using such satellite imagery to quantify the catches from weirs in this region. (Image: ©2012 CNES/Spot Image, DigitalGlobe, GeoEye, U.S. Geological Survey, Map data ©2012 Google)
monitor the effects of predator removals, recovery and reintroductions virtually anywhere on Earth.

At the Sea Around Us Project, we are also harnessing this technology. Under the supervision of Dr Daniel Pauly, I am using Google Earth to estimate catches from fishing weirs in the Persian Gulf, which are often not reported due to reasons related to their scale (small), ownership (often tribal) and local forms of governance. In our work, we describe the potential of Google Earth to circumvent voluntary reporting mechanisms and provide more accurate catch data, even revealing illegal fishing in certain countries.

Perhaps the software’s most important merit, however, is its cost: nothing. Virtually anyone with a computer and an internet connection can gain free access, making it especially valuable in countries where resource allocation towards conservation is scarce. It remains to be seen what other exciting, new applications this technology could have in helping to expand our scientific knowledge when we take it beyond our own backyards.

References

The Sea Around Us Project is a scientific collaboration between the University of British Columbia and the Pew Environmental Group that began in July 1999. The Pew Environment Group works around the world to establish pragmatic, science-based policies that protect our oceans, wild lands and climate. Pew also sponsors scientific research that sheds new light on the dimensions of and solutions to the problems facing the global marine environment.
The conference was a testament to the region’s commitment to the stewardship of the Gulf of Mexico and the Caribbean Sea, and the marine resources therein. The Caribbean Sea is a special place for me, because I grew up in Trinidad and because I discovered my niche in Caribbean fisheries while doing my Master’s thesis on the fishing of queen conch in Tobago. The theme of this year’s conference was “Artisanal fisheries: importance, implications and challenges for management,” a topic which is familiar to many of us. Artisanal fishing is defined by the Food and Agriculture Organisation (FAO) as fishing carried out by individuals or households requiring low investment in technology and gear. By this measure, the majority of Caribbean fisheries operations are artisanal or small-scale.

The conference’s keynote speaker was Dr Ratana Chuenpagdee, who is no stranger to the Sea Around Us Project. Dr Chuenpagdee completed her PhD under Dr Daniel Pauly’s supervision in 1998 and is now the Canada Research Chair in Natural Resource Sustainability and Community Development at the Memorial University of Newfoundland, St. John’s. She urged the GCFI conference participants to consider ways to elevate the profile of small-scale fisheries, which – in terms of providing employment for fishers and catches for human consumption – are simply “too big to ignore” [1]. Dr Chuenpagdee is a powerhouse, and I was eager to chat with her at a socio-economic café where I got the opportunity to ask whether we erroneously mislabel our fisheries as small.

In terms of technological capacity, small-scale fisheries are certainly “small” compared to industrial ventures, but they are rather large in terms of the employment they provide for fishers as well as the quantity of catch they supply for human consumption [2]. Undoubtedly, the dearth of quantitative catch data associated with small-scale fishing sectors perpetuates this false notion of their size. As Dr Pauly plainly states in his foreword to the book “World small-scale fisheries: contemporary visions” (edited by Dr. Chuenpagdee), “countries cannot be bothered with the logistical and administrative nightmare that monitoring and reporting on small-scale fisheries often represents” [3]. As a native of the Caribbean and a research assistant with the Sea Around Us Project, I feel it to be my duty to reconstruct this historical fisheries information.

During my presentation at the conference, I explained how using information on catch, effort and seafood demand (i.e., consumption, as per household surveys) allowed me and my colleagues to reconstruct total marine fisheries catches for 10 Caribbean island countries from...
1950 to 2010. Unsurprisingly, these catch reconstructions illustrated a substantial level of under-reporting in the Caribbean. For example, the reconstructed catches of Haiti and Jamaica were 3 and 4.3 times higher, respectively, than catches reported by these countries to the FAO, where the data become part of the world “catch” database. Overall, approximately 5 million tonnes of unreported catches were estimated for these 10 Caribbean countries during the 60-year period that we examined, with an average of 54,000 tonnes of unreported catches each year. The main discrepancy was due to unreported and under-reported catches from the artisanal, subsistence and recreational sectors. However, reporting seems to be improving as unreported catches in the early time period accounted for 80% of reconstructed catches, as opposed to 50% in the present time period.

The presentation was well-received and I had a number of scientists and fishers as well as an anthropologist interested in learning more about the Sea Around Us Project. Despite the English-Spanish language barrier, the GCFI spirit demonstrated that we are just one planet, working together for our precious oceans – questioning, sharing and improving things.

References

[1] “Too big to ignore” is a research network and knowledge mobilization partnership which aims to address the issues and challenges facing small-scale fisheries; http://toobigtoignore.net/


Chapters in books and reports


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