

Turtle boom may cause habitat crash

Virginia Gewin

Green sea turtles (*Chelonia mydas*) are thriving in a 1.2-million-ha marine protected area (MPA) surrounding the Derawan Archipelago near Indonesia. The population has grown to 20 individuals per hectare – the highest density ever reported globally – over the past decade of protection.

But according to new research, the turtles' success has resulted in overgrazing of the local seagrass habitat they need to survive. The study (*P Roy Soc B* 2014; doi:10.1098/rspb.2013.2890) even documents a previously undescribed feeding strategy: turtles digging up seagrass rhizomes and roots with their flippers after they have removed the above-ground biomass. “The seagrass meadow is now close to collapse”, says study author Marjolijn Christianen,



Protected sea turtles may overgraze their habitat.

an ecologist at Groningen University (Groningen, the Netherlands).

By modeling turtle population dynamics and grazing on ecosystem recovery, Christianen found that turtle numbers would have to be reduced to almost zero for the seagrass to recover. The findings call into question whether MPAs are being managed optimally for turtle conservation. “Our research provides a clear example that the use of MPAs for conservation can't focus only on turtles. It has to incorporate habitat protection as

well”, insists Christianen. For instance, she continues, MPAs will function most effectively when they are established as networks that are able to ensure sufficient seagrass habitat in addition to protection of large predators.

Seagrass overgrazing in MPAs has been noted elsewhere. For example, fishers in India's Lakshadweep Islands have linked lower fish abundance to turtles overgrazing seagrass (*Biol Conserv* 2013; doi:10.1016/j.biocon.2013.07.014).

“In some ways, it's a nice problem to have – protecting turtle nesting beaches and stopping international trade has been remarkably successful”, says Brendan Godley, a conservation ecologist at the University of Exeter (Cornwall, UK). “Many sea turtle populations are increasing, so it shouldn't be a surprise that there will be knock-on ecological impacts.” But, he admits, it does call into question efforts to conserve single species rather than whole ecosystems. Christianen says the answer is simple: “To protect a charismatic species, protect its habitat, both inside and outside the reserve”. ■

Iraq, UN plan environmental restoration

Jen Fela

In late January, the Government of Iraq signed a landmark agreement with the UN Environment Programme (UNEP) that aims to improve the country's environmental health, which has been degraded by decades of war and increasing pressures on natural resources.

Among the findings of a recent study by the Iraqi Government – entitled *Iraq State of Environment and Outlook* – are that dust and sand storms are increasing in frequency because of declining soil moisture and lack of vegetation, 1.6 million Iraqis are affected by chemical pollution from years of conflict, and 83% of Iraq's wastewater is left untreated. The same report indicates that environmental degradation is responsible for a 5–8% annual loss of Iraq's gross domestic product (GDP). Other difficulties include a substantial reduction in cropland, an increasing human

population, rising food insecurity, and declines in the quality and quantity of water as a result of damming, pollution, inefficient usage, and drought.

Priorities of the new 5-year Strategic Cooperation Agreement include creating sound environmental legislation, conserving biodiversity, improving resource efficiency and production, combating dust storms, and responding to climate change. Abdul-Majeid Haddad, UNEP Regional Climate Change Coordinator for West Asia (Manama, Kingdom of Bahrain), explains, “This cooperation agreement supports the realization of the vision of both the [Iraqi] National Development Plan (2014–2017) and the National Environment Strategy and Action Plan (2014–2017). But to achieve that [vision], the primary government institution mandated for environment – the Ministry of Environment – has to have the necessary human and institutional capacities in place. This agreement provides a platform to ensure that UNEP is responsive to the needs of the

government in integrating environmental concerns into socioeconomic development.” According to Haddad, the Iraqi Government will provide US\$4 million of funding, with additional support being sought from the Global Environment Facility (Washington, DC).

The agreement was signed during UNEP Executive Director Achim Steiner's first trip to Iraq. Steiner said at the signing, “To achieve a safe and just operating space for human development, which does not come at the expense of Earth's resources, we will need to develop a new narrative. Building environmental resilience, supported by green economic infrastructure, is at the heart of this narrative. We will also need to move toward a new development model that goes beyond GDP as a measure for human development – one that considers natural and social capital in relation to poverty alleviation, food security, and the consumption of energy and natural resources”. ■

L’Oreal declares zero deforestation drive

Adrian Burton

In mid January, cosmetics giant L’Oreal announced a “zero deforestation commitment” to acquire all of its palm oil and other raw materials from sustainable sources by 2020. The company joins others such as Nestlé, Unilever, and Ferrero in response to growing consumer concern over deforestation caused by palm-oil production.

Six years, however, is a long time in deforestation terms. A Greenpeace document entitled *Certifying Destruction: Why Consumer Companies Need To Go Beyond The RSPO To Stop Forest Destruction* establishes that in Indonesia, a major palm-oil producer, 300 000 ha of forest were cleared for palm plantations between 2009 and 2011. If losses continued at that rate, a further 600 000 ha would be gone by 2020,

totaling 900 000 since 2009 – an area half the size of Kuwait.

Yet L’Oreal insists this period is necessary to make changes. “It is a long process to involve suppliers. We need time to do it; it would have been untruthful to announce a shorter time limit”, says Clémence Fugain, a Media Relations Officer with L’Oreal (Paris, France). “We will be more than happy to succeed in reaching our commitment before this deadline. In 2013, we challenged all our suppliers on the subject. We have also made a mission in Indonesia, for example, to identify new partners. We are very mobilized and have been recognized for the third time as ‘best in class’ in our sector by WWF.”

“We think L’Oreal is on the right path”, says Tristan Tremschnig (Communications Coordinator, Indonesia Forests, Greenpeace International, Amsterdam, the Netherlands), “[but] 2020 is an unambitious timeline and [companies like L’Oreal need to]

implement their policies ahead of 2020 to make real change on the ground. We cannot wait another 6 years while ecosystems collapse and [species such as Sumatran] tigers are pushed dangerously close to extinction. L’Oreal’s policy is the sign of an industry in transformation, but we urge them and others to implement policies without delay.”

L’Oreal has reiterated its support for the Roundtable on Sustainable Palm Oil (RSPO), a body established in 2004 by palm-oil stakeholders to move the industry toward sustainable production, an important step for achieving zero deforestation. However, “with its voluntary guidelines and slow complaints process, some RSPO members continue to clear forests and destroy peat for new plantations”, worries Tremschnig. Hopefully, L’Oreal will deliver on its promises, and that after 6 more years, zero deforestation will not be a norm imposed by zero forest. ■

Using drones for conservation

Lindsay Deel

Monitoring sensitive environments at broad scales is often an expensive, complicated, and even dangerous task, but unmanned drones equipped with remote sensors may provide a cheap, accessible, and safe alternative. Lian Pin Koh, Associate Professor in the Environment Institute and School of Earth and Environmental Sciences at the University of Adelaide (Adelaide, Australia), started using drones for conservation purposes in 2012, to monitor threatened orangutan populations in North Sumatra, Indonesia. Soon afterward, Koh and Serge Wich (Professor in Primate Biology, Liverpool John Moores University, Liverpool, UK) created ConservationDrones.org, a nonprofit that promotes the use of low-cost drones to survey wildlife, map land cover, and detect poachers in protected areas. According to Koh, “Our biggest successes have been with surveying orangutan nests and helping government agencies in



Lian Pin Koh (right) and Serge Wich preparing to test-fly a prototype conservation drone in Indonesia.

Nepal, India, and Belize explore drone-based applications for conducting anti-poaching and anti-fishing patrols in protected areas.”

In places like the Himalayan foothills in Nepal, conventional monitoring efforts – foot patrols by soldiers – within national parks are costly and potentially hazardous due to poachers. The drones developed by Koh and Wich cost only about US\$3000, can be operated remotely from safe locations, and provide high-resolution

coverage of park lands through their sensors. Yet, despite its successes, the program is not without challenges. “The main obstacles have been in overcoming the stigma of the term ‘drones’ in some people’s minds, who might associate this technology with military applications. But by bringing our drones to many countries, and patiently giving demonstrations and raising awareness of the potential applications of civilian drones, we think the public’s perception of drones is quickly changing”, says Koh.

Koh is optimistic about the future for drone technology in the conservation realm. “We’ve been working with conservation groups and fellow biologists in over a dozen countries around the world, [and] many of these partners have suggested new ideas for how drones could be a game-changer for conservation research. One promising application is to use drones for radio-tracking wildlife. This would substantially reduce the cost of monitoring wildlife populations, potentially freeing up resources for other urgent conservation needs.” ■

Good news for European bats

Noreen Parks

During the second half of the 20th century, Europe's bat populations suffered massive declines, leaving many species rare and endangered. But a report released in January by the European Environment Agency (EEA) provides some positive news: over the past couple of decades, the abundance of nine species of bats has apparently increased.

"As with many other wildlife groups, agricultural intensification and loss of natural habitat have taken huge tolls on bats", says Karen Haysom, Director of Science at Bat Conservation Trust (London, UK). "On top of this, bats were affected by chemical treatments of roof timbers and subjected to deliberate killing and widespread destruction of their roosts before such activities were legally banned." Bats now increasingly face threats from development, wind turbines, and new building techniques that reduce roosting opportunities. And, given that bats tend to



Myotis daubentonii – one of nine European bat species showing moderate increases in population sizes.

be long-lived and have slow reproduction rates, environmental stressors can send populations into rapid declines.

Entitled *European Bat Population Trends – A Prototype Biodiversity Indicator*, the EEA report is the most comprehensive assessment yet made of bat population trends in Europe. Focusing on 16 of the continent's 45 bat species, researchers compiled data from monitoring programs in nine countries, where surveyors had counted hibernating bats at 6000 sites. The report team analyzed bat population trends by modifying a statistical tool previously used to assess European bird

and butterfly populations. The study revealed that between 1993 and 2011, the abundance of one species grew considerably, while another eight species either were stable or increased moderately. The report credits the apparent gains – equivalent to an overall increase of 43% for the species studied – partly to the effects of national and European conservation laws, site protection and direct management for more vulnerable species, and vigorous efforts to raise public awareness of bats' needs and change negative public attitudes toward them.

The results are encouraging, but Haysom warns, "These trends should be interpreted cautiously, as they don't yet represent all European species or countries. And, although this increase sounds substantial, it's likely that population levels for these species are far lower than before the severe declines. Many types of bats remain rare or vulnerable." Climate change may further exacerbate the plight of beleaguered bats, as they are sensitive to temperature shifts, affecting their ability to forage, reproduce, and hibernate. ■

New atlas reveals freshwater biodiversity worldwide

Kathryn Senior

The Global Freshwater Biodiversity Atlas (www.freshwaterbiodiversity.eu), launched at the end of January 2014, is the culmination of years of work by BioFresh, a pan-European collaboration between 12 EU research institutes, backed by an impressive list of leading international conservation organizations. The Atlas offers easily navigable maps of all freshwater habitats across the globe and will be continuously updated as new information becomes available.

Thierry Oberdorff (Muséum National d'Histoire Naturelle, Paris, France), an Atlas co-editor, stresses that the public availability of synthetic biodiversity data is essential to biodiversity and ecolog-

ical research, natural resource management, and decision making. "The present Atlas was constructed to this end and, by being linked to a source data portal, should be a powerful tool for managing freshwater diversity worldwide", he says.

Ben Collen (Centre for Biodiversity & Environment Research, University College London, UK) believes that the new resource fills a critical gap in biodiversity information. "Gathering a mechanistic understanding of how drivers of change affect biodiversity, particularly in freshwater systems that benefit humans, should provide the information we need to protect key components of freshwater ecosystems", he comments. Scott Bridgham, Professor and Director of the Environmental Science Institute at the University of Oregon (Eugene, OR), agrees, noting that the Atlas is a great example of what modern technology

can bring to global conservation. "While still in an early stage of development in terms of content, the Atlas will provide an invaluable open-access resource for scientists and resource managers to share visualizations of their spatial data with a broad community of users."

Oberdorff reports that the Atlas will increase its coverage in the near future, and its dynamic nature is already stimulating ideas. Collen notes several lines of evidence that suggest we should expect patterns of key metrics of biodiversity – such as species richness, threatened species richness, and endemism – to vary among different groups of freshwater species. "One of the obvious next steps is to use the Atlas to ask questions about how those patterns are likely to change under future scenarios of different land use, climate, and policy implementation", he suggests. ■

A tale of two parasites

Rachel Kaufman

Warming climatic conditions are facilitating the spread of two protozoan parasites in the Arctic in ways never before seen, according to a presentation at the American Association for the Advancement of Science's 2014 annual meeting. Mike Grigg, an investigator at the National Institutes of Health (Bethesda, MD), discovered that *Toxoplasma gondii*, a parasite mainly associated with felines, is now infecting beluga whales (*Delphinapterus leucas*) in the wild. "Toxoplasma is not [traditionally] considered to be an agent that's infecting marine mammals in the North, but with climate change and increases in cat density, what we saw in the lower 48, we're seeing in the Arctic." According to Grigg, humans (and their companion animals) have pushed farther north into previously

undeveloped areas while the warm season has been extended; freezing temperatures are one of the only ways to kill this particular parasite.

Grigg and his team tested beluga whale meat collected over 6 years. From 2004–2008, polymerase chain reaction (PCR) tests for *T. gondii* came up negative. In 2009, however, 14% of sampled beluga tissues exhibited PCR-based evidence for the presence of *Toxoplasma*, albeit in a slightly different form than that observed in the contiguous US. "We also started to search [for direct evidence of the *Toxoplasma* organism] and found it in the whales' heart muscle tissues." Grigg argues that because the indigenous Inuit people hunt for belugas for subsistence and eat raw beluga meat, this finding has potential public health implications. Although harmless in most humans, *Toxoplasma* can cause serious health problems for pregnant women or individuals with weakened immune systems.

Meanwhile, another parasite, *Sarcocystis neurona*, is moving south. Once confined to the ringed seal (*Phoca hispida*), which ranges across the Arctic, *Sarcocystis* is now spreading to other hosts, including sea lions, monk seals, and grey seals. "There used to be a polar ice barrier", Grigg explains, "so ringed seals didn't typically mix with other marine mammal species." However, as the extent of polar ice has receded in recent years, this is no longer the case. During a 3-week period in 2012, more than 400 grey seals died of necrotizing hepatitis, a complication resulting from *Sarcocystis* infection, at their breeding grounds on Hay Island. "There's been this liberation of a parasite whose range [was formerly limited to] the Arctic. Climate change is shifting the ranges of many marine mammals, which are mixing with other species previously blocked off and are picking up these pathogens." ■

Having our solar and tortoises too

Robin Meadows

When herpetologist Brad Shaffer came to the University of California, Los Angeles 2 years ago, he was keen to jump into local conservation issues. Then he saw an article in the *Los Angeles Times* on the clash between desert tortoises (*Gopherus agassizii*), which are listed as threatened, and massive solar arrays in the Mojave Desert, which is prized by the industry for its open spaces and intense sunlight. "That got me thinking", he recalls. "It's a conflict between two things everybody likes – renewable energy and an iconic species – and it would be great if we could do more proactive planning."

Now, Shaffer is launching a study to help install solar projects in places the tortoises don't use. How? By using genomics to learn where they move in the Mojave. "It's better to avoid the problem from the get-go", he points out. "It's easier and cheaper for everyone."

Shaffer's team will start with existing tortoise tissue samples and, to fill gaps across the landscape, will also begin collecting blood samples this spring, when the tortoises emerge from their burrows. The focus is on determining the connections between, say, Joshua Tree National Park and other large protected areas. "We'll target corridors that go through lands where solar could go in", he says, adding that the Mojave includes mosaics of protected and unprotected areas. A prime example is the Ivanpah Valley, a key tortoise corridor that is already composed of a mix of reserves and solar projects.

By identifying important corridors for desert tortoise gene flow, Shaffer's work will help predict which spots should be left undisturbed. "We'll be able to say, 'If you put a solar facility here, the population will be like this 50 to 100 years from now'", he explains. His work could also iden-



Desert tortoises use corridors up to 70-km long between protected areas.

tify opportunities for assisted migration, such as tunnels under highways and railroad tracks.

These findings cannot come soon enough for the desert tortoise. "The faster, the better – solar installations are being sited now", cautions Kathryn Phillips, Director of Sierra Club California (Sacramento), which monitors energy projects in the Mojave. Shaffer recognizes the urgency and says usable results could start coming in by the end of this summer. ■

Mammalian responses to climate change

Jane Bradbury

A systematic review and statistical analysis of published research identifies two traits that moderate the responses of mammals to climate change and provides an estimate of how many mammals are responding as predicted (according to current theories). “We shouldn’t expect all animals and plants to respond in the same way to anthropogenic climate change”, explains researcher Christy McCain (University of Colorado, Boulder). “And we need to identify those traits that underlie the variation in responses if we’re going to make valuable predictions about which species are most at risk from climate change and informed conservation management decisions.”

McCain and her colleague Sarah King identified 73 North American mammal species that have been assessed for responses to climate change such as range contractions and local extirpations. Although about half of these species had responded as ex-



Marmota flaviventris, a yellow-bellied marmot above the treeline near Nederland, CO.

pected, 41% had not responded at all, and 7% had done the opposite of what was expected. Statistical analyses of the data retrieved by the systematic review identified body size as the single largest predictor of response to climatic changes; an elk, for example, is 27 times more likely to respond to climate change than a shrew, according to McCain. The second trait that moderates whether a species responds to climate change is activity time. Thus, obligate nocturnal or diurnal species are more than twice as likely to show responses than species that can vary their activity times (*Glob Change Biol* 2014; doi:10.1111/gcb.12499).

“It is critically important to understand how and why species are responding to climate if we are to move beyond trial and error in our climate-adaptation actions”, says ecologist Erik Beever (US Geological Survey, Bozeman, MT). “I’m not surprised by the findings in this thoughtful analysis, which underscore the need for more research. However”, he warns, “the accuracy of these findings is predicated upon correct characterization of life-history traits”.

Mammalian expert Jim Patton of the University of California, Berkeley (Berkeley) adds that the question tackled by McCain and King is important because too many researchers and modelers “treat species (mammals or otherwise) as a black box and make forecasts [of the effects of climate change] that assume tight niche parameters involving only temperature and precipitation. Any effort that points out the variability within and across cohorts of species”, he continues, “will help improve understanding and increase awareness of the types of data that are necessary for future modeling efforts”. ■

Brazil renews forest-friendly soy moratorium

Katherine Blackwood

Amid forecasts that Brazil’s soy (*Glycine max*) production will surpass that of the US in 2014, the Brazilian moratorium on trading soybeans sourced from newly deforested land has been extended for one final year. The soy moratorium has been renewed regularly since its adoption in 2006, when member companies of two national soy trading associations (ABIOVE and ANEC) partnered with NGOs and the Brazilian Government to ensure its implementation.

The moratorium has been hailed by many – including Rachael Garrett, a Harvard University (Cambridge, MA) postdoctoral fellow investigating soybean production in Brazil – as an effective governance mechanism for curbing deforestation.

Garrett believes the moratorium has been successful because, she explains, it “enables local actors to enforce policies related to deforestation. Producers can’t sell into the supply chain and can’t get credit from the federal banks if they have deforested after 2006”. As a result, in the municipalities where 97% of soy is grown in the Amazon, just 4% of forest cleared since 2006 was planted with soy this past growing season. However, deforestation in the Amazon increased 28% last year, in spite of a decade-long downward trend. Garrett cites changes made in October 2012 to Brazil’s national Forest Code and gradually rising commodity prices as major contributors to the increase.

Another suite of mechanisms is currently in development to replace the soy moratorium next year. The Cadastro Ambiental Rural (or “Rural Environmental Registry”; CAR) will be a major focus of the

initiative to prevent deforestation in the near future, according to Romulo Batista of Greenpeace Brazil’s Amazon Campaign (Manaus, Brazil). The CAR dictates that landowners must register their properties with the government, ultimately linking deforestation detected by satellite-based sensors to the parties responsible. How rigorously compliance with the federal CAR may be enforced is a matter of contentious political debate. “The CAR does not have government regulation”, says Batista, “its database is not completely functional... and we don’t believe that the CAR will solve all the problems [of deforestation]”. Nevertheless, Batista is hopeful that upcoming talks will produce robust legislation to replace the moratorium while better engaging individual soy producers and consumers in preventing deforestation. ■