

Storm brews in India over coastal regulations

Leslie Bienen

Recent coastal disasters, and the presence of 2.3 billion people (forecast to grow to 3.2 billion by 2025) living within 100 km of the coast, have made “sustainable” coastal management an urgent issue worldwide. The sustainability of existing and newly outlined coastal policies is under intense debate in India. The controversy centers on the proposed replacement of the 1991 Coastal Regulation Zone Notification (CRZ) with a new regulation, entitled Coastal Zone Management Notification (CZM).

The CZM regulations, which were already in the pipeline prior to the December 2004 tsunami, are based almost exclusively on the Swaminathan Committee Report, a document sharply criticized by environmental groups and community-rights NGOs. A report entitled *Coastal Zone Management Notification '07: better or bitter fare?*, issued in July 2007 by the Ashoka Trust for Research in Ecology and the Environment (ATREE; Bangalore, India), states that the CZM is “completely antithetical to the...principles of integrated coastal zone management” and is “a brazen attempt at disempowering fishworkers and traditional coastal communities and making available premium lands in coastal areas to commercial interests”. “The CZM”, says one of the report’s authors, Sudarshan Rodriguez of ATREE, maintains a “conspicuous silence on rights access and tenure of fishing communities. The CRZ at least had some safeguards and was regarded as fisherfolk/livelihood-friendly by the communities and NGOs themselves.”

Although the Swaminathan Report has its supporters, even among environmentalists, statements such as Rodriguez’s capture the abiding frustration of ecologists and conservation-



Casuarina saplings along an upper beach in Tamil Nadu, buried in sand – an example of the wrong trees in the wrong place.

ists struggling to establish a scientific, rather than a political, basis for post-tsunami coastal management in India and neighboring regions. Rajib Shaw (Kyoto University, Japan) is editing a forthcoming special issue of the *Journal of Environmental Management*, entitled *Environmental aspects of the Indian Ocean tsunami recovery*. Shaw describes efforts to replant on dunes and shore breaks as “in most cases, haphazard”. Antonio Mascarenhas (National Institute of Oceanography, Goa, India) concurs, pointing out that storm surges “are more common and of greater concern than are rare tsunamis”. He adds that “three cyclonic storms and one to two severe storms strike the east coast of India every year, and storm surges have caused thousands of lost lives and seawater invasion up to 35 km inland”. Yet, say the legislation’s detractors, coastal development and growth of settlements continue unchecked and may be greatly expanded by the CZM.

Much of the frustration for ecologists stems from the fact that remedies exist for addressing and mitigating ecological disasters, but are largely ignored. “Lack of political will is a major cause of the prevailing undesirable scenario on India’s coasts”, laments Mascarenhas. Adds Rodriguez, “There was a Supreme Court

judgment in 1996, where the court, appalled by non-implementation of the CRZ, asked the state and central governments to get their act together, and even gave specific deadlines for doing so, which none of the states have complied with to date.”

Mascarenhas also emphasizes that “coastal managers must understand and consider the role and function of sand dunes and vegetation in dissipating oceanic energy”, which has not consistently happened. “Well-designed forested shelter belts, containing a gradation of species from the dune line toward the hinterland, are needed”, he says, although these management specifics will require much more study. For example, casuarina plantations successfully neutralized the 2004 tsunami in many locations. However, post-tsunami efforts have commonly resulted in trees being planted on sand dunes, where they actually increase beach erosion, rather than behind dunes, where they help to dissipate wind and waves. “Communities do not want them in front of villages because the visibility of the sea is important for making fishing decisions about wind, currents, etc”, explains Rodriguez. “This defeats the logic of the trees providing any kind of bioshield.”

Sangeeta Sonak (Energy Resources Institute, Goa, India) has written extensively on how India might adopt integrated coastal zone management concepts in rebuilding efforts; she has called for specific guidelines for replanting mangroves and casuarinas, though she also warns that extensive use of casuarinas, exotic to India, may cause other problems. Sonak further believes that “the lack of clearly defined guidelines for reconstruction” following the tsunami has hampered the success of rebuilding efforts.

On a positive note, however, Rodriguez says the proposed legislation has galvanized fisher-based NGOs and fishing communities. Fishing communities are now motivated to “assert their rights in the reconstruction process and in drafting laws that affect their livelihoods.” ■

Chernobyl: an ecosystem disaster?

Jane Bradbury

New research suggests that species richness and abundance of forest birds decreases with increasing radiation levels in regions affected by the Chernobyl nuclear power plant. The study, conducted by Anders Møller (Université Pierre et Marie Curie, Paris, France) and Timothy Mousseau (University of South Carolina, Columbia, SC; *Biol Lett – UK* 2007; **3**: 483–86) used a standardized bird count to provide new details about the ongoing ecological effects of the world's worst nuclear accident.

On April 16, 1986, the Chernobyl nuclear power plant in northern Ukraine exploded, exposing nearby plants and animals to lethal doses of radiation. Twenty years on, radiation levels in the 30-km radius exclusion zone are 1% of the original levels. “Most early studies found that the accident had significantly

affected the environment in the exclusion zone”, explains Mousseau, “but recently, the area has been portrayed as a thriving ecosystem”. For example, the Chernobyl Forum, a group of experts convened to reach a consensus on the environmental and health effects of the Chernobyl accident, has suggested that, in the absence of people, the exclusion zone has become a wildlife sanctuary. But, says Mousseau, there is little data showing exactly how the abundance of animals varies with radiation levels.

The researchers counted all birds seen or heard over 5 minutes at 100-m intervals across several forested areas within or next to the exclusion zone, and measured ground radiation levels at the same sites. In all, they recorded 1570 individual birds, representing 57 species. After controlling for habitat characteristics and other confounding factors, species richness in the areas with the highest radiation levels was less than half that in areas

with the lowest levels; bird abundance was reduced to a third. “Robins, blackbirds, and bluetits were among the birds most seriously affected”, reports Mousseau.

“These are the first data of this type”, notes ornithology professor André Dhondt (Cornell University, Ithaca, NY), “and therefore very interesting. The strength of the effects described suggests that the results should be robust, but it would be useful to replicate this study.”

Radiation ecologist Ward Whicker (Colorado State University, Fort Collins, CO) agrees that the data are interesting, but points out that the researchers did not measure the radiation doses absorbed by the birds and may not have controlled adequately for habitat variation. Nevertheless, he says, “this study is suggestive of a true radiation impact, although more research is needed to understand the real causes of differences in ecological characteristics”. ■

Australia's wild dogs under threat

Claire Miller

Dingoes have been recommended for listing under endangered species legislation in the Australian state of Victoria. The move by the state's scientific advisory committee reflects growing concern that the genetically distinct native dog has all but disappeared in the wild, through interbreeding with domestic dogs and persecution by farmers.

Canis lupis dingo probably arrived on the Australian mainland from Asia 3500 to 5000 years ago, and rapidly outcompeted marsupial predators such as the thylacine and devils, which were relegated to Tasmania and other islands.

Dingoes evolved in isolation until domestic dogs and livestock arrived with Europeans 200 years ago. “People brought a lot of baggage with them, ‘big bad wolf’ baggage, and they saw dingoes as being like wolves”, explains Barry Oakman of



Courtesy of B Oakman

The dingo – a rare sight in Australia these days.

the Australian Dingo Conservation Association (Michelangelo, New South Wales).

Old world attitudes led to a culture, persisting today, in which “dingoes” are routinely shot and poisoned to protect livestock. Oakman says the most destructive dogs, however, are look-alike mongrels with a similar hunting nature, but which lack the dingo's instinctive aversion to settled areas or the tight family hierarchy that keeps young dogs in check.

The result is a species with a very bad name, few official friends, and no other state governments prepared

to follow Victoria's lead. Indeed, dingoes are still legally considered “pests” to be eradicated in Victoria, even as the state considers an endangered listing that Oakman fears may be too little and too late. Dingoes were once widespread across Victoria, but are now restricted to remote bush areas in the eastern part of the state. Recent extensive wildfires and baiting programs to control feral dogs have taken a further toll on remnant populations.

“In Victoria, the pure dingo probably doesn't exist in the wild any more”, continues Oakman. “The best dingoes, with the purest genetic lines, are on islands off Western Australia.” And yet the dingo may hold the key to saving Australia's beleaguered small marsupials. The scientific advisory committee noted recent research suggesting that, when dingoes are eradicated from an area, foxes and cats proliferate and subsequently wipe out small marsupials, like bilbys, dunnarts, potoroos, and rock wallabies. ■

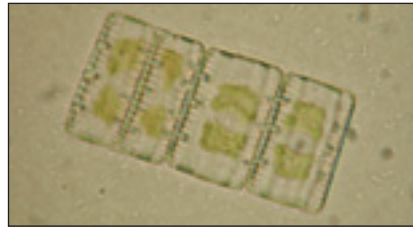
Climate change aids Pacific diatom's return to North Atlantic

Virginia Gewin

A microscopic diatom, *Neodenticula seminae*, has become an unwitting trans-Arctic migrator. Since 1999, large numbers of the Pacific diatom have been detected in the North Atlantic's Labrador Sea, where it hasn't been a fixture for over 800 000 years.

New research (*Global Change Biol* 13[9]: 1910–21) suggests that a pulse of Pacific water carried the diatoms through the Canadian Arctic archipelago and into the North Atlantic in 1998 or early 1999. At that time, ice in Alaska and Canada retreated north of the land mass, opening the Canadian archipelago and allowing winds to actively move water from west to east, explains Chris Reid, former Director of the Sir Alister Hardy Foundation for Ocean Science (SAHFOS; Plymouth, UK).

While a possible introduction from ship ballast water cannot be completely



Courtesy of P. Snoeijs

A trans-Arctic migrant – *N seminae*.

discounted, the timing of oceanographic changes preceding *N seminae*'s detection is convincing. The species is thriving because the northwest Atlantic has experienced an increased outflow of freshwater and cooler conditions in recent years, due to melting ice and permafrost in the Arctic.

N seminae was the cause of an unusual spring bloom in the Gulf of Lawrence, according to Michael Starr (Maurice Lamontagne Institute, Mont-Joli, Canada). He says the Gulf's low salinity waters appear to favor the development of massive blooms of this species, but its impact on productivity in the Gulf has not yet been determined. However, further introductions of Pacific plank-

tonic species via the Arctic, which could impact all trophic levels and fisheries, are expected, warns Starr.

Reid is troubled by the concurrent increase in chlorophyll found in the North Atlantic over the past few years. This may indicate that the CO₂ removal system to the deep ocean, otherwise known as the biological pump, may be compromised if it gets out of balance with the atmosphere. "We know huge changes are taking place", says Reid. "If equivalent changes are taking place in other parts of the world, it could impact the biological pump."

Unfortunately, there is little monitoring, particularly biological, in the world's oceans – especially in the Arctic, a region that will likely change rapidly in future decades. *N seminae* was identified by the Continuous Plankton Recorder, a monthly survey of North Atlantic plankton levels since 1962. Starr says Canadian officials are monitoring their waters, but Reid suggests additional monitoring is needed, to document further migrations as sea ice cover declines. ■

Dutch wind farms all at sea

Kathryn Senior

Harnessing wind power is a good idea in principle, but there is often local opposition to siting wind farms near highly populated areas, particularly in Europe. The Netherlands is experimenting with a way to circumvent this problem by initiating an ambitious program of offshore wind-farm construction, to help meet a target of 20% renewable energy use by 2020.

The €383 million (US\$522.3 million) "Q7" development is being built 23 km (14 mi) from the Dutch North Sea coast and will become operational in March 2008. Bernard van Hemert, one of Q7's engineering directors, expects more wind farms, with even larger turbines, in the coming years. "Offshore wind farms and other offshore energy sys-

tems will eventually be connected with offshore grids", he says.

The Q7 wind turbines are 98 m (320 ft) above sea level, with three sharp, narrow blades, each 40 m (130 ft) long. There is concern about the impact of these massive structures on marine ecosystems. "In the process of asking for building permission, wind-farm developers have to prepare a 'Milieu Effect Rapportage' (MER), a paper stating all of the potential environmental effects – on birds, fish, and other sea life", explains Jim Mollet, Chairman of the Dutch anti-wind farm group Nationaal Kritisch Platform Windenergie (Stroe, Holland). "But the MER can only predict. The real effects only become apparent once the wind farm is in place", he says.

Danish researchers say that fewer than 1% of birds flying past wind farms collide with the giant blades

(*Biol Lett* 2005; 1: 296–98), but more recent events suggest that this low risk applies only if wind farms are properly sited. At least 13 white-tailed eagles have been killed by collisions with the turbine blades in the past 2 years, at a 68-turbine wind farm in Smøla, Norway. These islands, 300 miles up the coast from Bergen, are eagle nesting sites, and all of last year's chicks perished, according to the Royal Society for the Protection of Birds (London, UK).

Mollet also fears the impact that Q7 could have on birds. "Positioning of the farms is very important, but this seems to have also been overlooked at Q7 – many established bird migration routes pass through the area of the wind farm. Also, if many birds do become victims of the turbine blades, who will know? On the land, there are bodies, but at sea, they just disappear." ■

Greenhouse gases drove 2006 heatwave

Chris Emery

Near record-setting high temperatures over the US in 2006 were primarily the result of human-generated greenhouse gases, according to a study by scientists at the National Oceanic and Atmospheric Administration (NOAA; *Geophys Res Lett* 2007; **34**: L17704). Last year was the second hottest since record keeping began in 1895, with temperatures 2.1°F above the 20th-century average. Temperatures were above normal in all but two states and corresponded with widespread drought, wildfires, and extreme summer heat.

The hottest year on record was 1998, which, like last year, corresponded with an El Niño event. After media reports blamed last year's heat on warm sea-surface tem-

peratures generated by El Niño, the NOAA scientists sought to provide a scientifically based explanation for the heatwave. "A lot of people assumed it was due to El Niño, but we chose not to assume that", says Jon Eischeid, a climatologist at NOAA's Earth System Research Laboratory (Boulder, CO) and one of the paper's authors.

Using a combination of 18 computer climate models and historical records of temperature and greenhouse-gas levels, the researchers estimated the effects of human-generated gases and El Niño on temperature. The technique is similar to that used by the influential Intergovernmental Panel on Climate Change. "We used all of the climate models available to us", Eischeid said, "because as soon as you start leaving models out, someone will complain that their model showed a different result."

Using data from the ten El Niño events since 1965, the researchers found that the country cooled slightly during El Niño years. In contrast, the simulations showed that greenhouse-gas emissions resulted in warming over much of the US last year. The models' predictions accounted for about half the rise in temperatures actually recorded, suggesting that greenhouse gases trumped El Niño's cooling tendencies. Other natural factors probably accounted for the other half of the rise, according to the authors.

Last year was the ninth consecutive year that the US has seen above-average temperatures and 2007 is likely to continue that trend, as greenhouse-gas concentrations are expected to be nearly identical to 2006. "We still have a few months to go", says Eischeid, "but it's been a warmer-than-normal year again". ■

Plant communities may counteract methane emissions

Noreen Parks

As global warming defrosts the far north, thawing permafrost is expected to trigger the release of enormous quantities of methane by microbial decomposers, amplifying warming in an accelerating positive feedback loop. However, a new study (*Global Change Biol* 2007; **13**[9]: 1922–34) suggests that changes in plant community succession in response to thawing may offset increases in methane emissions by enhancing carbon storage.

The boreal forests of Canada and Siberia encompass about 10% of the planet's surface, nearly a third of which contains peatlands. Billions of tons of carbon-rich, sub-surface plant material have been locked in these waterlogged, often frozen layers of peat for millennia. To tease out the effects of thawing permafrost on peatland ecosystems, Merritt Turetsky of Michigan State University (East Lansing, MI) and her colleagues studied three sites in south-



Courtesy of D Vitt

Thawing permafrost alters the environment – and the cycling of carbon – in Canadian boreal peatlands.

ern Canada over several years. Each location included landforms representing the "before" and "after" stages of thaw: peatlands with intact surface permafrost, where black spruce, shrubs, and desiccation-tolerant mosses grow, and open, saturated expanses supporting semi-aquatic plants. Using aerial surveys, on-the-ground measurements, and other methods, the researchers tracked site changes in air temperature, moisture levels, species composition, and greenhouse-gas emissions.

Within a matter of years, the permafrost transformed "from terra

firma to terra 'softa'", says Turetsky. As thawing progressed, the spruces sagged into a "drunken forest" profile; then, as soupy ground depressions formed, they keeled over. With abundant water and increased sunlight, *Sphagnum* mosses and other semi-aquatic plants exploded onto the scene, and anaerobic soil bacteria began churning out methane. But surprisingly, Turetsky's results showed that the amount of atmospheric carbon absorbed and sequestered in the soil by new plant growth exceeded the amount released by microbes.

However, the effect would likely be temporary. Clues gleaned from Turetsky's peat cores point to an inevitable decline in carbon storage rates as wetlands fill in and soil accumulates to support dry-adapted plants. And, says Jennifer Harden, (US Geological Survey, Menlo Park, CA), increasing fire activity in sub-Arctic regions, "almost certainly a direct result of enhanced summer drought over the past 50 years, doesn't bode well for peatlands". ■

Via Baltica controversy continues

Alison Gillespie

An official pause has been put on parts of the Via Baltica highway in Poland, but the controversy regarding this project – and, in some places, the construction work – continues. As reported in the April 2007 issue of *Frontiers* (*Dispatches*, 5[3]: 119), this road has been criticized by environmental groups since its inception. Observers say the government made little or no attempt to locate ecologically sensitive routes when planning the Via Baltica, opting instead to send parts of the highway straight through unique marshlands and fens in the Rospuda Valley. Some of the most controversial parts of the road include a bypass at the town of Augustow, where land is strictly protected under Natura 2000 agreements.



The Rospuda River flows through areas supposedly protected by Natura 2000.

In late July, the Polish government announced that work would begin on the Augustow bypass on August 1. But after appeals from several NGOs went out to Polish leaders and the EU, Polish officials decided to wait for a decision from the European Court of Justice on the matter, and construction on the bypass was halted. An official ruling could take 2 years.

Regional observers report that, in the mean time, construction continues on parts of the road which lie outside the protected areas. “We may say that, for now, the Natura 2000 site is safe”, confirms Anna Roggenbuck (Central and Eastern European Bankwatch Network, Szczecin, Poland). “But if roads are built on either side, you may end up with a highway with a hole in the middle.”

Several NGOs have also expressed concern about areas along other parts of the planned road, such as the Biebrza Valley. The case is likely to test the limits of the European Union’s power to enforce environmental mandates, and some say it could set an environmentally damaging legal precedent for all of Europe. ■

Gas flaring waste revealed by satellite data

Kathryn Senior

A global survey of gas flaring, commissioned by the World Bank’s Global Gas Flaring Reduction Partnership and carried out by the US National Oceanic and Atmospheric Administration (NOAA), has revealed that, in 2006, a massive 170 billion m³ of natural gas were burned worldwide in “waste” flares from oil fields. This is equivalent to 27% of the total annual natural gas consumption in the US and amounts to 5.5% of the total annual global production of natural gas. In addition to being economically wasteful, the practice is also environmentally damaging, producing around 400 million tons of CO₂ per year, or 13% of the 2012 target for greenhouse-gas emission reduction set by the Kyoto Protocol.

“We have shown that it is possible to monitor gas flaring from space and to make reasonable and independent estimates of the volume being wasted”, says Chris-



Gas flaring: wasteful and damaging to the environment.

topher Elvidge (NOAA National Geophysical Data Center, Boulder, CO). The satellite data reveal that gas flaring in 60 areas of the world has remained stable over the past 12 years, at around 150 to 170 billion m³ per year. However, there have been fluctuations in the amount of flaring in specific countries; rates of gas flaring have increased in 22 countries, including Russia, China, and South Africa, over that time, while 16 countries, including Nigeria, the UK (in the North Sea), and several South American nations, have reduced flaring rates.

Two years ago, legal action was brought against Shell – one of the largest gas flarers in sub-Saharan Africa – and other oil companies operating in Nigeria. “The practice was then costing Nigeria about US\$2.5 billion annually, at a time when about 66% of its population was living on less than US\$1 a day”, explains Peter Roderick, a lawyer and co-director of the Climate Justice Programme (London, UK), which supported the case. On November 14, 2005, the Federal High Court of Nigeria ordered that gas flaring must stop in a Niger Delta community, as it was violating guaranteed constitutional rights to life and dignity. Today, although flaring has waned, it is still a major problem, with 20 billion m³ of natural gas being burned each year. This is still almost 12% of the global total. Concludes Roderick, “Gas flaring in Nigeria will not reduce to world average levels until the companies are forced to stop. Legal action is one way to help, but ultimately there needs to be political will.” ■

More protection for California's marine life

Adrian Burton

In August 2007, The US National Oceanic and Atmospheric Administration announced the completion of the California Channel Islands marine protected area (MPA) network. This will expand the area of the archipelago's 13 MPAs by 145 square miles through the extension of protection limits from 3 to 6 miles from the islands' coastlines – the federal contribution to state-level efforts made by California back in 2003.

Designed to safeguard the Channel Islands' renowned marine flora and fauna and to help stocks of fish and other organisms to recover, the completion of the network is not the only glimmer of hope for Californian sea life. "On September 21st, a network of 29 MPAs, covering some of the central coast's most important ecological areas, will go into effect", explains Kaitilin Gaffney, Program Manager with Ocean Conservancy (Santa Cruz, CA), who helped to



Robert Schweimer, CINMS, NOAA

One of the Channel Islands, now a safer place for wildlife.

negotiate the new MPA boundaries, along with a variety of stakeholders including fishermen, divers, educators, and conservationists. "California's Marine Life Protection Act, passed in 1999, requires adoption of a science-based, comprehensive statewide network of MPAs off the California coast, and planning is now underway for additional areas [ie non-central areas] of the coast".

The term "MPA" encompasses areas conferring different levels of protection: marine reserves, where all fishing is prohibited; marine con-

servation areas, where some commercial and recreational fishing is allowed; and marine parks, where only recreational fishing is permitted. The MPA network of the Channel Islands – home to kelp beds inhabited by sea lions, dolphins, giant sea bass, and Garibaldi fish, and a feeding ground for blue whales – includes 11 marine reserves and two marine conservation areas. According to Mike Chrisman, California's Secretary for Resources, "[The] new MPAs will help us preserve some of California's most biologically important marine habitats, while also allowing for recreational and commercial fishing".

"The scientific evidence shows that well-designed MPAs produce more fish and bigger fish", says Kate Wing, Senior Policy Analyst with the Natural Resources Defense Council (San Francisco, CA). "With the Channel Islands network complete and MPAs under development for the rest of the state, we're looking forward to a future full of wildlife in Californian waters." ■

Eco-responsibility rocks the music industry

Jen Schoenburg

In a culture that analyzes the personal lives as much as the performances of celebrities, an unprecedented number of musicians are using this scrutiny to inspire environmental responsibility. Bandago, a van-rental company primarily servicing the music industry, announced in June that it was the first auto-rental company in the US to be certified as carbon neutral. Sharky Laguana, lead singer of the band Creeper Lagoon and CEO of Bandago, says, "Our commitment to the environment is sincere and heartfelt. Our office in San Francisco is solar powered with no air conditioning. Our Los Angeles office uses so little energy that the Los Angeles Department of Water

and Power called to ask if we were using the facility as storage because there was barely any measurable output. Employees live within a mile of their offices, and most walk or bike to work. We recycle our waste, use as little paper as possible, and remain constantly open to suggestions on ways to improve."

Adam Gardner of the band Guster and his wife, Lauren Sullivan, run Reverb, a non-profit organization that helps musicians like John Mayer practice and promote environmental sustainability by fueling tour vehicles with biodiesel, using biodegradable catering products, recycling guitar strings, educating fans, and more.

Also on Reverb's client list is the Dave Matthews Band, whose long-time commitment to the environment includes working to offset 100% of the CO₂ pollution they've

produced since the band formed in 1991. Pearl Jam's "Carbon Portfolio Strategy" includes donating a total of \$100 000 to nine different environmental organizations. And Hawaii native Jack Johnson and his wife Kim provide environmental education for children through their Kokua Hawaii Foundation. Johnson's song "The 3 R's" is a catchy call to reduce, reuse, and recycle.

Is it all just a trend? Jason Smith, co-founder and executive director of LiveNeutral, a non-profit organization that helps individuals and businesses reduce their carbon footprint, doesn't think so. "Because global warming is not going away anytime soon, living a more environmentally responsible lifestyle is a long-term commitment. It's the only way that we can ensure a sustainable future for generations to come." ■