



# IUCN's Science Bulletin

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## SCIENCE FOR IUCN'S PROGRAMMES



### Population diversity and the portfolio effect in an exploited species [\[abstract\]](#)

Diversity provides a buffer to ecosystem variance that is termed a "portfolio effect". While portfolio effects are often considered in terms of species diversity, given that current rates of population extirpation are >3 orders of magnitude higher than species extinction rates an understanding of trends beyond species diversity is needed to understand ecosystem service delivery. The authors present data from sockeye salmon in Alaska and report that, among other portfolio effects, variability in annual salmon returns is 2.2 times lower for the populations of several hundred currently surveyed than it would be if the system consisted of a single population. The authors emphasize the critical importance of maintaining population diversity (in contrast to focusing on just species diversity) for stable ecosystem services and securing local economies and livelihoods. Schindler, Daniel E., Ray Hilborn, Brandon Chasco, et al. (2010). *Nature* 465: 609-612.

### Using Ecological Function to Develop Recovery Criteria for Depleted Species: Sea Otters and Kelp Forests in the Aleutian Archipelago [\[abstract\]](#)

Recovery criteria for depleted biodiversity are often based on demographic measures to maintain enough individuals over a sufficient area to avoid extinction. The authors argue that demographic recovery criteria alone may be insufficient to restore the functional roles of strongly interacting species in an ecosystem and that recovery criteria for functions are needed. They considered the sea otters in the Aleutian archipelago on the basis of their keystone role in kelp forest ecosystems, and report that kelp forest phase state is a sensitive and cost-effective measure of sea otter recovery and may be more appropriate than the more traditional demographically based metrics. They suggest that similar approaches could have utility in establishing recovery criteria for depleted populations of other functionally important species.

Estes, James A., M. Tim Tinker, and James L. Bodkin. (2010). *Conservation Biology* 24: 852-860.

### Designing marine reserve networks for both conservation and fisheries management [\[article\]](#)

Individual marine protected areas (MPAs) that exclude fishing enhance the abundance, size, and diversity of species but these impacts don't necessarily extend to other marine species not subject to fishing. Meeting the larger-scale conservation challenges facing ocean ecosystems, networks of MPA are being created. The authors present size, spacing, location, and configuration guidelines for designing such MPA networks that simultaneously can enhance biological conservation and reduce fishery costs or even increase fishery yields and profits. Issues needing consideration include the proportion of protection within a network area, the spacing and size of reserves in the network, and potential impacts of climate change on ocean systems.

Gaines, Stephen D., Crow White, Mark H. Carr, et al. (2010). *Proc. Nat. Acad. Sci.* online 3 March 2010.

### National Red Listing Beyond the 2010 Target [\[abstract\]](#)

The authors reviewed national Red Lists (NRLs) of 109 countries and analyzed gaps in NRL coverage in terms of geography and taxonomy as well as correlations between the NRL data set and gross domestic product (GDP) and vertebrate species richness. The largest geographic gap was in Oceania, followed by middle Africa, the Caribbean, and western Africa, whereas the largest taxonomic gaps were for invertebrates, fungi, and lichens. The comprehensiveness of NRL coverage within a given country was positively correlated with GDP and negatively correlated with total vertebrate richness and threatened vertebrate richness. This supports the assertion that regions with the greatest and most vulnerable biodiversity receive the least conservation attention and indicates that financial resources may be an integral limitation.

Zamin, Tara J, Jonathan E. M. Baillie, Rebecca M. Miller, et al. (2010) *Conservation Biology* 24 : 1012-1020.

## FUN TO KNOW

### Fireflies coordinate their 'fireworks' [\[abstract\]](#)

Andrew Moiseff and Jonathan Copeland. Firefly Synchrony: A Behavioral Strategy to Minimize Visual Clutter. *Science*, July 2010: Vol. 329. no. 5988, p. 181

### Ants think 'velcro' when looking for food. [\[open access\]](#)

Dejean A, Leroy C, Corbara B, et al. (2010) Arboreal Ants Use the "Velcro Principle" to Capture Very Large Prey. *PLoS ONE* 5(6): e11331.

### Fish moods affected by temperature! [\[abstract\]](#)

Biro, Peter A., Christa Beckmann & Judy A. Stamps. Small within-day increases in temperature affects boldness and alters personality in coral reef fish. *Proc. R. Soc. B* 2010 **277**, 71-77.

**An ounce of prevention: cost-effectiveness of coral reef rehabilitation relative to enforcement** [\[abstract\]](#)

Possible management responses to coral reef degradation, as a result of blast fishing, include reef rehabilitation of damaged areas, and/or increased enforcement to protect still-living ones. The authors show that in Komodo National Park, Indonesia, rehabilitation by installing locally-quarried rocks on blasted rubble fields can be relatively low cost (US\$4.80 / m<sup>2</sup>) and simple, but is not economically viable at large scales. They also compared rehabilitation costs with enforcement costs by 2 economic analyses: cost-per-area calculations and a cost-effectiveness model over 7 years, and found that rehabilitation costs 70 and 5-times more, respectively, than marine patrols to enforce blast fishing bans. Therefore, they recommend that marine protected area managers prioritize investment in achieving compliance with regulations above investment in rehabilitation to ensure that reefs continue to generate biodiversity benefits and tourist revenues.

Haisfield, Kelly M., Helen E. Fox, Sheen Yen, et al. (2010). *Conservation Letters* 3: 243-250.



**The Incidence of Fire in Amazonian Forests with Implications for REDD** [\[abstract\]](#)

The authors analyzed satellite-derived deforestation and fire data from the Brazilian Amazon and report that fire occurrence has increased in 59% of the area that has experienced reduced deforestation rates. They also note that differences in fire frequencies across two land-use gradients revealed that fire-free land-management can substantially reduce fire incidence by as much as 69%. Therefore, they caution that sustainable fire-free land-management of deforested areas should be included within an adopted REDD mechanism to ensure that carbon savings achieved by avoiding deforestation are not negated by increased emissions from fires.

Aragao, Luiz E. O. and Vosio E. Shimabukuro (2010). *Science* 328:1275-1278.

**Climate Change Adaptation and the Structural Transformation of Environment Law** [\[abstract\]](#)

After reviewing the context and policy dynamics of climate change adaptation the author identifies ten trends that will have profound normative and structural impacts on how environmental law fits in: 1) Shift in emphasis from preservationism to transitionalism in natural resources conservation policy, 2) Rapid evolution of property rights and liability rules associated with natural capital adaptation resources, 3) Accelerated merger of water law, land use law, and environmental law. 4) Incorporation of a human rights dimension in climate change adaptation policy, 5) Catastrophe and crisis avoidance and management as an overarching adaptation policy priority, 6) Frequent reconfigurations of trans-policy linkages and trade-offs at all scales and across scales, 7) Shift from “front end” decision methods relying on robust predictive capacity to “back end” decision methods relying on active adaptive management, 8) Greater variety and flexibility in regulatory instruments, 9) Increased reliance on multi-scalar governance networks, and 10) Conciliation.

Ruhl, J.B. (2010). *Environmental Law*, Vol.40 (2); 363 - 435; 73 p., 2010.

**Patterns of Indian Ocean sea-level change in a warming climate** [\[abstract\]](#)

The degree of sea level rise, as a result of climate change, is not globally uniform. Regional sea levels can be affected by changes in atmospheric or oceanic circulation. The authors report on a review of *in situ* and satellite observations of the Indian Ocean sea level in the context of current climate-model simulations. They report that sea level has decreased substantially in the south tropical Indian Ocean whereas it has increased elsewhere. They conclude that if ongoing anthropogenic warming dominates natural variability—the pattern they detected is likely to persist and to increase the environmental stress on some coasts and islands in the Indian Ocean.

Han, Weiqing, Gerald A. Meehl, Balaji Rajagopalan, et al. (2010). *Nature Geoscience* 3:546 - 550

**The Impact of Climate Change on the World's Marine Ecosystems** [\[abstract\]](#)

The authors review climate change impacts on marine systems globally and note that rapidly rising greenhouse gas concentrations are driving ocean systems toward conditions not seen for millions of years, with an associated risk of fundamental and irreversible ecological transformation. They report on impacts including decreased ocean productivity, altered food web dynamics, reduced abundance of habitat-forming species, shifting species distributions, and increased incidence of disease. They note that while some uncertainty about the detailed scope and level of change exists, we already see fundamentally altered ocean ecosystems.

Hoegh-Guldberg, Ove and John F. Bruno (2010). *Science* 328: 1523-1528

**Managing knowledge**

**For academics, no advantage to publish in open access journals.** [\[abstract\]](#)

The authors compared the number of citations of open access (OA) and non-OA papers in six journals and four books published since 2000 and determined that OA had no statistically significant influence on the overall number of citations per journal paper, including from authors in developing countries. As academic success is often evaluated based on number of citations, OA does not appear to provide any incentives for this community.

Calver, Michael C. and J. Stuart Bradley. (2010). Patterns of Citations of Open Access and Non-Open Access Conservation Biology Journal Papers and Book Chapters. *Conservation Biology*, Volume 24: 872–880



#### **Empirical Relationship between Large Dams and the Alteration in Extreme Precipitation** [\[abstract\]](#)

Hossain provides a global analysis of large dams and the reservoirs associated with them and reports that extreme precipitation in areas with large dams has altered considerably more than mean precipitation during the last century. He notes that dams in the regions of Southern Africa, India, Western U.S., and Central Asia were found to have increased extreme precipitation more than other regions and that large dams altered extreme precipitation patterns more in the arid/semiarid regions more than other places.

Faisal Hossain. (2010). *Natural Hazards Review*. 11: 97-101.

#### **Wildlife-friendly oil palm plantations fail to protect biodiversity effectively** [\[abstract\]](#)

Agriculture practitioners often try to mitigate their impact on biodiversity through “wildlife-friendly” practices including retaining fragments of forest within the agricultural matrix. However, the authors report that the abundances of imperiled bird species were 60 times lower in fragments and 200 times lower in oil palm than in contiguous forest. Forest fragments also did not increase bird abundances in adjacent oil palm, had lower species richness than contiguous forest, and had an avifaunal composition that was more similar to oil palm than to contiguous forest. Therefore, the authors suggest that any investment in the retention of fragments would be better directed toward the protection of contiguous forest.

Edwards, David P., Jenny A. Hodgson, Keith C. Hamer, et al. (2010). *Conservation Letters* 3: 236-242.

#### **International law and Sustainable energy: A Portrait of Failure** [\[abstract\]](#)

Despite energy’s critical role in sustainable development, internationally, sustainable energy policy remains a “homeless orphan” according to the authors. In May 2007, the UN CSD met to adopt a concrete set of specific policies and actions to make the world’s energy system more sustainable and accessible to the world’s poor. The CSD neither produced agreement on any new ideas nor maintained the pre-existing consensus on basic principles and none of the issues have been addressed in other fora. The authors propose that in the absence of international agreement, sustainable energy must be pursued through domestic laws that identify and implement policies that promote energy efficiency and renewable energy investment.

Hodas, David, (2010). *Widener Law School Legal Studies Research Paper*, No. 10-21



#### **Organic agriculture promotes evenness and natural pest control** [\[abstract\]](#)

Conservation efforts often focus on restoring or maintaining numbers of species in an area as opposed to the ‘evenness’ (distribution of abundance among species) of those species in a landscape. The authors show that organic farming methods mitigate potential ecological damage of agriculture by promoting evenness among natural enemies. They report that in field enclosures studied, very even communities of predator and pathogen biological control agents, typical of organic farms, exerted the strongest pest control and yielded the largest plants while when evenness was disrupted pest densities were high and plant biomass was low. They suggest that organic farming potentially offers a means of returning functional evenness to ecosystems.

Crowder, David W., Tobin D. Northfield, et al. (2010) *Nature* 466: 109-112.

#### **Applying Resilience Thinking to Questions of Policy for Pastoralist Systems: Lessons from the Gabra of Northern Kenya** [\[abstract\]](#)

The authors apply the resilience analysis framework of Cumming *et al.* (2005), to the social-ecological system of the Gabra people in Kenya. They report that indicators developed using this framework clarify the dynamics of resilience in such a socio-ecologic system and can provide guidance on potential thresholds that would be relevant for policy. In the case of the Gabra, their review suggests a need to consider an alternative livelihoods strategy distinct from traditional pastoralism, whose viability has been undennined, but recognizing that some livelihood alternatives (eg. horticulture) can also have impacts on the system.

Robinson· Lance W., and Fikret Berkes. (2010). *Human Ecology* 38:335-350

#### **Deep sea snail exoskeleton as a model for new age armour?** [\[open access\]](#)

The authors report on potential applications of the iron-plated multilayered structure of the natural armor of *Crysmallon squamiferum*, a recently discovered gastropod mollusk which is unlike any other known natural or synthetic engineered armor.

Haimin Yaoa, Ming Daoa, Timothy Imholt et al. (2010). Protection mechanisms of the iron-plated armor of a deep-sea hydrothermal vent gastropod. *Proc Nat Acad Sci* 107: 987–992.

#### **Both leaf function and structure guide future energy production** [\[abstract\]](#)

To date, most research has focused on imitating the functions of photosynthesis but the authors discuss the importance of leaf structure to energy production in plants.

Zhou, Han, Xufan Li, Tongxiang Fan, et al (2010). Artificial Inorganic Leaves for Efficient Photochemical Hydrogen Production Inspired by Natural Photosynthesis. *Advanced Materials* 22:951–956



**Traditional Ecological Knowledge Trends in the Transition to a Market Economy: Empirical Study in the Doñana Natural Areas** [\[abstract\]](#)

The authors analyzed the transmission of traditional knowledge, related to local practices in agriculture and livestock farming, among rural local people in communities linked to protected areas in Doñana, Spain. They surveyed across 3 generations that cover the period in which the area transited from an economy strongly dependent on local ecosystem services to a market economy with intensified production systems. They report an abrupt loss of traditional agricultural knowledge related to rapid transformations and intensification of agricultural systems, but maintenance of knowledge of traditional livestock farming, an activity allowed in the protected areas that maintains strong links with local cultural identity.

Gomez-Baggethun, Erik, Sara Mingorria, Victoria Reyes-Garia, et al. (2010). *Conservation Biology* 24: 721-729.



**Development and application of a model for robust, cost-effective investment in natural capital and ecosystem services.** [\[abstract\]](#)

Bryan presents a case study of evaluating cost-effective environmental investment decisions under uncertainty in the South Australian Murray-Darling Basin. He modeled the costs and benefits of 46 investment alternatives (called *targets*) for managing natural capital and ecosystem services. He concludes that, for effective environmental decision making for the Murray-Darling basin the consideration of uncertainty was at least as important as the investment strategy chosen.

Bryan, Brett A. (2010) *Biological Conservation* 143: 1737-1750.

**Eco-Labeling Strategies and Price- Premium: The Wine Industry Puzzle** [\[abstract\]](#)

Using data gathered about US wines, the authors report that even though there is increasing use of eco-labeling, these wines don't necessarily command price premiums. They show that certification of environmental practices by a third party, separate to the eco-label, provided benefits such as improved reputation of the vintner or increased product quality, thereby leading to increased sales, independent of whether or not there was also an ecolabel on the bottle.

Delmas, Magali, A., and Laura E. Grant. (2010). *Business & Society* published online 11 March 2010

**Reducing threats to species: threat reversibility and links to industry** [\[abstract\]](#)

Using data on threats to imperiled species in Canada and the IUCN Red List threat classification system, the authors review the type of threats presented by industries causing the harm, thus providing regulators with quantitative data that can be used directly in cost-benefit and risk analyses to broadly reduce threat levels. For Canada they report that the industries that threatened the greatest numbers of species were construction, agriculture, and hunting/ fishing. They go on to rank the potential of threat abatement and reversibility by identifying threats that are easiest to mitigate as well as threats that are possible to abate but difficult to reverse. The authors suggest that integrating biodiversity threats into business planning could assist industry in making both cost and conservation efficient decisions.

Prugh, Laura, Anthony R.E. Sinclair, Karen E. Hodges, et al (2010). *Conservation Letters* 3: 267-276.

**Beyond Abundance: Self-Interest Motives for Sustainable Consumption in Relation to Product Perception and Preferences** [\[open access\]](#)

This paper presents results of a study conducted in Montreal that examined the perceptions and preferences of identified —responsible, sustainable consumers. For these citizens, attempting to follow sustainable lifestyles, the authors report that the adoption of sustainable consumption patterns is motivated by altruistic and environmental considerations as well as perceived personal benefits. The authors conclude that better understanding both such motives could lead to incentives for change towards a more sustainable future.

Marchand, Anne, Stuart Walker and Tim Cooper. (2010). *Sustainability* 2:1431-1447;

**IUCN Science bulletin**

This Bulletin provides a quick overview of the recent peer-reviewed literature relevant to IUCN's programme. It is not intended as an exhaustive reflection of what is happening in conservation science but rather to stimulate further exploration of science relevant to IUCN's Programme.

Many thanks to contributors for this issue including:

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**Feedback welcome!**

Any comments on the bulletin format and content? Send your thoughts to [iucnscience@iucn.org](mailto:iucnscience@iucn.org).

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