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Meeting report



Challenges in global biodiversity conservation and solutions that cross sociology, politics, economics and ecology

Sean Hoban^{1,*} and Cristiano Vernesi²¹*Dipartimento di Biologia ed Evoluzione, Università di Ferrara, Via L. Borsari, Ferrara, 44100, Italy*²*Department of Biodiversity and Molecular Ecology, Fondazione Edmund Mach, S. Michele all'Adige, Trento, 38010, Italy**Author for correspondence (shoban@alumni.nd.edu).

The study and practice of conservation biology is inherently interdisciplinary, addresses short and long time-scales and occurs within complex human–natural interfaces. Zoos and aquaria, in partnership with researchers, other non-government organizations, government, industry and educators, are combining knowledge of species and ecosystems with economics, psychology and law to create solutions for conserving biodiversity. From 22 to 25 May, the Conservation Forum of the European Association of Zoos and Aquaria was a venue for discussing conservation research, education and interventions, from the scale of villages to global policy.

Keywords: biodiversity conservation; zoos; stakeholder engagement; evaluating conservation effectiveness; policy

1. INTRODUCTION: EXPANDING AND EVOLVING APPROACHES TO TWENTY-FIRST CENTURY CONSERVATION

Contemporary conservation faces not only the mounting problems of human population increase, global climate change, pollution and land degradation, but also the daunting task of working in areas of low income, education and/or political and community stability, and where exploitation of resources and land is desired by local and international players. Further, conservation actions (such as protected areas, PAs) can clash with local interests, creating resentment and mistrust. Scientific investigations contribute valuable knowledge of ecology, genetics and behaviour, but to be applicable to conservation this knowledge clearly must be complemented with social and political sciences [1]. Similarly, biodiversity research and conservation should be considered key elements of food security, sustainable development and human well-being [2,3].

The Conservation Forum of the European Association of Zoos and Aquaria was a venue for debating how zoos and aquaria educate, take action and research to address these interdisciplinary challenges, while retaining their vital role as ‘arks’ for threatened

species. With 700 million visitors every year worldwide [4], zoos and aquaria are major venues for raising awareness, attention and a sense of urgency among individuals, communities and governments about biodiversity issues. Further, they (collectively) are the third largest non-governmental body funding *in situ* conservation programmes: coordinating and supporting on-the-ground conservation and restoration, and gathering and disseminating much-needed knowledge about species’ breeding and ecology.

At the Tiergarten Schönbrunn in Vienna, approximately 100 participants discussed overarching themes, including the systems approach to conservation (fitting species conservation actions into intertwined social–ecological networks); working together with industry executives and poachers; and using psychology to foster community involvement, communicate conservation science; and change public policy and individual behaviour on issues from habitat loss to illegal animal trade. The participants and projects ranged from restoration in economically stable but nature-poor Europe, to agricultural development, human–wildlife confrontations, and critically endangered species in southeast Asia and Africa. Speakers also showcased tools for conflict resolution and local capacity building, education and engagement with stakeholders, and quantitative measures of conservation success [5].

2. HUMAN–ANIMAL CONFLICTS TAKE PLACE WITHIN SYSTEMS

The systems approach, a major meeting theme, was first demonstrated by talks on human–animal conflicts from Alexandra Zimmerman (elephants) and Laurie Marker (cheetahs). The speakers showed that, contrary to common public opinion, local people often strongly care for nature. However, values are overcome by desperation when agriculture-based livelihoods are threatened by crop-raiding or livestock predation. Both speakers showed short- and long-term solutions that integrate but do not rely solely on biological knowledge: immediate interventions (low-cost fences, deterrents made from local hot chillies); income diversification (micro-loans to finance natural products export); education about behaviour and ecology of the problematic animals and reforestation. Training local people and creating handbooks allows these ideas to propagate to other villages, achieving self-sustenance.

In a similar vein, E. J. Milner-Gulland and Simon Mahood addressed poaching and illegal harvest by re-employing former hunters and egg collectors as guardians, nest monitors or data collectors (removing harvest pressure while providing a low-cost conservation service), an example of engaging with local people to address root causes. Several talks mentioned the need for ecological modelling to delimit boundaries between extractive and sustainable use, as such knowledge is often absent, especially in marine ecosystems. Bill Robichaud tackled the common assertion that ‘poverty is a major driver of biodiversity loss’, and provided the sobering reminder that high-value species, such as those exported for traditional medicine, can fetch enormous prices (4000€ for a tiger). In these cases, while alternative livelihoods and law enforcement will help, the elusive wider solution must address drivers (increasing wealth of consumers,

cultural beliefs) at an international and societal level, such as tracking trade [6] to show connections between biodiversity threats and consumption, with the goal of identifying and controlling 'at-risk commodities'.

3. BROAD STAKEHOLDER ENGAGEMENT AND DIALOGUE

The benefit of broad partnerships was shown in a series of talks regarding the conundrum of palm oil, which converts forest land to agriculture and contributes to climate change. Bryan Carroll showed the other side of the story, palm oil is in half of our processed foods, is highly efficient relative to other oil crops, and brings much wealth to tropical communities. There was general agreement that scare tactics, boycotts and no-compromise attitudes of environmentalists have not advanced conservation goals [1,7]. Government officials, industry representatives, researchers and non-government organizations discussed how the solution to preserving tropical ecosystems must include a level of conservation-minded integration with agriculture [8].

This set the stage for Carl Traeholt, who explained the partnership between Copenhagen Zoo and United Plantations to provide biological expertise in integrating plantations with ecosystems, maintaining ecological processes and services [9]. The partnership used GIS to choose least-impact locations for planting, plan corridors and refuges for wildlife, establish a native tree nursery staffed by locals, and use 'integrated pest management' (predators instead of chemicals). How does the company benefit? In addition to accessing eco-minded markets through certification, the company establishes a long-term, productive partnership with community and country. Dato' Seri called this the 'new economic model', combining high income, sustainability and inclusiveness (community consent and living wages). Zoos are valuable advisors and arbiters in this work owing to experience in engagement and marketing as well as biological expertise in reintroductions, relocations and restorations. Zoos can also educate the public about consumer choice in food, medicine, tourism and forest products. Researchers can help design and monitor the intensity of agricultural practice to optimize for ecological benefit, and identify high conservation value land [8]. For this to succeed, biologists must stop seeing businesses as solely problematic, and untouched PAs as sole solutions [7,10], a lesson applicable to other human-ecosystem interfaces (livestock, logging, fisheries).

4. EFFECTIVE COMMUNICATION AND PSYCHOLOGY

In addition to engaging with stakeholders from bankers to politicians, the forum focused on effective communication with the public and the psychology of zoo visits and nature appreciation. Neil Madison used bushmeat campaigns to stress that our messages are often biased from our outside views and experience, and may fail to engage or may result in confusion. He suggested moving from arguments based on moral obligation, common among conservation advocates, to scientific

arguments of species' roles in ecosystems. As with discussions of palm oil, the solution is not simple: subsequent talks introduced the concept of 'audience segmentation', identifying target audiences and tailoring messages to audience needs and capacity, a useful tool for any scientist seeking funding or public approval.

An imperative question was whether education can actually change behaviour, and if not, what can? Maggie Esson discussed communication and systems thinking in a talk about how schools were not sufficient to teach local villages the value of a new PA. Immersive educational visits inside the park and lessons in ecology, especially for respected members of the communities (termed 'message multipliers'), and the use of rangers as role models, created a better connection and understanding of conservation goals and outcomes. Integrating PAs with community goals and needs is an emerging conservation trend [10].

5. RESTORING AND CONSERVING SPECIES

While many large conservation organizations are moving away from a single-species focus, this forum showed why zoos and aquaria remain 'species champions'. There was discussion of how conservation of 'umbrella species' provides protection and consideration of other species and entire habitats. Further, research on umbrella species can result in data on species connected in the food web. Species may also be 'flagships', emblematic of widespread problems, issues or ecosystems, such as tigers or rhinos. As Sara Brook explained, these charismatic faces serve as emotional or iconic attachment for the public while also providing educational case studies or stories.

One focus was the extinction crisis in Asia that faces the most rapid decline in species of any region worldwide. Several examples highlighted the myriad of threats in this biodiverse region, from the Chinese paddlefish whose migration habits are disrupted by dams, to the decline of vultures caused by decline of large animal carcasses, and from the explosion of 'hobby trade' in the newly discovered salamander (*Laotriton laoensis*), to the white-bellied heron whose decline has no known cause. While long-term solutions to these problems concern reducing trade demand and educating young people, presentations emphasized expensive but necessary short-term solutions such as science-based choice and protection of critical sites.

Another topic was species reintroduction and restoration in Europe. Tiit Maran and others summarized systems approach lessons including: integrating *in situ* and *ex situ* plans; researching genetics, demography and behaviour and specifically how these relate to population increase; ensuring that prey and suitable habitat are available; involving communities (especially families) in local actions (rescue, reintroduction, monitoring) to build appreciation. Richard Zink added that 'active reintroduction' (trying different methods and recording outcomes) can optimize the age and condition of released animals [11]. Other reintroduction tools including 'head-starting' released individuals with supplemental food; use of large, enclosed natural areas for acclimation and radio tracking were also discussed. Bálint Halpern showed the use of 'conservation

heroes' and media coverage (the President of Hungary personally releasing two meadow vipers), while Anna Nekaris showed the power of social media and YouTube to combat illegal animal trade. Ben Delbaere gave this section broader context with a presentation of European policy directions such as integrating ecosystems into our cities; striving to define vague terms such as 'sustainable', 'degraded' and 'restored'; and the planned Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (<http://www.ipbes.net/>).

6. TOOLS AND APPROACHES

In addition to the general approaches of systems thinking, stakeholder engagement and communication, several specific tools were presented. Carly Waterman explained evolutionary distinct and globally endangered, a method of species prioritization that combines IUCN Red List categories with phylogenetic distinctiveness to ensure that unique genetic lineages are not overlooked [12]. Another workshop presented a simple, user-friendly way to measure the impact of conservation actions [13]. While such methods are critiqued for value judgements and quantifying the qualitative, the earnest discussion showed the necessity for evaluating and ranking effectiveness, in order to identify factors underlying success and failure [5].

A consistent question was: how to fund long-term projects [2]? Kathrin Hebel discussed the potential but uncertain future of REDD+ to create funds for protecting areas from deforestation and degradation, as well as active reforestation and sustainably managing forests as carbon sinks. In spite of criticism (carbon accounting, determining unexpected environmental impacts, ensuring that funds reach the projects), there was agreement that new solutions are needed, because the standard development approach (short-term infusions of knowledge and funds to implement solutions drawn up by outsiders) is not working.

Genetics was briefly mentioned in several talks, particularly regarding inbreeding, connectivity and captive populations. However, despite the well-known importance of genetics concerns and the increasing availability, utility and power of genetics tools to inform conservation projects and measure outcomes [14], genetics remains at the periphery. Sean Hoban and Cristiano Vernesi presented a collection of online tools to better disseminate knowledge about conservation genetic techniques and topics (www.congressgenetics.eu/), and discussed applications of genetics to policy and management.

7. OUTSTANDING ISSUES AND MOVING FORWARD

The forum left open many questions. How to begin (and sustain) change in long-term, international, socioeconomic threats [6], when it is clear that this change will take place on a generational scale? What are the best measures of conservation success (ecosystem services/productivity, number of species, size of protected ecosystems)? Still, although the path to conservation solutions

is as difficult as ever, the Conservation Forum showed that zoos and university researchers can partner with others to identify and establish PAs, provide education and training, and support law enforcement and policy evolution, addressing root causes including livelihoods, knowledge, community capacity and behaviour. To move forward, we as biologists should focus our language of public discourse and make strong connections among disciplines to apply our results.

- Rudd, M. A. *et al.* 2011 Generation of priority research questions to inform conservation policy and management at a national level. *Conserv. Biol.* **25**, 1–9. (doi:10.1111/j.1523-1739.2010.01625.x)
- Evans, D. M. *et al.* 2012 Funding nature conservation: who pays? *Anim. Conserv.* **15**, 215–216. (doi:10.1111/j.1469-1795.2012.00550.x)
- Millennium Ecosystem Assessment 2005 *Ecosystems and human well-being: synthesis*. Washington, DC: Island Press.
- Gusset, M. & Dick, G. 2011 The global reach of zoos and aquariums in visitor numbers and conservation expenditures. *Zoo Biol.* **30**, 566–569. (doi:10.1002/zoo.20369)
- Howe, C. & Milner-Gulland, E. J. 2012 Evaluating indices of conservation success: a comparative analysis of outcome- and output-based indices. *Anim. Conserv.* **15**, 217–226. (doi:10.1111/j.1469-1795.2011.00516.x)
- Lenzen, M., Moran, D., Kanemoto, K., Foran, B., Lobefaro, L. & Geschke, A. 2012 International trade drives biodiversity threats in developing nations. *Nature* **486**, 109–112. (doi:10.1038/nature11145)
- Kareiva, P., Lalasz, R. & Marvier, M. 2011 Conservation in the Anthropocene. *Breakthrough* **7**, 1. See: http://breakthroughjournal.org/content/issues/issue_2/.
- Edwards, D. P., Fisher, B. & Wilcove, D. S. 2012 High conservation value or high confusion value? Sustainable agriculture and biodiversity conservation in the tropics. *Conserv. Lett.* **5**, 20–27. (doi:10.1111/j.1755-263X.2011.00209.x)
- Goh-Jeevan, J. & Loh, B. 2011 A new shift in CSR palm oil industry's role in biodiversity protection, conservation and natural resource management: philanthropy, internal partnership, & capacity building. *J. Oil Palm Environ.* **2**, 63–71. (doi:10.5366/jope.2011.07)
- Miller, J. R., Morton, L. W., Engle, D. M., Debinski, D. M. & Harr, R. N. 2012 Nature reserves as catalysts for landscape change. *Front. Ecol. Environ.* **10**, 144–152. (doi:10.1890/100227)
- Schaub, M., Zink, R., Beissmann, H., Sarrazin, F. & Arlettaz, R. 2009 When to end releases in reintroduction programmes: demographic rates and population viability analysis of bearded vultures in the Alps. *J. Appl. Ecol.* **46**, 92–100. (doi:10.1111/j.1365-2664.2008.01585.x)
- Isaac, N. J. B., Turvey, S. T., Collen, B., Waterman, C. & Baillie, J. E. M. 2007 Mammals on the EDGE: conservation priorities based on threat and phylogeny. *PLoS ONE* **2**, e296. (doi:10.1371/journal.pone.0000296)
- Gusset, M. & Dick, G. 2010 'Building a future for wildlife'? Evaluating the contribution of the world zoo and aquarium community to *in situ* conservation. *Int. Zoo Yearbook* **44**, 183–191. (doi:10.1111/j.1748-1090.2009.00101.x)
- Allendorf, F. W., Hohenlohe, P. A. & Luikart, G. 2010 Genomics and the future of conservation genetics. *Nat. Rev. Genet.* **11**, 697–709. (doi:10.1038/nrg2844)