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Policy Forums

An open, online method in science education to support conservation: the National Conference on Conservation Biology



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Conservation biology is a multidisciplinary science oriented to problem solving, created by merging various disciplines from the biological and social sciences. It provides concepts and tools for nature conservation by combining different approaches, bridging basic and applied sciences (Soulé, 1985; Rodrigues, 2002; Groom et al., 2006; Martins et al., 2009). Conservation science was consolidated when Michael Soulé brought together leading scientists in a series of events and publications in the 1980s (Meine, 2010; Franco, 2013).

The history of conservation science in Brazil began with the creation of four national parks in the 1930s, but only since the 1970s conservation efforts in the country started to thrive (Mittermeier et al., 2005). Fortunately, there has been an increase in the number of publications in the past 15 years (Grelle et al., 2009), and important technical manuals written in Portuguese have been published since then (Primack and Rodrigues, 2001; Cullen et al., 2004; Drummond et al., 2005; Rocha et al., 2006; Machado et al., 2008; Piratelli and Francisco, 2013). Another major milestone was the creation of the Brazilian Association of Ecological Science and Conservation

(Associação Brasileira de Ciência Ecológica e Conservação – ABECO), a scientific society that brings together professionals engaged in research, teaching, and application of ecological sciences in Brazil. Related events have also taken place, such as the Brazilian congresses on Conservation Units and Wetlands, and the National Symposium on Protected Areas.

The most important advance in terms of events about conservation science is the Brazilian Symposium on Conservation Biology, held in Goiânia in 2011, and in Sorocaba, in 2013. However, there was still a need for additional initiatives of scientific outreach about conservation biology in the Brazilian society. Therefore, our company conceived and organized an online conference to fill this gap, the National Conference on Conservation Biology (Conferência Nacional de Biologia da Conservação – CNBC). We are members of a Brazilian company called Bocaina Biologia da Conservação, which is devoted to conservation literacy, with a staff of only three people. This was an open, online scientific event whose primary objective was to promote the discussion of conservation biology. Specifically, we wanted to train and instruct students and

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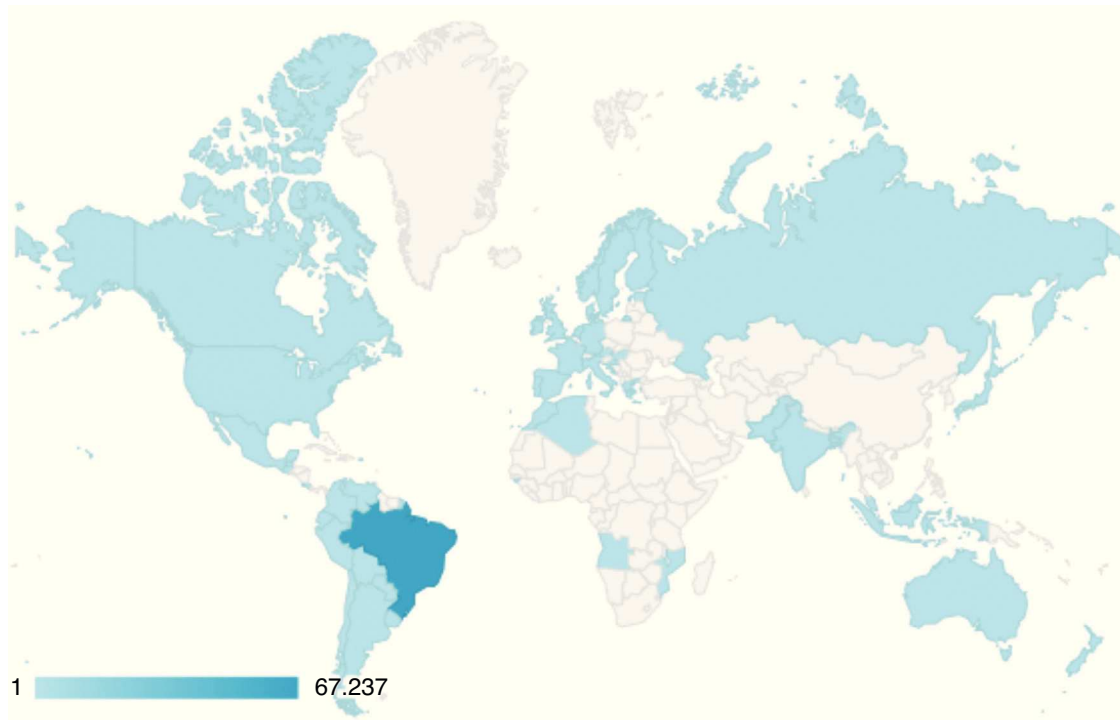


Fig. 1 – In blue, the 50 countries of origin of the total CNBC page accesses. Caption indicates the total number of hits with identified origin.

Source: Google Analytics.

professionals from several sections within conservation biology, while promoting the inclusion of the public from outside academia. The talks included recent conceptual information and basic procedures about how to make a real positive impact on the protection of nature, focusing upon the performance of institutions and professionals who have presented concrete results in conservation.

The conference occurred between 19 and 29 May 2014 on the Internet (<http://cnbc.com.br/programacao/>) and consisted of a series of 24 pre-recorded videoconferences in semi-structured interview format, with key experts in several topics of conservation biology. The topics of talks focused on primary principles for the protection and restoration of biological diversity, ecological integrity, and ecological health mentioned in the Recommended Guidelines for Conservation Literacy from the Education Committee of the Society for Conservation Biology (Trombulak et al., 2004). Aspects covered included conservation and management of species and ecosystems, research techniques and application of scientific research, legislation and political participation, environmental permitting, environmental management and restoration, protected areas, and scientific and environmental education. We invited professionals from different sectors, such as universities, museums, corporations, and non-governmental organizations, whose output was relevant to both practitioners and academic researchers. This broad arrangement enabled the discussion of both basic theoretical aspects and case studies.

The interviews were structured in two parts following a dialogical perspective of scientific communication (de Oliveira,

2007). In the first part, we asked specific questions about the area of expertise of each interviewee, focused on conceptual questions on the topics of the conferences. The second part addressed experiential, hands-on information to encourage successful conservation efforts, and pointed to errors that should be avoided by practitioners, with practical and useful guidance to early-career students and professionals (Burchard, 2011).

Based on the principles of Distance Education (Nogueira, 1996), the CNBC was conceived as a massive open online course (MOOC; Yuan et al., 2013). Thus, no requirements for participation were established. Enrollment has been done through a free double opt-in registration using a valid e-mail address. Content was broadcasted via webinars, a semi-synchronous and bidirectional communication mechanism (Santos and Rodrigues, 1999) used to transmit videoconferences from a dedicated server. This mechanism provided a favorable learning environment allowing the interaction of participants and facilitators through a questions-and-answers area (Wang and Hsu, 2008). An e-mail service was used as a support tool to send an access link to participants minutes before presentations. The only requirement to attendance was that participants needed to be connected to the Internet through a broadband service, and that they entered the room at scheduled times. An asynchronous communication mechanism was used in parallel, with the publication of the event recordings on a learning management system, in different media, including video, audio, and mind maps. This strategy allowed the full content to be permanently available to be viewed later.

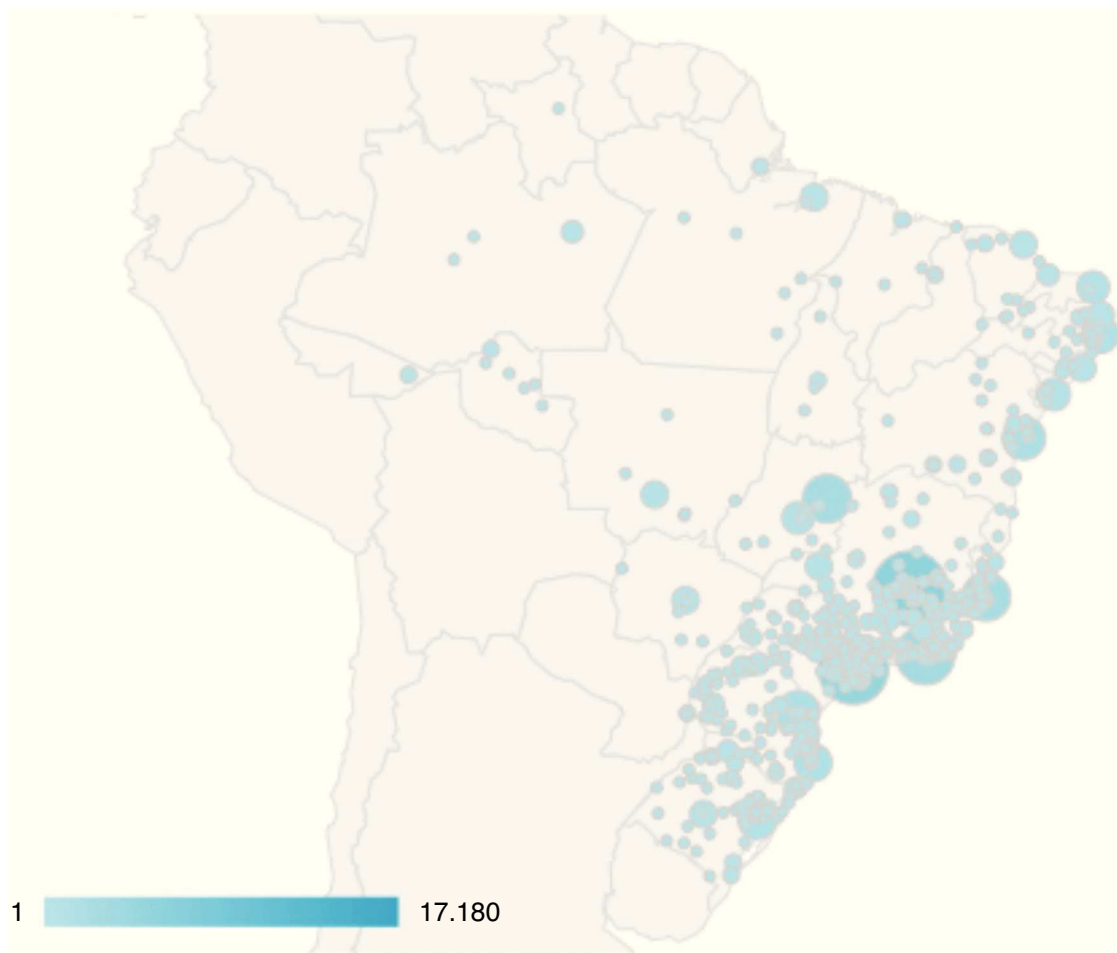


Fig. 2 – Distribution of accesses by municipalities in Brazil. Circle size indicates the proportion of hits. Color density indicates the total number of hits with identified origin.
Source: Google Analytics.

CNBC had a total of 7845 people enrolled, of which 5051 (64.4%) actually attended at least one conference in full, with a total of 259 questions sent to speakers. Besides the larger number of participants compared to a traditional scientific event, the geographic reach of the event was also striking. There were over 67,000 unique accesses to the event page, from 50 countries in all continents, especially South America, which had participants from almost all countries (Fig. 1). Accesses in Brazil came from at least 510 cities, comprising all 26 states and the Federal District (Fig. 2), which shows that the method of scientific education employed fulfilled the goal of bringing quality information and knowledge to the public from outside academia. This is a major achievement in social inclusion fostered by MOOCs. This important outreach had been observed in other MOOC initiatives worldwide, and motivated the foundation of companies entirely devoted to developing such educational programs, using a variety of techniques and technologies for different purposes, and creating what has been called the “Campus 2.0” (Waldrop, 2013). For example, the world’s largest MOOC platform, Coursera permanently offers a large set of different university courses, bringing traditional tuition programs to the web (Kellogg, 2013). Using a different

strategy, CNBC was a web-based scientific event that resulted in a coaching program in conservation biology, with a different structure from that of traditional university courses. Although these two approaches to MOOCs point at different targets, both are founded on the principles of open, online education to bring knowledge to a large number of people, probably spending fewer natural resources than traditional events or courses. Those features of MOOCs not only alter the economics of education (Waldrop, 2013), but also meet the interests of conservation biology concerning the reduction of the magnitude of human impacts on nature.

Conservation biology has broad political and educational dimensions. However, researchers usually face many challenges to establish bridges between the scientific knowledge they produce and practical solutions to the society (Trombulak et al., 2004; Diniz-Filho and Loyola, 2010). Therefore, improving ecological literacy of a broader proportion of the population would be of great value to encourage efforts to fill this gap, through the participation of people from the nonscientific community in academic practices, such as citizen science. This is a means to help bridge researchers and the public, integrating ecological research, natural history observation and

environmental education (Lepczyk et al., 2009; Dickinson et al., 2012). As a result, MOOCs are a valuable tool for academic researchers to communicate scientific knowledge to the public, and find means of political and technical participation that empower citizens and promote their involvement in nature conservation.

Given the historical conditions of inequality in the appropriation of scientific and technological knowledge in Brazil, the mass media play a key role as a channel to spread the information and educational practices to a large number of people (Moreira, 2006). Since Brazilian television media usually do not promote appropriate actions to disseminate science (de Oliveira, 2004), the Internet emerges with great potential for providing scientific and environmental learning to the general public, through the use of Open Educational Resources (Litto, 2006).

Science communication plays a key role in the continuing education of citizens and the general increase in scientific and technological qualifications. Therefore, the promotion of science in a contextualized and critical way is essential to the popularization of knowledge. In this context, our initiative with CNBC is a great achievement in the diffusion of scientific culture that supports conservation actions in Brazil and worldwide. The conference has still many advantages, since it can be easily replicated and also help to form environmentally literate citizens with an improved ability to judge government measures. Because ecological literacy is an educational foundation necessary for public decision-making (Cardelús and Middendorf, 2013), we suggest that future initiatives like this conference should be implemented complementarily to traditional scientific events. Thus, funding agencies and partners should consider providing specific resources to foster the application of this method in all major scientific events related to conservation biology. This would help spread the discussions held in such events and increase knowledge popularization and social inclusion, as well as support the active participation of society concerning nature conservation issues, which would ultimately yield environmental benefits in the long term.

Conflicts of interest

The authors declare no conflicts of interest.

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REFERENCES

- Burchard, B., 2011. *The Millionaire Messenger: Make a Difference and a Fortune Sharing Your Advice*. Simon and Schuster.
- Cardelús, C., Middendorf, G., 2013. Ecological literacy: the educational foundation necessary for informed public decision making. *Front. Ecol. Environ.* 11 (6), 330–331.
- Cullen, L., Rudran, R., Valladares-Padua, C., 2004. *Métodos de estudos em biologia da conservação e manejo da vida silvestre*. Editora UFPR.
- de Oliveira, J.M., 2004. A representação da ciência no jornal televisivo brasileiro: Ações sociais da divulgação científica. In: *Pluriculturalismo y Globalización Producción del conocimiento para la construcción de la ciudadanía en Latinoamérica.*, pp. 71–78.
- de Oliveira, J.M., 2007. *Ciência e divulgação científica: reflexões sobre o processo de produção e socialização do saber*. Caligrama, São Paulo (Online), 3.1.
- Dickinson, J.L., et al., 2012. The current state of citizen science as a tool for ecological research and public engagement. *Front. Ecol. Environ.* 10 (6), 291–297.
- Diniz-Filho, J.A.F., Loyola, R.D., 2010. Conservation science in Brazil: challenges for the 21st century. *Nat. Conserv.* 8, 1–3.
- Drummond, G.M., et al., 2005. *Biodiversidade em Minas Gerais: um atlas para sua conservação*, 2ª ed. Fundação Biodiversitas, Belo Horizonte.
- Franco, J.L.A., 2013. The concept of biodiversity and the history of conservation biology: from wilderness preservation to biodiversity conservation. *História (São Paulo)* 32, 21–48.
- Grelle, C.E., et al., 2009. Uma década de Biologia da Conservação no Brasil. *Oecol. Aust.* 13, 420–433.
- Groom, M.J., Meffe, G.K., Carroll, C.R., 2006. *What is conservation biology*. *Principles of Conservation Biology*, vol. 1. USA, Sinauer Associates Inc., pp. 3–25.
- Kellogg, S., 2013. Online learning: how to make a MOOC. *Nature* 499, 369–371.
- Lepczyk, C.A., et al., 2009. Symposium 18: citizen science in ecology: the intersection of research and education. *Bull. Ecol. Soc. Am.* 90 (3), 308–317.
- Litto, F.M., 2006. A nova ecologia do conhecimento: conteúdo aberto, aprendizagem e desenvolvimento. *Inclusão Social* 1, 2.
- Martins, R.P., et al., 2009. Rumos para a formação de ecólogos no Brasil. *Rev. Bras. Pós-Graduação* 4, 7.
- Machado, A.B.M., Drummond, G.M., Paglia, A.P., 2008. *Livro vermelho da fauna brasileira ameaçada de extinção*. Ministério do Meio Ambiente-MMA.
- Meine, C., 2010. Conservation biology: past and present. In: *Sodhi, N.S., Ehrlich, P.R. (Eds.), Conservation Biology for All*. Oxford University Press, Oxford, United Kingdom, pp. 7–26.
- Mittermeier, R.A., et al., 2005. Uma breve história da conservação da biodiversidade no Brasil. *Megadiversidade* 1, 14–21.
- Moreira, I.C., 2006. A inclusão social e a popularização da ciência e tecnologia no Brasil. *Inclusão Social* 1 (2), 11–16.
- Nogueira, L.L., 1996. *Educação a distância*. Comunicação Educação, 2.
- Piratelli, A.J., Francisco, M.R., 2013. *Conservação da biodiversidade: dos conceitos às ações*. Technical Books.
- Primack, R.B., Rodrigues, E., 2001. *Biologia da conservação*. Planta.
- Rocha, C.F.D., et al., 2006. *Biologia da conservação: essências*. RiMa, São Carlos.
- Rodrigues, E., 2002. *Biologia da Conservação: Ciência da Crise*, vol. 23. *Semina: Ciências Agrárias*, pp. 261–272.
- Santos, E.T., Rodrigues, M., 1999. *Educação à distância: conceitos, tecnologias, constatações, presunções e recomendações*. EPUSP, São Paulo.

- Soulé, M.E., 1985. What is conservation biology? *Bioscience*, 727-734.
- Trombulak, S.C., et al., 2004. Principles of conservation biology: recommended guidelines for conservation literacy from the Education Committee of the Society for Conservation Biology. *Conserv. Biol.* 18, 1180-1190.
- Waldrop, M., 2013. Campus 2.0. *Nature* 495, 160-163.
- Wang, S.-K., Hsu, H.-Y., 2008. Use of the webinar tool (Elluminate) to support training: the effects of webinar-learning implementation from student-trainers' perspective. *J. Interact. Online Learn.* 7, 175-194.
- Yuan, L., Powell, S., CETIS, J., 2013. MOOCs and Open Education: Implications for Higher Education. *Cetis White Paper*.