

2013

Pushing Taxonomy to Extinction?

Alessandro Minelli

Annemarie Ohler

Erna Aescht

Aaron Bauer

Lucio Bonato

See next page for additional authors

Follow this and additional works at: <https://scholarship.richmond.edu/biology-faculty-publications>



Part of the [Biology Commons](#), [Cell and Developmental Biology Commons](#), and the [Population Biology Commons](#)

Recommended Citation

Minelli, A., Ohler, A., Aescht, E., Bauer, A., Bonato, L., Bour, R., De Carvalho, M.R., De Sá, R.O., Foissner, W., Fusco, G., González-Oreja, J.A., Grandcolas, P., Iverson, J., Leschen, R., Löbl, I., Maruzzo, D., Nel, A., Nemésio, A., Riff, D., Dubois, A. 2013. Pushing Taxonomy to Extinction? *Science* 2, 2013.

This Article is brought to you for free and open access by the Biology at UR Scholarship Repository. It has been accepted for inclusion in Biology Faculty Publications by an authorized administrator of UR Scholarship Repository. For more information, please contact scholarshiprepository@richmond.edu.

Authors

Alessandro Minelli, Annemarie Ohler, Erna Aescht, Aaron Bauer, Lucio Bonato, Roger Bour, Marcelo Rodrigues de Carvalho, Rafael O. de Sá, and et al.

Pushing Taxonomy to Extinction?

Can we describe all species on Earth before they disappear? We argue that this is possible only by endowing taxonomy with professional manpower and appropriate material resources as required by big science.

Contrary to Costello *et al.*'s (CMS) (1) statements, taxonomy is not an easy discipline accessible to all through a smartphone. It requires exhaustive training and long familiarity with field, specimens and literature (2).

CMS's argument is framed in terms of species numbers, but different, non-overlapping species concepts apply to bacteria, brambles and birds (3,4,5): "the species" as common unit of biodiversity does not exist (6).

Even ignoring this conceptual and semantic issue, CMS's estimates of undescribed biodiversity and extinction rates are based on insufficient evidence and poorly supported models. Biodiversity hotspots steadily emerge in geographic areas where diversity was long assumed to be largely described (7,8). The number of species, whatever species are, cannot be easily estimated because of the historical, rather than deterministic or teleological, nature of biological evolution (9,10).

Extinction rates are highly context-sensitive (11), lineage- and region-dependant, thus generally difficult to ascertain (12) without thorough analyses of data such as IUCN's estimates of threats and extinctions (13). However, evidence being mainly restricted to vertebrates, the extinction risks in most other groups remain *terra incognita*. Furthermore, recent surveys (14,15) do not support CMS's optimistic predictions regarding extinction rates.

CMS's agenda emphasizes technology, voluntary work and recognition of subjective "morphospecies" (16). However, improvement of data storage and retrieval cannot substitute for the production of sound data. Serious taxonomists cannot describe two new species per week, as suggested by CMS's calculations. Describing new species, even with the help of molecular data and especially in best-investigated groups, is increasingly demanding, following the "law of diminishing returns" (17). More than anything else, taxonomy requires professional manpower, unrestricted fieldwork and permanent collections.

1. M. J. Costello *et al.*, *Science* **339**, 413 (2013).
2. J. M. Padial *et al.*, *Front. Zool.* **7**, 16 (2010).
3. Q. D. Wheeler, R. Meier, *Species Concepts and Phylogenetic Theory: A Debate* (Columbia University Press, New York, 2000).
4. P.-M. Agapow, O. R. P. Bininda-Emonds, *Quart. Rev. Biol.* **79**, 161 (2004).
5. A. Dubois, *Comptes rendus Palevol* **10**, 77 (2011).
6. M. F. Claridge *et al.*, *Species: The Units of Biodiversity* (Chapman and Hall, London, 1997).
7. K. Manamendra-Arachchi, R. Pethiyagoda, *Raffles Bull. Zool., suppl.* **12**, 163 (2005).
8. J. Hájek, J. Bezděk, *Acta Entomologica Musei Nationalis Pragae* **52** (suppl. 2), 1 (2012).
9. E. Mayr, *J. Hist. Ideas* **53**, 117 (1992).
10. F. P. D. Cotterill, W. Foissner, *Biodiv. Conserv.* **19**, 291 (2010).
11. D. B. Wake, V. T. Vredenburg, *Proc. Natl. Acad. Sci. U.S.A.* **105**, 11466 (2008).
12. R. A. B. Leschen, T. R. Buckley, R. Hoare, *N. Zeal. Entomol.* **32**, 85 (2009).
13. IUCN, *IUCN Red List of Threatened Species: Version 2011.2*; www.iucnredlist.org (accessed 2 February 2013).
14. H. M. Pereira *et al.*, *Science* **330**, 1496 (2010).
15. M. Hoffmann *et al.*, *Science* **330**, 1503 (2010).

16. P. M. Hammond, in *Insects and the Rain Forest of South East Asia (Wallacea)*, W. J. Knight, J. D. Holloway, Eds. (Royal Entomological Society, London, 1990).
17. A. Minelli, *Biological Systematics: The State of the Art*, Chapman & Hall, London (1993).

ALESSANDRO MINELLI,¹ ANNEMARIE OHLER,² ERNA AESCHT,³ AARON BAUER,⁴ LUCIO BONATO,¹ ROGER BOUR,² MARCELO RODRIGUES DE CARVALHO,⁵ RAFAEL DE SÁ,⁶ WILHELM FOISSNER,³ GIUSEPPE FUSCO,¹ JOSÉ ANTONIO GONZÁLEZ-OREJA,⁷ PHILIPPE GRANDCOLAS,² JOHN IVERSON,⁸ RICHARD LESCHEN,⁹ IVAN LÖBL,¹⁰ DIEGO MARUZZO,¹ ANDRÉ NEL,² ANDRÉ NEMÉSIO,¹¹ DOUGLAS RIFF,¹¹ ÉLISE TANCOIGNE,² ALAIN DUBOIS.²

¹Department of Biology, University of Padova, Padova, Italy

²Département Systématique et Evolution, Muséum national d'Histoire naturelle, Paris, France

³Universität Salzburg, Salzburg, Austria

⁴Department of Biology, Villanova University, Villanova, PA 19085, USA

⁵Instituto de Biociências, Universidade de São Paulo, Brazil

⁶Department of Biology, University of Richmond, Richmond, VA 23173, USA

⁷Departamento de Ecología y Recursos Naturales, Instituto Vasco de Investigación y Desarrollo, Derio, Spain

⁸Department of Biology, Earlham College, Richmond, IN 47374, USA

⁹New Zealand Arthropod Collection, Auckland, New Zealand

¹⁰Muséum d'Histoire naturelle, Geneva, Switzerland

¹¹Instituto de Biologia, Universidade Federal de Uberlândia, Uberlândia, MG, Brazil