The Semantic Diversity of Biodiversity Semantics: An Overview

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Abstract

Biodiversity is a relatively recent term, becoming prominent starting in the mid-1980's as a descriptor for the study of the "diversity of life-forms" on Earth. This charismatic label served to focus concerns on recent alarming trends in the global loss of Biodiversity-- including populations, species, communities, and ecosystems.

While coining of the term Biodiversity grew out of concerns over the accelerating disappearance of natural habitats and corresponding extinction of species — more recently its connotations have been much broader, encompassing a number of disciplines dedicated to characterizing, quantifying, conserving and understanding the remarkable variation in Earth's life forms at various scales, ranging from the molecular to the global. Fundamental to these investigations is the discipline of "Modern Systematics" that focuses specifically on the naming and categorizing of biological, often organismal "types", according to codes and rules established and maintained by the research community. The resulting "names" provide a unifying, though not entirely uncontested, reference terminology used by researchers in fields such as phylogenetics, evolutionary biology, paleontology, ecology, and conservation biology— to effectively clarify what types of biological entities were studied.

There is clearly an opportunity for these names (that can change over time as our understanding changes)— whether of clades, species, other taxonomic ranks, vegetation associations, habitat types, etc.; and the rules governing them — to be expressed in modern semantic languages and frameworks, in order to enable more effective discovery, interpretation, re-use, and exchange of biodiversity resources over the Web. In addition semantic technologies provide opportunities to de-silo and interoperate biodiversity terminologies more effectively with resources from disparate fields, ranging from ecological field data, to taxonomic descriptions, to conservation policy decisions.

In this talk I will provide some perspectives on current exciting work building biodiversity-relevant vocabularies, ontologies, and knowledge graphs, that collectively are helping to realize the goal of an interoperable "Biodiversity Semantics". I will also attempt to identify some opportunities and challenges that remain.

Bibliography

Dr. Schildhauer was Director of Computing at the U.S. National Center for Ecological Analysis and Synthesis, NCEAS, from its opening in 1995 until 2017, when he "semi-retired" to focus on research. His technology research interests are primarily in the areas of environmental informatics, geospatial semantics, the Semantic Web, Knowledge Graph technologies, and Open Science. In the distant past, he was technical coordinator of the first major biodiversity assessment of the macrobiota of rocky intertidal habitats within the Southern California Bight, and later did extensive field work in coral reef fish communities in the southern Caribbean Sea. At NCEAS, Schildhauer worked closely with plant biologists designing vegetation classifications for North America, and a functional trait database for

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New World plants. He also participated in the creation of the formal XML metadata schema, EML (Ecological Metadata Language; https://eml.ecoinformatics.org/), and its recent extensions to accommodate semantic annotation. He co-developed the OBOÉ ontology for observations and measurements, and helped align it with the W3C SSN/SOSA recommendation (https://www.w3.org/TR/vocab-ssn/). Schildhauer's academic training was in marine, population, and behavioral ecology (PhD, Univ Calif, Santa Barbara); and an undergraduate degree in Biology (A.B., Harvard).