

**Virtual Bio-Diverse Relationships and Digital Knowledges: Latin America in and through
the *Biodiversity Heritage Library***

Lidia Ponce de la Vega

Department of Languages, Literatures, and Cultures

Hispanic Studies

McGill University, Montreal

June 2022

A thesis submitted to McGill University in partial fulfillment of the requirements of the degree of
Doctor of Philosophy

Table of Contents

List of Figures.....	4
List of Abbreviations.....	7
Abstract	8
Sommaire	9
Acknowledgements.....	10
Introduction.....	12
1. (Re)Defining Biodiversity: A Model.....	17
2. Redefining an Era: Biodiversities of and during the Anthropocene	29
3. The Actual and the Virtual: (Virtual) Biodiversities and (Digital) Interdisciplinary Knowledges	40
4. Digital Archives as Cyborgian Rhizomatic Sympoietic Existential Utopias of Biodiversities: The <i>Biodiversity Heritage Library</i>	46
5. Reframing Digital Bio-Diverse Archives: What Does It Mean to Decolonize BHL?	50
Notes for Introduction	56
Accessing Bio-Diverse (Hi)Stories: BHL's Glocality and the Case of BHL México	63
1.1 Dissecting the Library: Biodiversity + Heritage + Library	64
1.2 Archival Glocality: BHL México and BHL's Global Outlook.....	68
1.3 Decolonial Collections: Towards Plural Linguistic Representation	75
1.4 Decolonial Access: Towards Plural Audience Engagement.....	84
1.5 Avenues for Access: Web Responsiveness and Adaptability	98
1.6 Communicating Archives: Engagement and the Mexican Archival Panorama	106
Notes for Chapter 1	113
Whose Stories? Towards the Bio-Diverse Decolonization of Representation and Knowledge Production	125
2.1 Representing and Communicating (Hi)Stories: BHL's Social Media Landscape	126
2.2 Interspecies (De)Colonial Representation: The Travel (Hi)Stories of <i>pyrostegia venusta</i>	136
2.3 My Stories, Your Stories, Our Stories: Virtual Repatriation and the Issue of Ownership.....	143
2.4 Repaired, Returned, Reborn: Bio-Diverse Virtual Epistemic Repatriation.....	157
Notes for Chapter 2	167
Bio-Diverse Curation: The (De)Colonial (Hi)Stories of Metadata.....	171
3.1 What's in a <i>Place</i> ? The Metadata of Place and the Place of Metadata.....	172

3.2 Geopolitical Archival (Hi)Stories: Subjects and Objects of Metadata	175
3.3 The (Hi)Stories of What? Subject Patterns and Representation of Topics	192
3.4 Re-Thinking Intraspecies Relationships: The (De)Colonial (Hi)Stories of the Brazil Nut.....	205
3.5 Whose Colonization? Or the (Im)Possibility of Being a Storyteller.....	213
3.6 Diversifying Collections: The (De)Colonial Metadata (Hi)Stories of BHL México	231
Notes for Chapter 3	243
The (Im)Possibilities of (De)Colonial (Hi)Stories.....	255
1. What is Missing? De la Cruz's and Badiano's <i>Libellus de Medicinalibus Indorum Herbis</i>	256
2. Indigenous Agency and Representation: The Bicultural Value of the <i>Libellus</i>	257
3. National Imaginaries: The Current Cultural Relevance of the <i>Libellus</i>	263
4. The Local and the Global: The Travel (Hi)Stories of the <i>Libellus</i>	266
5. Colonial Absence and Decolonial Presence: BHL and the <i>Libellus</i>	271
6. A Drop in the Ocean: Closing Remarks about the <i>Libellus</i>	278
7. Bio-Diverse Decolonial Strategies for Digital Archives: What's Next?	279
1. Diversify BHL partnerships and global nodes.....	283
2. Promote the equitable representation and active participation of Indigenous and marginalized communities.....	284
3. Continue to develop and implement a multilingual and multicultural approach.....	284
4. Solidify and improve engagement with BHL's existing nodes.....	285
5. Revise metadata standards and vocabulary.....	286
Notes for Conclusion	290
Appendix.....	292
Works Cited.....	294

List of Figures

Figure 1 Visual representation of a sympoietic system of the multiple and multiplying (hi)stories of biodiversities.	28
Figure 2 Language distribution for BHL China in the Internet Archive (as of June 2020).....	77
Figure 3 Language distribution for BHL Singapore in the Internet Archive (as of June 2020).....	77
Figure 4 Language distribution for BHL Africa in the Internet Archive (as of June 2020).	78
Figure 5 Language distribution for BHL SciELO in the Internet Archive (as of June 2020).	78
Figure 6 Language distribution for BHL México in the Internet Archive (as of June 2020).	79
Figure 7 Total visits to BHL and CONABIO's websites (April-June 2020).....	85
Figure 8 Daily traffic comparison of BHL and CONABIO's websites (June 2020)..	86
Figure 9 Traffic share by country to BHL, CONABIO, and Bioteca (April-June 2020).....	87
Figure 10 Traffic share by country to BHL, CONABIO, RI-UNAM, MEXICANA, and NaturaLista (April-June 2020).....	87
Figure 11 Traffic by countries to CONABIO's website, July 2020.....	90
Figure 12 Traffic share by country to BHL and CONABIO only (June 2020).....	93
Figure 13 Traffic by country to the five selected Mexican websites (April-June 2020).	95
Figure 14 Traffic share by device to BHL (left), CONABIO (center), and NaturaLista (right) (April-June 2020).....	99
Figure 15 Visits share by device to BHL and CONABIO, April-June 2020.	99
Figure 16 Traffic share by device to Bioteca (April-June 2020).....	103
Figure 17 Comparative engagement metrics for BHL, CONABIO, and Bioteca (top), and for the selected Mexican websites (bottom) (April-June 2020).	106
Figure 18 Social traffic to BHL (top left), CONABIO (top right), Bioteca (bottom left), and NaturaLista (bottom right) (April-June 2020).....	128
Figure 19 BHL's Facebook post promoting the work of Dr. Bravo Hollis and linking to Aguilar-Rocha's post as part of the #HerNaturalHistory campaign.	135
Figure 20 BHL's Instagram post on <i>pyrostegia venusta</i> as part of the #HerNaturalHistory campaign.	137
Figure 21 Metadata in the BHL catalogue of Lowis's <i>Familiar Indian Flowers</i> (left) and Edwards and Ridgway's <i>Botanical Register</i> (right).....	139
Figure 22 Subject-based subsets generated to analyze the geopolitics of bio-diverse knowledge production in the <i>Biodiversity Heritage Library</i>	176
Figure 23 Most frequent places of publication in the GR subset for non-unique IDs.	178
Figure 24 Most frequent places of publication in the GR subset for unique IDs.	178

Figure 25 Density of publications per year per place of publication of materials in the GR subset published in France.....	180
Figure 26 Number of titles per place of publication in the LAC subset for non-unique IDs.	181
Figure 27 Number of titles per place of publication in the LAC subset for unique IDs.....	182
Figure 28 Number of records related to locally-produced knowledge in the LAC subset.	183
Figure 29 Map showing places of publication (density per number of records) in the LAC subset.	184
Figure 30 Map showing blue markers for holding institutions in the LAC subset.	184
Figure 31 BHL's tweet promoting the work of Evangelina Schwindt and the book <i>Especies exóticas marino-costeras</i>	187
Figure 32 Overview of traffic by channel to BHL's main website (April-June 2020).	189
Figure 33 DR of BHL's website on Ahref.	189
Figure 34 Linking domains to BHL's website (left) and CONABIO's website (right).	190
Figure 35 Secondary subsets of subject lists generated to analyze the geopolitics of bio-diverse knowledge production in BHL.	194
Figure 36 The 10 most frequent terms in the CAC subset.....	195
Figure 37 Sample of subject lists that include the word Panama.....	195
Figure 38 Co-occurrence network of the CAC subset. The overlapping of subgraphs 01 and 06 shows the strong association between Panama and the United States.	196
Figure 39 Titles per place of publication in the PAN subset (with cleaned data for missing fields)..	197
Figure 40 Hierarchical Clusters 7 (green, above) and 8 (magenta, below) for the CAC subset.	198
Figure 41 Map showing places of publication (density per number of records) in the PAN subset (with cleaned data for missing fields).	200
Figure 42 Distribution per year of publication of titles in the PAN subset (with cleaned data for missing fields).	201
Figure 43 Chronological distribution per place of publication of titles in the PAN subset (with cleaned data for missing fields).	201
Figure 44 Percentage of titles per language in the PAN subset (with cleaned data for missing fields).	203
Figure 45 Density map of places of publication of materials in BHL containing the scientific name <i>Bertholletia excelsa</i>	207
Figure 46 Top 10 places of publication of materials in BHL containing the scientific name <i>Bertholletia excelsa</i>	207
Figure 47 Number of titles per place of publication in Latin America of materials in BHL containing	

the scientific name <i>Bertholletia excelsa</i>	208
Figure 48 Places of publication of materials in BHL containing the scientific name <i>Bertholletia excelsa</i> that were British colonies at the time of publication of the records.	208
Figure 49 Language of publication of materials in BHL containing the scientific name <i>Bertholletia excelsa</i>	209
Figure 50 Number of materials in BHL containing the scientific name <i>Bertholletia excelsa</i> published per year in each included language.	210
Figure 51 The 30 most frequent words in subject lists of materials in BHL that include a subject that begins with the phrase <i>Indians of</i>	215
Figure 52 Co-occurrence network of all materials in BHL that include the phrase <i>Indians of</i> in their subject lists.	216
Figure 53 Co-occurrence network (left) and top-20 most frequent words (right) in all materials in BHL that include the word <i>Indigenous</i> to refer to topics related to Indigenous peoples in their subject lists.	217
Figure 54 Co-occurrence network for the IP-G2 subset.	225
Figure 55 Sample of contexts of the word <i>language</i> in the IP-G2 subset.	225
Figure 56 Places of publication (left) and language distribution (right) for unique ID titles in the IP-G2 subset.....	226
Figure 57 Co-occurrence network for the IP-S subset.....	227
Figure 58 The 30 most frequent terms in the subject lists in subsets IP-G2 (left) and IP-S (right).	228
Figure 59 Map showing places of publication (density per number of records) (left) and graph showing language frequency (right) in the IP-S subset.....	229
Figure 60 Places of publication (non-unique IDs) in the MEX subset with more than 33.32 records (subset average).	232
Figure 61 Places of publication and holding institutions of materials in the MEX subset published in Mexico.....	233
Figure 62 Language frequency of materials (non-unique IDs) in the MEX subset.....	235
Figure 63 Frequency of English and Spanish in the GR, LAC, IP-G, IP-S, and MEX subsets.	235
Figure 64 Language frequency of materials (unique IDs) in the MEX subset.	236
Figure 65 Yearly distribution (left) and publications per language per year (right) of records in the MEX subset.	237
Figure 66 Density of publications per year per place of publication of materials in the MEX subset published in Mexico.....	238
Figure 67 Co-occurrence network (left) and 30 most frequent words (right) in the MEX subset... ..	240

List of Abbreviations

BHL: Biodiversity Heritage Library

CONABIO: Comisión Nacional para el Conocimiento y Uso de la Biodiversidad

CRSEUoB: Cyborgian rhizomatic sympoietic existential utopia of biodiversities

ECOSUR: El Colegio de la Frontera Sur

ENBioMex: Estrategia Nacional sobre Biodiversidad de México y Plan de Acción 2016-2030

INECOL: Instituto de Ecología

RI-UNAM: Repositorio Institucional de la Universidad Nacional Autónoma de México

STRI: Smithsonian Tropical Research Institute

UNAM: Universidad Nacional Autónoma de México

Subset Abbreviations

BR: Brazil

CAC: Central American Countries

CLS: Central America, Latin America, South America

GR: Greater Regions (Latin America, Central America, South America, West Indies)

IP-G: Indigenous Peoples – General (Latin America, Central America, South America, West Indies)

IP-G2: Indigenous Peoples – General Specified (Indians of Central America, Indians of Mexico, Indians of South America, Indians of the West Indies)

IP-S: Indigenous Peoples – Specific

LAC: Latin American Countries

MEX: Mexico

PAN: Panama

SAC: South American Countries (except Brazil)

WI: West Indies

Abstract

This doctoral dissertation constitutes a critical and decolonizing study of the collections, metadata, online activities, and archival practices of the *Biodiversity Heritage Library* (BHL). It aims to understand epistemic constructions of biodiversity, more specifically, of biodiversity in Latin America, as they are communicated through this digital archive. This dissertation is an assessment of the strategies the Library has implemented and can implement toward a more plural, inclusive, decolonial, and non-anthropocentric network of knowledges of biodiversity. This doctoral research analyzes BHL through a mixed-methods approach, considering web analytic data (especially traffic trends), language representation, social media representation, critical metadata, decoloniality, and ecocriticism. Therefore, this thesis focuses on the current online panorama as much as on the historical processes that have constructed and continue to construct our understandings of what biodiversity means. Such understandings determine our relationships with all subjects encompassed by the term *biodiversity*, including a plurality of human subjects and societies, embedded as they are in colonial dynamics between the Global South and North. This dissertation dissects how such understandings are transmitted through narratives—historical, scientific, cultural—of humans with-in biodiversity, contained in (digital) archives such as BHL. It highlights the presence and (under)representation of marginalized communities—particularly Indigenous peoples and the Global South—within biodiversity-related epistemic networks of (digital) knowledges.

Sommaire

Cette thèse de doctorat propose une étude critique et décolonisatrice des collections, des métadonnées, des activités en ligne et des pratiques d'archivage de la *Biodiversity Heritage Library* (BHL). Elle vise à comprendre les constructions épistémiques de la biodiversité, plus particulièrement de la biodiversité en Amérique latine, telles qu'elles sont communiquées à travers cette archive numérique. Il s'agit d'évaluer les stratégies que la Bibliothèque a mises en œuvre et peut mettre en œuvre afin de constituer un réseau plus pluriel, inclusif, décolonial et non anthropocentrique des savoirs sur la biodiversité. Cette recherche doctorale analyse la BHL à travers une approche à méthodes mixtes, qui tient compte des données analytiques Web (en particulier les tendances du trafic), de la représentation linguistique, de la représentation par les médias sociaux, des métadonnées critiques, de la décolonialité et de l'écocritique. Par conséquent, cette thèse se concentre autant sur le panorama actuel en ligne que sur les processus historiques qui ont façonné et continuent de façonner notre compréhension de ce que signifie la biodiversité. Les savoirs sur la biodiversité déterminent nos relations avec tous les sujets englobés par le terme « biodiversité », y compris une pluralité de sujets humains et de sociétés dont tous sont intégrés aux dynamiques coloniales existant entre le Sud et le Nord. Cette thèse s'attache à démontrer comment de tels savoirs sont transmis à travers des récits — historiques, scientifiques, culturels — représentant des humains au sein de la biodiversité et contenus dans des archives (numériques) telles que la BHL. Elle met en évidence la présence et la (sous)représentation des communautés marginalisées — en particulier les peuples autochtones et les pays du Sud — au sein des réseaux épistémiques de connaissances (numériques) liés à la biodiversité.

Acknowledgements

No puedo más que comenzar mis agradecimientos con una manifestación de mi eterna gratitud hacia mi madre, la piedra angular sobre quien descansan todos mis logros, y hacia mis abuelos, nuestro mayor apoyo a lo largo de los años.

I cannot express enough gratitude to my professor and supervisor, Dr. Cecily Raynor, for her invaluable guidance and feedback throughout my doctoral research and beyond matters related to this thesis. My doctoral work would not have been possible without her. I would also like to thank my thesis committee, Prof. Stéfán Sinclair (former member), Prof. Stephanie Posthumus, Prof. José Jouve-Martín, Prof. Roopika Risam, and Prof. Katherine Zien who not only provided their generous support and expertise in the evaluation of this thesis but also accommodated tight deadlines so that I can continue with my academic journey.

My completion of this thesis was possible through the generous financial support of the Fonds de recherche du Québec - Société et culture (FRQSC, Bourse de doctorat en recherche 2022), the Mitacs Research Training Award (Summer 2020), and the Frank & Judith Kunz Fellowship in Humanities (2019-2020). I am grateful as well for the several awards and paid positions granted to me by the Faculty of Arts and the Department of Languages, Literatures, and Cultures at McGill.

I would like to thank, once more, Prof. Stéfán Sinclair and Prof. Stephanie Posthumus for introducing me to the fields of Digital Humanities and Ecocriticism. I am equally grateful to all my professors in LLC and Hispanic Studies: Prof. Jesús Pérez Magallón and Prof. Fernanda Macchi, for their expertise, knowledge, and enriching courses; Prof. Amanda Holmes not only for her support and help during my studies but also in submitting countless scholarship and job applications; Prof. José Jouve-Martín, once again, for being a wonderful supervisor and mentor during my time as his student and teaching assistant; and Prof. Andrew Piper for his guidance as my supervisor in DH matters and his helpful feedback regarding my thesis project.

I would like to thank the teaching faculty of LLC, especially, Ms. Lucia Chamanadjian for her mentorship and friendship since I first taught a Spanish course back in 2016. I would also like to

thank Anny Guimont, Maite Mascaró, Sandra Barriaes Bouche, and Sun-Young Kim for their help, support, and knowledge, which greatly aided my teaching practices.

I am immensely grateful to the people at the *Biodiversity Heritage Library*, in particular, Program Director Martin Kalfatovic for his guidance and mentorship during my internship. I am equally grateful to Digital Collections Manager Bianca Crowley, Chair Constance Rinaldo, Program Manager Colleen Funkhouser, and former Outreach and Communications Manager Grace Constantino for their help and support in sharing my work with the BHL community.

I would like to recognize the support of the administrative staff of the LLC department and of *Graphos* at McGill. I am forever thankful to Lynda Bastien, Livia Nardini, Victor Iacob-Mayer, Sarah Curci, Mariève Isabel, Donetta Hines, and Sahar Fazeli for their invaluable work and care.

I am deeply grateful to my friends and peers for their help, feedback, and moral support; to Neeth, Zyanya, and Fernanda for their immense love and for being my family away from home; to Anne-Marie for her unconditional friendship and her help in navigating the Canadian lifestyle; to Mary, Lilia, Karuna, Kate, Sam, and Ful for their friendship and undying support; to Anne-Sophie and Lara for their help in revising the French versions of all abstracts related to this thesis; and to all my colleagues, friends, and students at McGill and beyond for the wonderful time we had together.

Por último, pero ciertamente no de menor importancia, quiero agradecer a mi familia: una vez más, a mi madre, cuyo amor traspasa tiempo y distancia; a mis abuelos, sin quienes jamás habría llegado hasta donde estoy; a mis primos Betty y Daday, por ser el trampolín que me ha permitido alcanzar alturas jamás imaginadas; a sus hijos, César, Lalo y Leo, por enseñarme la alegría de ver crecer a mis sobrinos; a mi tío Rubén y a mis primos David y Arturo, por su apoyo y cariño constantes; a Cristian, que no ha hecho sino darme amor, a pesar de la distancia; y a Dalí, cuyo amor incondicional no solamente me inspira, sino que es la muestra fehaciente de las relaciones interespecie de las que tanto hablo.

Virtual Bio-Diverse Relationships and Digital Knowledges: Latin America in and through the *Biodiversity Heritage Library*

Introduction

The history of biodiversity runs in parallel with the history of human societies, which are, in turn, affected by the course of and knowledge about biodiversity. This process places biodiversity as an essential part of human interactions with and within nature. Biodiversity has historically been ascribed cultural and social meanings and values ranging from resource to art, from scientific knowledge to self-knowledge, from hobby to national symbolism (National Research Council 60–65). Thus, human culture affects, defines, and shapes biodiversity. In turn, biodiversity affects, defines, and shapes human culture. These intertwining paths of humanity and biodiversity are documented in a long history of human texts. With the increasing importance of digital archives and archival practices, our knowledge of biodiversity is now compiled, accessed, and disseminated through digital means, a practice exemplified by the *Biodiversity Heritage Library*.

The *Biodiversity Heritage Library* (BHL) is an online open-access biodiversity archive that is widely recognized and accessed. Founded in 2005, it began as an effort to create “a global digital library project” that compiled historical literature about biodiversity (Pilsk et al. 137), that is, works of different genres and in different languages that include references to one or more of the living species on our planet. As such, BHL is “one of the cornerstones of the Encyclopedia of Life, a global effort to document all 1.8 million named species of animals, plants, and other forms of life on earth” (Gwinn and Rinaldo 25). The mission of BHL is to “improv[e] research methodology by collaboratively making biodiversity literature openly available to the world as part of a global biodiversity community” and establishes as its primary goal to be “the largest reliable, reputable, and responsive repository of biodiversity literature and other original materials” (Biodiversity Heritage Library, *BHL Bylaws*). Following these precepts, BHL has an important reputation amongst

researchers and has been recognized for the value of its work. For example, BHL was awarded the John Thackray Medal 2010 by The Society for the History of Natural History “in recognition of [BHL’s first] three years of work building on the digital library,” which includes “over two million volumes of biodiversity literature collected over 200 years to support the work of scientists, researchers, and students in their home institutions and throughout the world” (The Society for the History of Natural History).

Even though BHL has consolidated as an outstanding effort and resource to document the history and literature of biodiversity, this digital archive intertwines inevitably with processes of epistemic construction, concerning both human and nonhuman subjects. Thus, it is key to analyze the nuances of the archive as an archive: if BHL is an effort to concentrate the knowledge of biodiversity and make it accessible to the public, it is essential to acknowledge and explore the biases and colonial dynamics that underlie the construction of said knowledge. It is necessary to highlight the very construction of the term *biodiversity* and the human-nonhuman relationships that it entails, as well as to critically explore the impact of digital technologies on systems of knowledge and power that determine how we study biodiversity. By evidencing human constructions of and approaches to nonhuman subjects, we can better understand not only the importance of biodiversity knowledge but its shortcomings, as well as how it impacts our understanding of different regions in the world. It is precisely within these needs that this doctoral thesis is situated.

This dissertation constitutes a critical study—a dissection—of BHL in its (re)telling of biodiverse histories to understand the epistemic constructions of (Latin American) biodiversity (counter)acted by this online archive. Based on a narrative approach to archives as storytelling mechanisms, I analyze BHL’s materials, collections, metadata, platforms, partnerships, and overall online presence from the perspective of its construction and dissemination of knowledge of Latin American biodiversity. Through this approach, this thesis aims to contribute to current efforts to

decolonize knowledge, especially digital knowledge. My dissertation aligns with projects, such as *Whose knowledge? (Whose Knowledge?)*, that seek to decolonize the Internet by emphasizing and analyzing “issues of power and privilege inherent in the ways knowledge is understood and the ways the internet is designed and experienced” as well as “questions about how power and privilege manifest in public knowledge online” (‘Decolonizing the Internet’). Therefore, I aim to critically explore the answers to questions of digital and non-digital epistemological and colonial practices, as well as of relations between human and nonhuman subjects and the Global South and Northⁱ as sites of knowledge production: How is biodiversity defined and who defines it? What roles do the definition and the history of biodiversity play in the construction of Latin America? What historical interspecies relationships are documented in BHL? What intra and interspecies power relationships are at play in the Library’s catalogue and online presence? How do digital archiving practices in the twenty-first century affect our understandings of the history and present of Latin America and her biodiversity? How can digital archival decolonization evidence our construction, understandings of, and relationships with biodiversity and Latin America? What do we do as researchers in the twenty-first century considering this history of representation of Latin America and biodiversity?

To address these questions, this thesis follows the premise that BHL is a storytelling mechanism that compiles, (re)tells, and disseminates (hi)stories of biodiversity on several levels, from the stories contained in the texts themselves, to the processes of cataloguing, annotation, and curation, to the practices of dissemination of and access to BHL’s collections. To understand how these different facets of the Library unfold and function, I employ a mixed-methods approach to the study of this digital archive in order to understand the storytelling mechanics of BHL as well as to identify possible gaps and the multiple layers of inclusion and exclusion uncovered by its collections.

Thus, this thesis begins, as part of this Introduction, with a proposal for a theoretical model that encompasses biodiversity, plurality, equitable intra and interspecies relationships, decoloniality,

and virtuality. This model constitutes the backbone of this doctoral research and informs all chapters. In Chapter 1, I follow the question of access, that is, *who can participate in the storytelling* of the *Biodiversity Heritage Library*. In this chapter, I consider the Library as an online archive on the path toward decoloniality and delve into issues of colonial and decolonial practices of access, particularly considering the relationships between the global and the local and the Global South and North. I look at web analytic data on language representation, traffic by country, traffic by device, and engagement metricsⁱⁱ to understand the enactment and limitations of BHL's global outlook and consider access strategies that can diversify and pluralize BHL's audiences and participation, especially from a Latin American perspective. As part of this chapter, I analyze BHL's global partners and examine the BHL México project in light of my proposed model and toward the decolonization of online archives. In Chapter 2, I follow the questions of ownership and representation, that is, *whose stories are (re)told* in BHL. I consider the Library's presence and engagement with and from social media, the geopolitics of the archive from the perspective of virtual repatriation, and the possibilities to decolonize and diversify BHL's practices of dissemination, (re)presentation, annotation, and curation. In Chapter 3, I focus on the specific knowledge of Latin American biodiversity that is being reproduced, disseminated, and constructed through texts incorporated in and omitted from the BHL catalogue as communicated by BHL's metadata practices. In this chapter, I examine issues of coloniality evidenced by the selection, annotation, and classification of texts in BHL in terms of human and nonhuman alterity, dating and publication, geographical distribution, and epistemic construction and consider the question of curation as a key component in the decolonization of archives, especially to reconcile the need to compile with the obligation to decolonize. With *place* as a guiding concept, I analyze metadata extracted from materials *about* Latin America in BHL and evidence the (hi)stories and representation of Latin American regions, Indigenous peoples, and biodiversity that metadata fields (re)tell and

construct. Finally, in the thesis conclusions, I argue for the application of the proposed theoretical model to close-reading and zoom in on the specific case of one record, the *Libellus de Medicinalibus Indorum Herbis* as an example of bio-diverse Indigenous knowledge. I discuss this text's absence from and possible inclusion in BHL's collection and use it as a bridge for my specific recommendations for BHL and other digital archives in the path towards decolonization.

This dissection of BHL as a storytelling mechanism at different levels demonstrates that (digital) archives are engrained in historical and present colonial and power relationships that have determined epistemic constructions of the Global South, Indigenous peoples, and nonhuman species. The goal of this dissertation is not only to reflect upon the power dynamics at play in (digital) archives but also to develop decolonizing and diversifying strategies for more equitable intra and interspecies relationships. At the core of BHL lie the (hi)stories of the interactions between different human communities and between humans and nonhumans. However, these (hi)stories are narrated—constructed—and, therefore, inevitably determined by their context and specificities and by the power structures behind the archive (Derrida and Prenowitz 11). Biodiversity itself is always tied to the concept of value (Mayer 108), meaning that it is dependent on a system of knowledge and a set of political, historical, and cultural conditions. In this regard, this dissertation addresses fundamental questions at the intersection of digital archives, human and nonhuman species, and knowledge production from and about the Global South: what meanings are ascribed to biodiversity and on what basis? How does culture *shape* notions of biodiversity? Who *owns* and *produces* biodiversity and knowledge about biodiversity? Who *owns* and *produces* biodiversity and knowledge about *Latin American* biodiversity? How do colonial processes and systems of power determine our understandings of and relationships with biodiversity? How do historical texts interface with clean, homogenizing understandings of Latin America and biodiversity? How are our understandings of and relationships with biodiversity and Latin America encoded in the digital? How are they affected

by digital technologies? How, finally, is biodiversity constructed?

1. (Re)Defining Biodiversity: A Model

Biodiversity is a common yet versatile concept that has no singular definition. The term itself was introduced in the late eighties in scientific research, soon to be adopted and popularized across contexts and disciplines (Ghilarov 304). The term *biodiversity* was first employed by Edward O. Wilson in 1988 as a shorter version of the previously-used compound “biological diversity” (Haila and Kouki 7; Dobson 17). In its most general sense, biodiversity translates to all forms of life on our planet (Haila and Kouki 5). More specifically, it refers to “plant and animal species, the genetic resources they embody and the varied ecosystems they help define” (Blanc 70). It evokes genetic, evolutionary, and geographical diversity and variety between and within species (National Research Council 21–23). Thus, biodiversity is meant to encompass “[a]ll aspects of biological heterogeneity, whether structural, functional, or taxonomic” (Sarkar 104).

Nevertheless, certain applications of the term *biodiversity* have been criticized for being vague and context-dependent, as well as determined by the specific interests of the group or groups that refer to it (Mayer 105). In this sense, biodiversity can be considered an abstract concept:

The term [biodiversity] is primarily descriptive, because it summarizes a universal, phenomenological observation about nature: natural entities appear ‘diverse’. *Interpretation* of this generalization, either by explaining why biological entities are diverse, or by explicating the ultimate significance of this diversity for life on the earth, is an entirely different matter.

(Haila and Kouki 7; emphasis mine)

The ambiguity of the concept of biodiversity is characterized by variety: variety in life forms, variety in “organizational levels,” variety in “spatial scales,” variety in ecosystems (Mayer 106), but, most of all, biodiversity is marked by the variety in the *interpretation* of what biodiversity is and how humans

relate (and belong) to it. In this sense, biodiversity is more a phenomenon—or a set of phenomena—than a specific concept (Haila and Kouki 6) and must be understood as “the result of human thinking” instead of an absolute term (Mayer 106). The construction of the term *biodiversity* is even more so essential considering its relevance in and parallel growth with conservation biology, which gives biodiversity both a normative and a descriptive dimension (Sarkar 104). If biodiversity is the result of human thinking, it is inevitably tied to human concerns and experiences. As a result, biodiversity stands at the center of human relationships with nature and highlights a human sense of responsibility and ethics towards the natural world and its species.

The relationship between humanity and biodiversity entails an appreciation of value.ⁱⁱⁱ Several studies and initiatives, especially about conservation, focus precisely on the importance of biodiversity in terms of the spectrum of values it represents for humans (Singh 638–39). For instance, the United Nation’s Convention on Biological Diversity establishes as its first motivation for the protection of global biodiversity the recognition of biodiversity’s “intrinsic value” as well as its “ecological, genetic, social, economic, scientific, educational, cultural, recreational and aesthetic values” (United Nations 1). These different dimensions of the values attributed to biodiversity manifest in international and local policy, global and national economic development, interdisciplinary research, artistic manifestations, cultural and social norms, environmental movements, and many other human activities, products, and concerns that attest to the fundamental connection between biodiversity and human experience. Moreover, human experiences related to biodiversity are increasingly enacted in digital spaces and through digital technologies (Gaikwad and Chavan 1), meaning that technological advances further determine and transform our relationships with biodiversity.^{iv}

The human valorization of biodiversity is particularly evident in conservation biology and conservation efforts. Conservation biology is a discipline that developed from ecology and responds

to the rise and centrality of conservation awareness in several human societies (Pullin 141, 144). As such, conservation biology is “a crisis discipline” and “a value-laden science” (145) that constitutes an active response to ecology’s main concerns fueled by the rise of environmental crises across the world. What has been called “the biodiversity crisis” refers to the accelerated decrease in nonhuman species and species populations, which predicts a loss of at least half of all species on our planet “by the end of the 21st century” (Singh 638). The phenomena encompassed by this crisis have been continuously present in the discourse of conservation since the seventies (Haila and Kouki 9) and are acknowledged by conservation efforts across the globe. This concern for biodiversity is usually seen as “a common concern of humankind” (United Nations 1), a discourse that seeks to transcend social, cultural, geographical, and other barriers separating human groups. In this sense, biodiversity becomes a homogenizing interest of sorts, uniting humans on the basis of species but emphasizing the split between humans and nonhumans. Without a profound questioning of what biodiversity and humanity are, this trend obscures the inequalities that exist between different(iated) human groups and complicates the relationships we establish with biodiversity.^v

Under the umbrella of conservation biology, protecting nature in general and biodiversity in particular has become a primary goal of many human societies and governments, which highlights several facets of biodiversity value, from basic needs such as nutrition to identity processes such as the consolidation of the human self. For example, the United States’ National Research Council recognizes the strong connection between “self-awareness” and “knowledge of biodiversity,” as well as biodiversity’s role in creating a human “sense of place” and, therefore, of roots and belonging (63-64). Biodiversity thus cannot be defined but should be considered “intangible” (Mayer 109), constructed, experiential, and even imaginary, inextricable from human perception. Moreover, the variety of perspectives on and values of biodiversity often contrast with efforts to provide a clear definition of biodiversity, rendering the concept itself undefinable and inseparable from

conservation idiosyncrasies. As noted by Philipp Mayer, the UN's Convention on Biological Diversity itself provides "a reasonably neutral definition of what biodiversity is" while remaining "very value-laden about biodiversity" in terms of its policies and conservation efforts (108). Similarly, the E.O. Wilson Biodiversity Foundation is motivated by Wilson's recognition of an "urgent need for broader research and understanding of our biodiverse planet in order to protect key species and avoid unintended destruction of the ecosystems that sustain our lives," destruction that can be prevented, or at least contended, "through biodiversity research that expands our understanding of our 'little known planet' and that innovates in helping us to learn how to best care for it" ("Mission Statement"). Here, the Foundation itself emphasizes the value of biodiversity from the human perspective by arguing for the conservation of *key* species, that is, those that "sustain our [human, that is] lives" (*ibid.*). In this sense, the values and attitudes that surround the idea of biodiversity further complicate how we define and, especially, how we relate to and think about biodiversity; in sum, how human cultures and modes of thinking frame biodiversity.

A deep tie exists between human experience and *ideas* of biodiversity. On the one hand, values associated with biodiversity highlight the importance of conservation and protection efforts that are becoming more and more crucial across the world to ensure the continuation of human and nonhuman societies. On the other, however, common discourses on biodiversity evidence the divide—that is, the hierarchy—constructed between humans and other species: biodiversity encompasses all living species "other than humans" (Dobson 17). Thus, biodiversity and humanity are presupposed as two separated binary concepts, marked by the usual consequences of binarism—power, inequality, oppression. Like the concept of *animal*, biodiversity categorizes living beings into separate, yet hierarchical groups based on species. Stacy Alaimo, following Jacques Derrida, considers this act as a showcase of "absurdity and violence" (Alaimo 9). Similarly, the main arguments in conservation biology and discourses "are based on the direct value of natural systems

to humans,” meaning based on “[t]he economic (current market) value of natural goods” rendering these “resources directly comparable with other commodities in the market” (Pullin 15). Thus, the discursive use of the term biodiversity strengthens both the objectification of actual biodiversity and the dichotomy between humans and other living beings. This divide posits humans above other species, which are deemed inferior and vulnerable, and creates a power structure that underlies our understandings of nature and of the human experience.

Difference based on species not only affects the relationship between humans and nonhumans but also among humans. For instance, the animal-human dichotomy, essential to our ideas of and relations with-in^{vi} biodiversity, is the primeval binary on which other power-based categories are constructed and that characterizes the relationship between oppressors and oppressed (Wolfe xx; Rajamannar 5):

The category [of animal] has been invoked to elevate humans above all other living creatures as well as to denigrate certain groups of people as not-quite-human via racist, sexist, classist, Social Darwinist, and colonialist ideologies that place them “closer” to animals in hierarchies of being. Human exceptionalism, emerging from monotheisms, Enlightenment humanism, capitalist anthropocentrism, and other forces insulates (some) humans from kinship with degraded, brutish beasts. (Alaimo 10)

Differentiation processes that separate humans and nonhumans are therefore at the core of hegemonic powers and intertwine with historical processes of discrimination that find questionable support in a *difference* assumed as observable, factual, and indisputable between the animal and the human.

Especially important in studies about biodiversity, the human-nonhuman binary is tied to the notion of science as universal and true. For instance, Walter Mignolo, in his critique of Immanuel Kant, identifies a link between the coloniality of knowledge, time, and space, and the coloniality of

being (Mignolo 186). Through the colonization of peoples and nature and the imposition of *his* epistemic paradigms, the modern European subject becomes the *model* subject, the Subject, whereas other(ed) (human and nonhuman) subjects transform into (wild, exploitable, uncultured, primitive, savage) objects of the Subject's epistemology. The European (human) subject is positioned in what Mignolo calls the "hubris of the zero point," which leads *him* (the European human) to believe—and impose—*his* subjectivity as universal objectivity:

the modern/colonial matrix of knowledge ... has been created, perfected, transformed, expanded, exported/imported by a particular kind of social agent: in general (and we can go through the biography of the great thinkers and scientists in the Western canon), they were male, they were Christians, they were white, and, as we said, they lived in Western Christendom, which, after the sixteenth century, was translated into Europe.^{vii} (111)

This is an epistemological stance that transforms Western hegemonic knowledge from human, individual, culturally-embedded epistemology (one of many) to universal, objective Epistemology (the one and only); that is, it is constructed and established as *Truth*. Western scientific research is the result of the Enlightenment, where human reason became a guiding and central concept to measure others, including the value of human reason itself and of human subjects as opposed to nonhuman non-reason and nonhuman subjects.

In his tellingly titled article "What does 'biodiversity' mean—scientific problem or convenient myth?", Alexej Ghilarov explores the use and popularity of the term biodiversity by contrasting the (supposed) scientific objective truth of biodiversity studies to the mythological conception of biodiversity *outside* of science.^{viii} He asserts that in order "to do science" scientists must avoid mythology, even if or when "[s]cience has to disguise itself as technology, and/or even as mythology, in order to procure the money for subsistence. The very term 'biodiversity' is an element of this disguise" (Ghilarov 306). Although Ghilarov recognizes the need to protect biodiversity and

acknowledges the aesthetic and ethical justifications behind it, he concludes that “[w]here science is concerned, reasoning must develop according to inner logic, and science must solve primarily those problems that arise in and of itself, but not those imposed by mythology” (*ibid.*). Ghilarov’s statements thus exemplify the binaries surrounding traditional scientific Western conceptualizations of biodiversity: human versus nonhuman, culture versus nature, objectivity versus subjectivity, reason versus mythology, logic versus mythology, science versus art, science versus myth, science versus culture, and so on. Such tendencies in scientific positionings vis-à-vis the nonhuman and more-than-human worlds determine not only our understandings of biodiversity as a concept but also of biodiversity as subjects, obscuring both the belonging of the human as part of biodiversities^{ix} and the relational nature of the bio-diverse worlds that our human and nonhuman kin inhabit.

Within this framework of human thought, diverse and conflicting approaches to nature determine the history of human-nonhuman relationships: the exotic coexists with the divine; the rare with the peaceful; paradise with chaos. Amidst these apparently contradictory attitudes, a colonial relationship emerges between body, environment, and gaze, a relationship simultaneously marked by violence and desire (Andermann 17). Nature has been historically conceived as a dangerous and threatening entity that must be contained, on the one hand, and as a richness and resource that can (and should) be exploited, on the other (Haraway, *Simians, Cyborgs, and Women: The Reinvention of Nature* 30; Mignolo 12). In the context of the Anthropocene^x and current geological crises, nature continues to be framed as an object even in conservation efforts, which often see nature as requiring (human) protection.

Such multifaceted relationships with the natural world entail the need to understand—to possess—that *object* which humans *see, need, use, and protect*. For instance, in the continuum and evolution of the rigour of taxonomy, natural history, and cartography, it is possible to observe the power dynamics on which Western scientific knowledge relies. Western scientists establish a

relationship with newly encountered species and lands that is mediated by instruments of measurement and determined by human paradigms. In this process, space and species are objectified and inserted into hegemonic epistemic discourses (Deleuze and Guattari, *Nomadology: The War Machine* 46), always human-centric and responding to human needs. The consequence of this complex history of natural history and science is the establishment of a fixed idea of nature, landscapes, and species that is constructed as scientific facts and, therefore, *becomes* truth.

Nevertheless, turning to traditional Western science in our past and present (Western) relationships with-in biodiversity seems unavoidable. Paul Crutzen, the Nobel laureate atmospheric chemist who, alongside Eugene Stoermer, coined the term Anthropocene^{xi} (Steffen 486), alludes to Teilhard de Chardin's concept of the noösphere (the sphere of thought and reason), to highlight "the growing role of human brain-power in shaping its own future and environment" (Crutzen 23). Referring to environmental crises, Crutzen sees the human and, specifically, "scientists and engineers," as imbued with the task of "guid[ing] society towards environmentally sustainable management during the era of the Anthropocene" (*ibid.*)^{xii}. It is not hard to perceive in Crutzen's statements an echo of the discourse of Science as saviour criticized by Bruno Latour^{xiii} (16). The importance of sustainability notwithstanding, here, too, humans are the geological force that determines the future of our planet, either for good or bad. In a similar vein, Dipesh Chakrabarty recognizes that researchers and scientists, precisely such as Edward Wilson and Paul Crutzen, rely on "the language of the Enlightenment" in their calls for justice and in their proposed courses of action to stop environmental crises (Chakrabarty, "The Climate of History: Four Theses" 219). This discourse problematizes the relationship between specific human histories and shared natural histories, and even "the very idea of historical understanding" (220):

[Scientists] see knowledge and reason providing humans not only a way out of this present crisis but a way of keeping us humans out of harm's way in the future ... But the knowledge

in question is the knowledge of humans as a species, a species dependent on other species for its own existence, a part of the *general history of life*. (219; emphasis mine)

Universalizing tendencies from the point of view of humanity as *species* become a sort of Enlightenment 2.0,^{xiv} in which reason is the cause but also the solution for environmental crises.

Of course, this is not to say that humans, as well as the natural and social sciences, have no role in counteracting these crises. On the contrary, we must not reduce nature to “social construction” nor obscure the realities of nature observed and studied by all sciences and threatened by human actions through critiques of “human representations of nature” (Latour 33). Instead, to counteract environmental and human crises, we must aim for a plural approach that comprises and transforms *all* our relationships with-in nature: epistemological, political, social, biological, scientific, environmental, chemical, historical, artistic, cultural, physical, and so on. Identifying human constructions of nature and human-centred epistemologies is but a step towards the consolidation of more sustainable, equitable, and conscientious modes of living with-in nature:

It is therefore impossible to understand global warming as a crisis without engaging the propositions put forward by these scientists. At the same time, the story of capital, the contingent history of our falling into the Anthropocene, cannot be denied by recourse to the idea of species, for the Anthropocene would not have been possible, even as a theory, without the history of industrialization. ... How do we relate to a universal history of life—to universal thought, that is—while retaining what is of obvious value in our postcolonial suspicion of the universal? (Chakrabarty, “The Climate of History: Four Theses” 219–20)

A new narrative of history brings together different and diverse human and nonhuman species and stories, across human and nonhuman specificities and contexts. In the end, what we can do for a more equitable relationship with-in biodiversities, is, precisely, to reframe our positions and positionalities with, in, and as biodiversity. We must go back and re-read and re-write “the general

history of life” of which Chakrabarty speaks, without losing sight of human history and the colonial processes that have determined it. This is an essential objective and contribution of this thesis in its questioning of our historical, digital, and archival understandings of humanity and biodiversity, a goal that also aligns with current trends in and about the Anthropocene.

The histories—that is, the narratives—of human, nonhuman, and more-than-human sciences, natures, and bio-diversities, and the epistemic discourses and practices that determine them, must be reframed so that our relationships with-in biodiversities become more just, closer to what Michael Marder and Patrícia Vieira call an existential utopia. Following Martin Heidegger and the theories of phenomenology, Marder and Vieira propose the concept of existential utopia to re-examine our knowledge of and relationship with human and other worlds. Starting with the notion that the phenomenological world encompasses multiple worlds (Marder and Vieira 36) and that the subject is inevitably immersed in that multiplicity (37), the authors define existential utopia as a practice of resignification (38) that entails the recognition of meaning- and time-dependent multiple truths, therefore “dethroning [the] objectivist notion of eternal truth” (40) and denying the ideal of objectivity inherited from the Enlightenment. In existential utopia, the quest for truth and hegemony becomes “an appeal to justice” (*ibid.*), founded on the acceptance of the coexistence of different systems of meaning, that is, of different worlds.

Regarding coexistence in a multiplicity of worlds, Marder and Vieira’s concept of existential utopia is in conversation with Donna Haraway’s sympoiesis, based on a term proposed by Beth Dempster (Haraway, *Staying with the Trouble: Making Kin in the Chthulucene* 33). Going beyond the humanism of phenomenology, Haraway proposes sympoiesis as the practice of “making-with... worlding-with, in company,” which supposes and acknowledges the existence of “complex, dynamic, responsive, situated, historical systems,” that comprise situated and overlapping human and nonhuman subjects (or critters), (hi)stories, and experiences (58-60). The existence and

understandings of the human world(s) thus depend on the existence and understandings of *other* worlds, nonhuman worlds, more-than-human worlds. Even more, human worlds do not exist in isolation, they are part of a network of worlds that intertwine and share their existences, that is, worlds that constitute sympoietic systems.

Existential utopia and sympoiesis can be more clearly understood, precisely, in and as shared experiences. When delving into the experience of death across species, Deborah Rose sees death as a common reality—a “wreckage,” a “catastrophe”—that occurs to all living beings (67). Despite this commonality, the phenomenon of death can be suffered—and performed—in autopoietic and sympoietic manners. In autopoietic modes of existence and of relating to others, death becomes destruction (73). In sympoietic terms, however, death is not only part of life but the genesis of life: “life wants to join, create, experiment, do more. And we can say that death is part of what enables life to do this ... Life’s desire for its own becoming is actualised through interaction with other living and non-living matter” (69). Sympoietic systems, both in Haraway and Rose, are made of human and nonhuman, living and nonliving, and biotic and abiotic entities. The connexions between, with-in, and across these entities are thus an essential component of sympoiesis:

Life expands complexity through time in the context of a universal kinship such that all living beings are ultimately related to each other through their shared substance, their conjoined histories, and their embeddedness in the aeons of life’s time on Earth ... we gain a better understanding both of ourselves and of life processes when we consider our participation in three lives: the given, the lived and the bequeathed. (Rose 74)

What this thesis proposes is, precisely, a sympoietic understanding of biodiversities. Sympoiesis is rooted in narratives. The experiences of humanity are part of a network of human, nonhuman, and more-than-human histories and stories—(hi)stories—that cannot be separated from each other. The world, made up of a multiplicity of worlds, is the result of these intertwining (hi)stories. Humanity

or, better, a multiplicity of humanities, is located and enacted from and with-in such (hi)stories. Humans—encompassing diverse human subjects, experiences, and knowledges—are situated with-in that multiplicity of worlds and are part of the (hi)stories of biodiversities across spaces and times. While humans interpret nonhuman (hi)stories through constructed scientific and epistemic paradigms of space, time, and being, these sympoietic (hi)stories do not reflect nor respond to those paradigms. They exist in a manner and on a right of their own.

A *sympoietic existential utopia of biodiversities*—the theoretical model that I am proposing for this re-telling of multiple (hi)stories—arises from a narrative that recognizes, acknowledges, and embraces the (hi)stories of humans and nonhumans, as well as their changes, intersections, and overlaps (Figure 1). Inspired by Haraway, Rose, Marder, and Vieira, this model follows the idea that “[n]obody lives everywhere; everybody lives somewhere. Nothing is connected to everything; everything is connected to something” (Haraway, *Staying with the Trouble: Making Kin in the Chthulucene* 31).^{xv} While “[s]cience tells a story that is grounded in the particular, often the micro or macroscopic, and at the same time is generalised beyond specific contexts” (Rose 74), a sympoietic existential utopia of biodiversities tells the (hi)stories of multiplicity and coexistence, of diverse spaces, times, and subjects. A sympoietic concept of biodiversity unfolds a story that is, in turn, made of human and nonhuman stories alike.

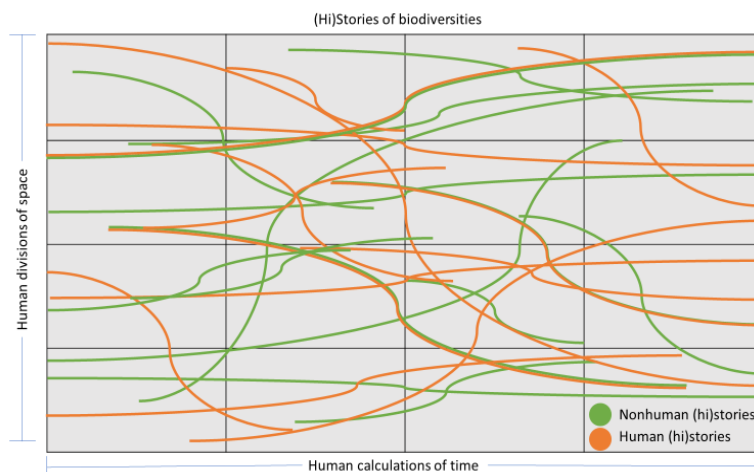


Figure 1 Visual representation of a sympoietic system of the multiple and multiplying (hi)stories of biodiversities.

These are precisely the (hi)stories of human and nonhuman biodiversities that we must strive to re-tell through the multiple storytelling mechanisms and layers of digital and non-digital archives. The analysis of the *Biodiversity Heritage Library* that constitutes the core of this dissertation is framed within the overarching goal of reassessing our historical and present discursive relationships with-in biodiversities. It seeks to turn traditional humanist historical accounts into an attestation of the sympoietic stories and potentialities that biodiversity-related archives present and tell, a necessary review in pursuit of a decolonized, decolonizing, equitable, sympoietic, and existentially utopic future. These goals have never been as essential as they are in our current era, the Anthropocene.

2. Redefining an Era: Biodiversities of and during the Anthropocene

To further understand the re-framing of biodiversities and biodiversity studies as proposed in this thesis, it is necessary to delve into the very concept of the Anthropocene. Even though it is not my intention to cover the totality of the history of and debates about the Anthropocene, both as a term and as an era, I consider it fundamental to address certain aspects that respond to the goals of this dissertation and inform my analyses of BHL. Of importance are the study and representation of, as well as our relationship with-in, biodiversities, in, from, and during the Anthropocene.

The term *Anthropocene* is increasingly being adopted to refer to our current geological era (Seddon et al. 1). Its change from the previous era, the Holocene, is determined by the fact that “mankind’s activities gradually grew into a significant geological, morphological force” (Crutzen and Stoermer 483). Even if Eugene Stoermer had been using the term since the eighties (Steffen 487; Haraway, *Staying with the Trouble: Making Kin in the Chthulucene* 44), it gained track when, in 2000 in Mexico,^{xvi} he and Paul Crutzen formalized the use of the term Anthropocene (Steffen 486) to highlight “the central role of mankind in geology and ecology,” which is attested by the “major and still growing impacts of human activities on earth and atmosphere” (Crutzen and Stoermer 484).^{xvii}

The exact date of the beginning of the Anthropocene is still debated. Crutzen and Stoermer themselves propose the late eighteenth century as its starting point, after the invention of the steam engine (484-485). Other scientists propose a more recent date, after World War II, determined by the beginning of the “Great Acceleration” and characterized by the war’s geological and, more specifically, radioactive consequences on our planet (Steffen 490; Meineke et al. 1–2). Other critics go further back, to the era of European expansion and colonization, to the moment when exploitation of human and nonhuman subjects and environments occurred globally and initiated the “Capitalocene” (Haraway, *Staying with the Trouble: Making Kin in the Chthulucene* 48; Meineke et al. 1). Regardless of these differing dates, what these criteria seem to have in common is the centrality of technology and human conflict in determining the impact of humanity on the environment.

No matter what initial date we choose, it is now widely accepted in Western science that we *are* in a new era (Chakrabarty, “The Seventh History and Theory Lecture. Anthropocene Time” 6). The Anthropocene is our present, the result of humanity’s historical exploitation of Earth and a breaking point given “that a single species has become an earth-changing force” (Lorimer 593). Because of this, the term Anthropocene has been greatly adopted in and outside scientific communities, especially with a sense of global urgency: “the Anthropocene obtained purchase in popular and scientific discourse in the context of ubiquitous urgent efforts to find ways of talking about, theorizing, modeling, and managing a Big Thing called Globalization” (Haraway, *Staying with the Trouble: Making Kin in the Chthulucene* 46). In this regard, the Anthropocene connects several spheres that previously seemed to be unconnected:

The Anthropocene debate thus entails a constant conceptual traffic between Earth history and world history ... for the first time ever, we consciously connect events that happen on vast, geological scales—such as changes to the whole climate system of the planet—with what we might do in the everyday lives of individuals, collectivities, institutions, and nations.

(Chakrabarty, “The Seventh History and Theory Lecture. Anthropocene Time” 6)

The Anthropocene is inevitably tied to humans as social and geological actors, as collective and individual agents, implying the overlapping of the history of humanity and the history of Earth, as outlined in the previous section. Human systems of knowledge established as supposedly universal and true are the basis on which we construct modern-day domination apparatuses. Recognizing their artificiality is key in the transformation of inter and intraspecies relationships in the Anthropocene:

From the fault lines of modern thought emerges an environmental rationality that allows us to unveil the perverse circles, enclosures, and chains that link categories of thought and scientific concepts to the rational core of its strategies of domination of nature and culture.

(Forns-Broggi 179)

As discussed by modern theories of the Anthropocene, dominant human groups have constructed hegemonic history as *their* history, where (certain) humans are agents and protagonists, concealing the ways in which we interact with and affect the lives of countless nonhuman species and oppressed human groups. In the Anthropocene, we recognize humans as a species as a transforming force on the conditions of the planet (Chakrabarty, “The Human Condition in the Anthropocene” 167–70), raising questions of responsibility and the need for action (159-160). Humans are no longer a unique species with an independent (often glorified) History. Critics such as Jens Andermann characterize the era of the Anthropocene—our era—precisely by the blurring of the split between human and natural (hi)stories (183). The age of the Anthropocene involves the transformation of interspecies alliances and relations (195), characterized by “la emergencia a partir de los desplazamientos y reconfiguraciones de alianzas en las que entra y se inmuniza lo humano, de una in-humanidad radical”^{xviii xix} (197). This radical non-humanity is an essential characteristic of the sympoietic existential utopia of biodiversities I propose in this dissertation. Andermann’s intention of furthering the scope of our relations with other species through the concept of *alliance*, also

highlighted by Haraway (*Staying with the Trouble: Making Kin in the Chthulucene* 31), is central to a sympoietic mode of thought. An alliance requires us to embrace the (hi)stories of (human and nonhuman) others while retaining and being aware of our own. It is not a choice between the two; it is diverse writing and existing together.

At the same time, a common argument against the Anthropocene as an era and as a concept relates to the use of the *anthropos*, first, as a human-centred concept and, second, as a homogenizing all-encompassing term that obscures inequalities between human groups. Despite its origins and applications in geology, the Anthropocene is often used “as a measure not of geological time but of the *extent* of human impact on the planet” (Chakrabarty, “The Seventh History and Theory Lecture. Anthropocene Time” 7). In this regard, Chakrabarty recognizes the discourse of collective (destructive) power implied in humans as “geological agents,” as opposed to humans as mere “biological agents:”

To call human beings geological agents is to scale up our imagination of the human. Humans are biological agents, both collectively and as individuals. ... But we can become geological agents only historically and collectively, that is, when we have reached numbers and invented technologies that are on a scale large enough to have an impact on the planet itself. To call ourselves geological agents is to attribute to us a force on the same scale as that released at other times when there has been a mass extinction of species. (“The Climate of History: Four Theses” 206–07)

The paradox of such discourses is that, while they highlight human responsibility, they stress the power of the Human, especially in “[t]he displacement of the category of physical force onto the historical-existential category of power” (Chakrabarty, “The Seventh History and Theory Lecture. Anthropocene Time” 9). This paradox is then situated in the continuum of anthropocentric History:

The story of Species Man as the agent of the Anthropocene is an almost laughable rerun of

the great phallic humanizing and modernizing Adventure, where man, made in the image of a vanished god, takes on superpowers in his secular-sacred ascent, only to end in tragic detumescence, once again. Autopoietic, self-making man came down once again, this time in tragic system failure, turning biodiverse ecosystems into flipped-out deserts of slimy mats and stinging jellyfish. (Haraway, *Staying with the Trouble: Making Kin in the Chthulucene* 48)

In this centring of *the* Human as an individual, the discourse of the Anthropocene becomes a new form of the discourse of anthropocentrism that characterizes Western thought and history. When Haraway enlists her objections to the use of the term Anthropocene “as a tool, story, or epoch to think with” (49), she rejects the Anthropocene’s elitist use among “intellectuals in wealthy classes and regions” as well as its affiliation with systems of power (epistemic, economic, political, scientific, etc.), which leads her to stand “against the managerial, technocratic, market-and-profit besotted, modernizing, and human-exceptionalist business-as-usual commitments of so much Anthropocene discourse” (49-50). In sum, the Anthropocene and humans as a geological force paradoxically reinforce human-centred systems and discourses. The Anthropocene becomes situated within and imbued with countless issues of power.

In Haraway’s objections it is possible to foresee the second main concern in debates about the Anthropocene: not only does it center its attention on the Human but also homogenizes humanity, as if the Human, the *Anthropos*, was One. This homogenization of humanity overshadows intersectional and specific identities, cultural embeddedness, and historical and present coloniality and oppression. In this sense, the concealed inequalities of the Anthropocene, and the *Anthropos*, refer to how global hegemonic systems of power and wealth affect and benefit different human groups in different unequal manners. Moreover, they point to the various degrees of responsibility of those human groups in Anthropocene crises that posit the Human—as one and only—as a geological transforming (or destroying) force (Chakrabarty, “The Seventh History and

Theory Lecture. Anthropocene Time” 11–12; Holmes 89). In this regard, both Chakrabarty and Haraway see an indissoluble connection between environmental crises and the consolidation of capitalism, industrialization, and globalization, with historical and present ties to Eurocentric and Western-centric discourses and systems of power and exploitation (Haraway, *Staying with the Trouble: Making Kin in the Chthulucene* 48; Chakrabarty, “The Climate of History: Four Theses” 216).^{xx}

Therefore, the Anthropocene unavoidably evokes the history of human and nonhuman oppression and colonialism:

so long as we think of the name and the concept of the Anthropocene as a measure—and a critique—of the impact humans have had on the geobiology of the planet, we cannot escape the moral pull of world history, for questions of empires, colonies, institutions, classes, nations, special-interest lobbies—in a word, the world system created by European empires and capitalism—are then never far from our concerns. (Chakrabarty, “The Seventh History and Theory Lecture. Anthropocene Time” 18)

Given these problematic uses and affiliations of the term Anthropocene, I propose several considerations for its application and this thesis. First, it is necessary to acknowledge that there is a complex relationship between issues of oppression and human diversity, and the responsibility of humanity as species in environmental crises (Chakrabarty, “The Climate of History: Four Theses” 214–17; Chakrabarty, “The Seventh History and Theory Lecture. Anthropocene Time” 6, 11–12, 26; Chakrabarty, “The Human Condition in the Anthropocene” 156). In this regard, I propose to pluralize not only the term biodiversity but also the term humanity and to use the concept of *plural humanities*^{xxi} to encompass the different positionalities in which humans are embedded. Plural humanities stand against a—white, male, cisgender, heterosexual, Western-developed, wealthy, middle-aged, able-bodied, and so on—*universal* prototype of the Human and Humanity. However, plural humanities are not opposed to the concept of humanity as species (and as a geological force in

the Anthropocene). On the contrary, plural humanities acknowledge human oppression and colonialism but stand as a collective concept on the basis of species, especially because I do consider, with Chakrabarty, Haraway, and others, that current environmental crises require us to think collectively, as humanity.

Similarly, my second consideration for the use of the term Anthropocene is related to the necessary re-definition of the *anthropos* in *Anthropocene*. In this regard, I propose a re-reading of Walter Mignolo's opposition between the *anthropos* and the *humanitas*. For Mignolo, the *humanitas* are "[t]hose who inhabited the epistemic zero point ... and were the architects of global linear thinking," while the *anthropos* are those "who are classified without participating in the classification" and who "inhabit the *exteriority* (the outside invented in the process of defining the inside) created from the perspective of the zero point of observation" (Mignolo 83). In simplistic terms, the *humanitas* are the oppressors and the *anthropos* are the oppressed. However, what matters most in understanding the *anthropos* in *Anthropocene* is to consider the *anthropos* not only in light of her colonial past and present but, mostly, as a force of change. Going back to my concept of plural humanities, and as a reiteration, I strongly believe that the Anthropocene requires species thought, that is, a human collectivity. Therefore, I suggest drawing upon Mignolo's concepts with a slight twist. For Mignolo, the *anthropos* is the object of coloniality but the subject of decoloniality. Therefore, she has the possibility of contending the hegemonic and oppressive discourses of the *humanitas*:

The third possibility,^{xxii} and the most rewarding and hopeful, is for the *anthropos* to unveil the pretentious sense of superiority of those who inhabit the *humanitas*—not to claim recognition, but to show how insane the inhabitants of the house of *humanitas* are, that they still believe that Humanity is divided between *humanitas* and *anthropos*, and to show that the control of knowledge gives them the privilege of seeing themselves as *humanitas* and not as *anthropos*. In other words, the task of the *anthropos* is to claim and assert, through

argumentation, his and her epistemic rights, to engage in barbarian theorizing in order to decolonize humanitas and in knowledge-building to show that the distinction between anthropos and humanitas is a fiction controlled by the humanitas. Engaging in decolonial thinking means confronting the imperial privileges of imperial/global linear thinking, *not to resist but to re-exist in building decolonial futures*. (Mignolo 90; emphasis mine)

I then propose to re-think the Anthropocene through the lens of the *anthropos* as a decolonial subject. If the Anthropocene requires us to think collectively but differently, in new, more equitable and sustainable, bio-diverse manners, the *anthropos* in *Anthropocene* can very well refer to the *anthropos* as Mignolo envisions her, as the agent of decoloniality, decoloniality of systems of power, governance, culture, knowledge, species. The *anthropos* in this sense becomes an ideal, the model for plural humanities to “re-exist in building decolonial futures” (*ibid.*). In terms of this thesis, the *anthropos* in *Anthropocene* should be a decolonial subject enacting and embedded in a sympoietic existential utopia of biodiversities.

Finally, regarding the use and application of the term Anthropocene, it is key to recognize that, if the Anthropocene as an era is marked by plural humanities, it inevitably entails affects:

Neither human historical time nor the time of geology, both being of human making, is empty of affect ... This means historical time cannot be separated from certain kinds of human affect ... This is what climate change as “world history” is: a stage for the play of various human emotions including those of hope and despair. (Chakrabarty, “The Seventh History and Theory Lecture. Anthropocene Time” 16–17)

This affective dimension of intraspecies relationships constitutes a fundamental part of the model of a sympoietic existential utopia of biodiversities, which requires multiplicity—of worlds, biodiversities, humanities—especially concerning the human, nonhuman, and more-than-human (hi)stories that intertwine in its conformation. From the standpoint of decolonial plural humanities,

this multiplicity is marked by affects and demands moral engagement. It necessitates the acknowledgment and transformation of “the affective past, present, and future of human power and responsibility” (17). This model, in sum, requires ethical commitment:

It is here that the value to biodiversity conservation of the concept of the Anthropocene, and the insights of the social science and humanities, become apparent ... thinking in terms of an overarching framework that links together many biogeochemical processes as well as forms of human organization, provokes important questions about the moral underpinnings, ethics, and norms of biodiversity conservation. (Holmes 103)

We are, therefore, at the brink of a re-definition of our inter and intraspecies relationships, a plural and sympoietic re-thinking of our biodiversities. The goal of this re-definition—a goal outlined and followed by this dissertation as well—is to move towards decoloniality, towards a sympoietic existential utopia of biodiversities.

How, then, can we study biodiversities in the Anthropocene? I believe the change must begin, precisely, with the re-definition of the relationships among and between humans and nonhumans, especially dismantling hierarchical understandings of species difference and considering the necessary plurality of humanities from an ethical standpoint. Studies of biodiversity are already determined by the ideal of a sympoietic existential utopia of biodiversities as I have outlined thus far. However, there is a need to consider plural humanities within this scope in order to transform the ways in which we understand intra and interspecies relationships in the Anthropocene. For instance, Jamie Lorimer identifies five common characteristics among studies of biodiversity, conservation, multinatural sciences, biogeography, and biopolitics that echo the principles of sympoiesis:

- (1) an inhabited world of porous and affective bodies connected by rhizomatic assemblages;
- (2) an immanent, indeterminable future, haunted by the past; (3) active experimentation and anticipatory interventions that (to differing degrees) seek to take responsibility for the future;

(4) an epistemological pluralism underpinning a knowledge politics comprising multiple forms of human and non-human expertise; and (5) a methodological commitment to ethnographic inquiry; including the emerging field of multispecies ethnography. (599)

These five characteristics enlighten several essential aspects of epistemic practices around biodiversities and possible paths on how to reframe them, not only as studies of biodiversity—which are being discussed by Lorimer—but, especially, as modes of existing as and with-in biodiversities.

In the first characteristic, Lorimer refers to Gilles Deleuze and Félix Guattari's rhizomatic assemblage. The rhizome has several characteristics that already overlap with the sympoietic existential utopia of biodiversities I have outlined so far. At first glance, heterogeneity, interconnection, non-binarism, multiplicity, and non-hierarchical relationships are essential characteristics of both the rhizome and sympoiesis (Deleuze and Guattari, *A Thousand Plateaus: Capitalism and Schizophrenia* 5–7). Noteworthy, Deleuze and Guattari take inspiration from the underground root systems of plants and discuss the behaviours of nonhuman animals as being rhizomatic as well (6–7). In this sense, nature is rhizomatic, not binary: “Nature doesn't work that way: in nature, roots are taproots with a more multiple, lateral, and circular system of ramification, rather than a dichotomous one” (5). As discussed earlier, together with the abundance of meanings and applications of the concept of biodiversity, bio-diverse variety and heterogeneity, as well as interdependence, are indeed terms and processes that are unquestionable components of biodiversities. Consequently, biodiversities are necessarily sympoietic: “If it is true that neither biology nor philosophy any longer supports the notion of independent organisms in environments, that is, interacting units plus contexts/rules, then sympoiesis is the name of the game in spades” (Haraway, *Staying with the Trouble: Making Kin in the Chthulucene* 33). Thus, biodiversities are sympoietic and rhizomatic. Additionally, Lorimer speaks of “porous and affective bodies” (599), which again

highlights the ethical commitment required by a rhizomatic sympoietic existential utopia of biodiversities. If we manage to erase the boundary between humans and biodiversities, plural humanities become bio-diverse, sympoietic, and rhizomatic as well, a necessary change towards the reconfiguration of our affective relationships with-in biodiversities in the Anthropocene.

In Lorimer's characteristics of studies of biodiversity, several ideas further relate to the rhizome and sympoiesis, time being an essential aspect to factor in. Biodiversity studies are determined by a consciousness of the past and by future-oriented goals. A re-reading of the past and how it relates to the present has always been a key component of studies of biodiversity. If we transcend the mere epistemic plane, this re-reading becomes a principle of new modes of existence in the Anthropocene, especially in paving ways for the transformation of our inter and intraspecies relationships. In terms of future paths, the rhizome too expands its multiplicity by opening dimensions, that is, possibilities (Deleuze and Guattari, *A Thousand Plateaus: Capitalism and Schizophrenia* 8; Adkins 26). Furthermore, the rhizome can re-generate, it can start over: "A rhizome may be broken, shattered at a given spot, but it will start up again on one of its old lines, or on new lines" (Deleuze and Guattari, *A Thousand Plateaus: Capitalism and Schizophrenia* 9). In a rhizomatic sympoietic existential utopia of biodiversities—and studies of biodiversities—possibilities and recoveries are created by and in the interaction between plural human and nonhuman (hi)stories, the ethic commitment of plural humanities, and the goal of creating, from the previous destruction, more just modes of co-existence.

Once we have a clear framework to redefine our (hi)stories with-in biodiversities, the last two characteristics listed by Lorimer lead us to a more pragmatic side of studying biodiversities. Plural humanities mean plural epistemologies. Studying and relating with-in biodiversities require the opening of spaces for those plural epistemologies to be enacted. Human (hi)stories in a rhizomatic sympoietic existential utopia of biodiversities are axiomatically plural. Multiplicity is a principle of

the rhizome (Deleuze and Guattari, *A Thousand Plateaus: Capitalism and Schizophrenia* 8–9).

Consequently, plural epistemologies—epistemic multiplicity—require new methodologies to approach knowledge, that is, a reconfiguration of knowledge.

In this sense, given the colonial and power relationships that are historically, scientifically, and epistemologically established between humans and nonhumans, it is imperative to address “both the necessity for scientifically derived data and the need for embedded epistemologies that reconfigure the boundaries between scientific practices, politics, human health, nonhuman animal health, and environmentalism” (Alaimo 13). Such a stance necessitates the questioning of the core concepts of plural human knowledge on biodiversities, their history and entanglement with other human and nonhuman natural and cultural (hi)stories, and a restructuring of our human understandings and relationships with-in biodiversities. This goal—which determines this thesis and the model of a rhizomatic sympoietic existential utopia of biodiversities, and which I deem an ideal goal for biodiversity and conservation studies—requires us to consider and analyze where and how those concepts and knowledges are being created, encoded, enacted, and narrated.

3. The Actual and the Virtual: (Virtual) Biodiversities and (Digital) Interdisciplinary Knowledges

Re-thinking biodiversities in the Anthropocene inevitably links to conservation (Holmes 88; Seddon et al. 2). However, it is important, as mentioned earlier, to break with the separation between nature as *reality*, traditionally the object of study of Science, and nature as *representation*, traditionally the object of study of the social sciences and the humanities (Latour 33). An actual enactment of a rhizomatic sympoietic existential utopia of biodiversities, with a move towards conservation, necessitates both reality and representation: “conservation biology has been poorly integrated into the social sciences, particularly history, meaning it may have missed out on the insights these

disciplines can bring to changing relations between humans and the natural world” (Holmes 92). Studies of biodiversities in the Anthropocene must then follow “a genuinely interdisciplinary approach, one that rigorously unites the social sciences, natural sciences and humanities on the one hand, and researchers and practitioners on the other” (Seddon et al. 7). At the same time, such an interdisciplinary approach must avoid the common discourse of protectionism, which can damage the desired reframing of intraspecies relationships. Following Christoph Kueffer and Christopher Kaiser-Bunbury, George Holmes states that “the existence of the Anthropocene requires a move away from the idea that conservation is about saving nature from human influence” (94). Rather, the Anthropocene requires us to see the human “as a component of ecological processes” (96), not as separate from them. We must then avoid the ideas of the saviour, so heavily criticized by Haraway, Latour, and others (Haraway, *Staying with the Trouble: Making Kin in the Chthulucene* 48; Latour 10–11), for it pulls us back to the traditional Western anthropocentric understanding of nature as object, as resource, and focuses only on what the natural world means for (capitalist) human modes of existence, the motivation to *protect* nature.

Instead, it is imperative to understand that nature does not need to be *saved* nor *protected*. It is our relationships with-in nature, with-in biodiversities, that need to be *reconfigured*. Additionally, if we maintain the discourse of Man as saviour, protectionism can have opposite results. In this regard, it is fundamental to be careful with the use of the term Anthropocene and the power it puts in the hands of humans, for it is easy to see (anthropogenic) environmental crises as inevitable and irreversible, thus “reducing motivation to fight back against human activities” and becoming “a grave distraction from the principle goals of conservation” (Holmes 94).

Going back to the model of a rhizomatic sympoietic existential utopia of biodiversities, studies of biodiversities that follow this model must be interdisciplinary and non-protectionist, and they should strive to encompass the (hi)stories of plural humanities and biodiversities. This move

requires a deep understanding and analysis of the ways policy on and knowledge of these (hi)stories are created:

important strands of work in the social and natural sciences build from a vital materialist ontology to propose political ecologies that are sensitive to nonhuman difference – and the multiple ways in which it might evolve and be governed. This pluralizing of the forms, spaces and times for biodiversities is interwoven with a critical assessment of the epistemological and political techniques through which they are made present and disputed. (Lorimer 598)

This is one of the goals I pursue in this dissertation. Throughout my analyses, I seek to align with works that examine and critically approach, from a perspective of plurality, the epistemic and political practices around biodiversities, with a particular focus on (hi)stories (i.e. narratives) and digital environments. A plural approach to human and nonhuman bio-diverse (hi)stories requires a questioning of the very methods through which such (hi)stories are told and disseminated. In the case of this dissertation and the *Biodiversity Heritage Library*, one of my fundamental goals is to understand how bio-diverse knowledge and narratives are created, enacted, accessed, and distributed in digital spaces.

Thinking of a rhizomatic sympoietic existential utopia of biodiversities (and plural humanities), this dissertation proposes a reconfiguration of digital knowledge that responds to the need to redefine inter and intraspecies modes of existence. In this regard, it is now necessary to frame this study in relation to virtual biodiversities. First, it is essential to note that our experiences of nature and biodiversities are heavily mediated by technology, which “enabl[es] and often defin[es] our experience of environments near and remote, familiar and strange, actual and virtual” (Weik von Mossner 337). This technological mediation is evidenced in the many forms taken by our interactions with nature: “technologies, both analog and digital, have led to seeing and experiencing

nature differently than would be otherwise possible. This ranges from enhancing a real experience (glasses, telescopes, microscopes), to capturing and representing nature (painting, film), to simulating imaginary natures (animation, video games)” (Sinclair and Posthumus 371). In this sense, many (if not most) of our relationships with nature are technologically mediated and virtual.^{xxiii}

In our times, virtuality is more clearly understood as a manifestation in digital spaces, in connection to digital technology and media. With an increasing advancement of digital media and technology, inter and intraspecies relationships in the Anthropocene are now more than ever determined by and enacted through that virtuality:

Transcending disciplinary boundaries, the virtual currently applies to any number of contemporary media performance contexts, including virtual worlds such as Second Life and other multi-player online games, virtual selves as expressed through internet social networking sites and digitally constructed avatars, virtual pets, virtual sex and even the somewhat paradoxical “virtual theatre” ... In all such contexts, virtuality suggests a distance from – as well as an engagement with – the actual, material, and physical world, real life.

(Darroch et al. 142)

Virtual biodiversities are part of such virtual contexts, an expression of actual biodiversities with which we establish relationships in technologically-mediated manners. This is not to say that virtual biodiversities replace or oppose actual biodiversities. On the contrary, virtuality always occurs within actuality, it does not deny it, it is “an alternative” (Norton 500). In the case of our relationships with- in biodiversities, virtuality enables the manifestation of such relationships, which in no way questions their reality. I have no way of establishing a “physical” relationship with, say, a white shark (*Carcharodon carcharias*). It will always be mediated through images, videos, audio; that is, media that I access through technology. However, such virtuality does not interfere with the *actual* affects I build through my virtual relationship with the shark, nor with the commitment I make to establishing a

rhizomatic sympoietic existential utopia of biodiversities that includes the shark's and my (human) (hi)stories. In sum, virtuality allows for the existence of wider intra and interspecies affective relationships and characterizes our existence with-in biodiversities, as well as our knowledge and concerns about the natural world:

for the majority of the population of industrialized nations (and of an increasing number of developing ones), the experience of nature is heavily mediated by technology. ... note that especially for urban populations, biological diversity has already become a virtual reality of sorts, one that is conveyed centrally by a wide array of TV documentaries and entire channels devoted to nature and exotic wildlife, whereas everyday urban life exposes humans to an extremely limited number of animal species. (Heise, "From Extinction to Electronics: Dead Frogs, Live Dinosaurs, and Electric Sheep" 75)

It seems, then, that studies of biodiversities in the Anthropocene cannot avoid studying virtual biodiversities, that is, representations, knowledges, and interactions with-in biodiversities through digital media and in digital spaces. This need implies "the important question of how best to envision the relationship between the natural world and simulations of it in their role for late-twentieth-century human culture, science, and society" (76), or phrased otherwise, how to understand the (telling of) (hi)stories of plural humanities and biodiversities in their digitality and virtuality.

To address these questions, I turn to Ursula Heise's concept of cyborg environmentalism. Following Haraway and her ideas of the cyborg, Heise considers the cyborg to be an appropriate notion to understand our relationships with technology but proposes to widen its scope by also considering nonhuman animal subjects: "a consideration of human identity as altered by contemporary technologies is no longer complete without a concurrent account of its relation to animal modes of being" (Heise, "The Android and the Animal" 504). For Heise, the relationship

between humans and technology must be determined by the relationships between the human and the android, the human and the animal, and the android and the animal (503). This is the premise behind cyborg environmentalism, which is based on the animal cyborg as a central subject:

Not merely the symbol of a nature finally vanquished by technology that it sometimes can be, the animal cyborg also points to the possibility of a different relationship between species: one that no longer privileges the rights of humans—feminine or masculine—over those of all other forms of life, but that recognizes the value and rights of nonhuman species along with those of humans. Viewed this way, the animal cyborg can take us, through the discovery of otherness in our own technological creations, to the recognition of and respect for the nonhuman others we did not make. (Heise, “From Extinction to Electronics: Dead Frogs, Live Dinosaurs, and Electric Sheep” 77–78)

Even though Heise proposes cyborg environmentalism from the perspective of the cyborg as an animal-machine hybrid, I believe her observations regarding human technology and nonhuman species can serve the purposes of this thesis as well. In this regard, cyborg environmentalism could be an avenue for the ethical reconfiguration of inter and intraspecies relationships. Redefining our relationships with-in (virtual) biodiversities requires understanding the role of technology and media in the establishment of those relationships. It is imperative to advocate for technological and virtual representations that mirror, precisely, the equal valorization of species (human and nonhuman) of which Heise speaks.

Like the animal cyborg can counteract hierarchical understandings of human and nonhuman modes of existence, virtual biodiversities can enlighten the strengths and shortcomings of technologically-mediated intraspecies relationships and practices of representation. By analyzing the overlaps and intersections between human-technology, human-nonhuman, and nonhuman-technology relationships—crystallized in the figure of the human and nonhuman cyborg—it is

possible to better fathom the basis of these relationships, the conditions under which they occur, and the decolonial options we have towards a more just configuration of them. In studying virtual biodiversities, we must aim for the construction of a cyborgian rhizomatic sympoietic existential utopia of biodiversities, one based on the principles of digitality, virtuality, multiplicity, interconnectivity, plurality, coexistence, equality, justice, ethics, and human and nonhuman (hi)stories.

4. Digital Archives as Cyborgian Rhizomatic Sympoietic Existential Utopias of Biodiversities: The *Biodiversity Heritage Library*

The overarching goal of constructing a cyborgian rhizomatic sympoietic existential utopia of biodiversities (CRSEUoB) as a decolonial option for digital archives determines my analyses of the *Biodiversity Heritage Library* and its archival practices. In this sense, this dissertation is located within the scope of the Digital Environmental Humanities (DEH). DEH is a relatively recent trend in interdisciplinary cultural studies that brings together the environmental humanities—“an ongoing negotiation about such things as agents (human, animal, and nature), scale (local, national, and global), time (past, present, and future), priorities (survival, justice, and conservation), and forms of communication (film, literature, code, and math)” (Sinclair and Posthumus 369)—and the digital humanities—“methods and techniques that can apply to the messy and interpretive enterprise of studying cultural texts ... consolidated around practical and technical questions of how to study objects of interest rather than what objects to study and what can be said about them specifically” (370). In this sense, DEH constitutes an ideal discipline from which to understand virtual biodiversities.

For this thesis, DEH is especially important to delve into how our plural human knowledges about biodiversities are and can be enacted, reproduced, and distributed in and through digital

epistemologies and spaces, aiming at the establishment of a CRSEUoB for digital archives. In this sense, “DEH needs to be constantly aware of the mediating effects and potential of technologies on perceptions of and access to nature, foregrounding the technologies not for their own sake, but so as to notice their effects on how we understand ourselves and our surroundings” (371-372). This premise of DEH highlights, precisely, one of the main goals of this dissertation, to understand not only how knowledge of biodiversities is built within the scope of the *Biodiversity Heritage Library* (BHL) but also, and especially, how that knowledge can impact our perceptions of and relationships with-in (virtual) biodiversities and plural humanities.

BHL is part of a growing effort to digitize and make accessible global knowledge of biodiversities. In this regard, studies of biodiversities in the Anthropocene are increasingly relying on digital information (Nelson and Ellis 1). Furthermore, the somewhat easy access^{xxiv} to digital data on biodiversities has become a pillar in interdisciplinary studies of the environment:

biological collections are increasingly recognized as among the best resources for reconstructing the human impacts of global change during the past century. These include documenting changes in plant and animal morphology, species decline and shifts in the timing of life-history events ... In recent years, researchers have increasingly begun to harness digital collections. (Meineke et al. 2)

Thus, digital collections are fundamental in the development of fields such as museology, natural history, and biodiversity studies. In this sense, these collections are progressively becoming a prime source of knowledge of biodiversities, which has also grown in numbers given the availability of digital and digitized biodiversity-related data and materials (Nelson and Ellis 3).

Nevertheless, virtual biodiversities hold great importance beyond scientific research. When discussing the several definitions and applications of the term biodiversity in this Introduction, I referred to the importance of value, which has various manifestations in approaches to and

perspectives of biodiversity. One such approach is national identity, given that biodiversities are often used as patriotic symbols (National Research Council 62–63) and are fundamental in fostering a human “sense of place” (64).^{xxv} In this sense, biodiversities are an essential part of the definition of human societies and nations. A manifestation of this importance of biodiversities can be found, precisely, in the emergence of digital biodiversity projects across the world such as

the United States (US) National Science Foundation’s Advancing the Digitization of Biodiversity Collections (ADBC) programme, Australia’s Atlas of Living Australia (ALA), Mexico’s Comisión Nacional Para el Conocimiento y Uso de la Biodiversidad (CONABIO), Brazil’s Centro de Referência em Informação (CRIA), Europe’s emerging Distributed System of Scientific Collections (DiSSCo) and China’s National Specimen Information Infrastructure (NSII). (Nelson and Ellis 2)^{xxvi}

Global and national initiatives like the ones listed by Nelson and Ellis have an expanding impact on the use of digital collections in science but also on the access to biodiversity-related knowledge for several human communities and, therefore, on the production of cultural meanings and heritage associated with these virtual manifestations of biodiversities.

Furthermore, bio-diverse digital collections continue to evidence that our relationships with-in nature are essentially virtual and attest to the possibility of a dialogue between diverse human societies. There are several projects that not only relate to the importance of biodiversities in building, consolidating, and affirming national identities but also to the possible response in light of historical and colonial processes that in many ways deprive countries, especially in the Global South, of their cultural heritage:

Digital natural history collections provide unprecedented opportunities for collaboration across disciplines and among institutions, including those in the tropics, which have historically had limited access to specimens held in museums throughout North America and

Europe. This is perhaps best exemplified by the Re flora project of Brazil, which has sought to repatriate its collections from institutions outside of their country via digitization. Thus, digitization has the potential to diversify hypothesis testing by promoting cultural diversity in science and by providing unique, vast datasets at reduced costs to researchers regardless of location. (Meineke et al. 3)

Projects such as Brazil's Re flora and the India Biodiversity Data Portal (Nelson and Ellis 3) thus employ digitization as a means for decolonization and re-appropriation of knowledges of biodiversities.^{xxvii} Therefore, these digital collections and initiatives can become essential tools for countries and societies that have been victims of epistemic colonization. From the perspective of a CRSEUoB, digital archives should align with efforts to decolonize their materials, from both the Global South and North as sites of bio-diverse knowledge production.

Decolonization of digital knowledges must then be a goal of digital collections of biodiversities, as it is also a goal of this dissertation. By analyzing the knowledges and (hi)stories of Latin American (virtual) biodiversities in the *Biodiversity Heritage Library*, I seek to contribute to such decolonization, especially in terms of plural humanities and plural epistemologies and avoiding epistemic colonial violence, which

appears in discursive forms. These include reproducing colonial influences in the production of digital knowledge and centering epistemologies and ontologies of the Global North, namely the U.S. and western Europe, which in turn decenters those of Indigenous communities and the Global South. ... This is not to say that invoking decolonization is only speaking to the political fact of colonization. On the contrary, it encompasses epistemological dimensions because the political realities of colonization are interdependent with displacement of Indigenous epistemologies and ontologies. The existence of colonization relies on not only ongoing occupation of land but also occupation of regimes of

knowledge erected to maintain and legitimate such occupation. (Risam, “Decolonizing the Digital Humanities in Theory and Practice” 79)

In this sense, this dissertation falls into the realm of postcolonial and environmental digital humanities, especially in “rethinking the role of representation in digital archives and the design methods subtending them” (Risam, “Colonial Violence and the Postcolonial Digital Archive” 47). As previously stated, digital archives are storytelling mechanisms. Therefore, to ensure they tell bio-diverse decolonial (hi)stories, digital archives must avoid the “risk of being a mirror of a colonial world-picture, another representation of colonized subjects from a colonial perspective that authorizes imperialism” (50). This is particularly important given that, in digital archives and through digitization, colonial violence is not repeated, “it [is] foster[ed] ... in the digital cultural record” (51), that is, the technology that mediates our inter and intraspecies relationships becomes a colonizing tool that perpetuates historical and present oppression in digital environments.

In the case of BHL, archival coloniality affects plural humanities and biodiversities (that is, human and nonhuman subjects) as well as their narratives. In this sense, Roopika Risam’s arguments echo the fundamental goals of my analyses of BHL. In its very name, BHL establishes biodiversity as heritage.^{xxviii} Thus, the (hi)stories of (virtual) biodiversities narrated by the Library’s collections become an essential part of the human epistemologies and identities about whom and for whom those (hi)stories are told. Acknowledging and understanding colonial biases in plural bio-diverse knowledges as contained in digital archives are fundamental steps towards equitable and fair bio-diverse coexistence.

5. Reframing Digital Bio-Diverse Archives: What Does It Mean to Decolonize BHL?

In rethinking human-nonhuman relationships and reunderstanding the meanings of *anthropos* and Anthropocene, it becomes necessary to consider a framework for decoloniality. My purpose in this

final section of my introduction is not to ignore the debate of neo/post/decolonial debates in Latin America and elsewhere nor to dive into the precepts and challenges that diverse theoretical approaches to coloniality presuppose (Rosenthal 18). On the contrary, I seek to outline key concepts and ideas that determine my understanding of decoloniality and, therefore, the critiques and strategies for digital archives that I propose.

Considering the postcolonial-decolonial debate in the late nineties in Latin America (Rosenthal 20), I would like to begin my decolonial reflection with a personal statement. Throughout my thesis, I argue for a decolonizing framework for digital biodiversity-related collections that encompasses multilingualism, multiculturalism, and plurality in outreach and annotation practices. However, as I push for a greater and alternative representation of materials from Latin America and in languages other than English, I must acknowledge my own positionality: I am producing this thesis from the Global North *and* in English. In turn, the privileges behind my position as a researcher and the almost necessary^{xxx} choice of language notwithstanding, the context of the production of this dissertation can very well serve as an entryway to my understanding of decoloniality.

First, let me recognize from the outset that I am writing this thesis not only from but, especially, *for* the Global North and in the theoretical and academic context of the Global North.^{xxx} As my thesis constitutes a critical analysis of BHL with the goal of devising strategies that the Library can undertake to counteract colonial mechanisms in its catalogue, the actors and stakeholders who can address such issues are clearly located in the Global North. The decolonization of BHL is, of course, contingent upon the active participation and engagement of actors and audiences outside the Global North—as I argue, for example, through my analyses of the BHL México project and CONABIO’s (sometimes limited) collaboration with BHL. Nevertheless, the system of knowledge in which the Library is rooted can only be transformed by the Global

North—in collaboration with the Global South.

BHL is a project from the Global North and its decolonization can only be set in motion by the actors that control it. Therefore, this thesis constitutes a call for BHL—and other individuals and institutions in the Global North—to question the apparatus that determines their modes of knowing and representing and to assume an ethical and decolonizing stance vis-à-vis the Global South and marginalized groups. In this sense, I follow the perspective of Santiago Castro-Gómez, characterized not by a complete rejection of Western paradigms but by a negotiation of identities and cultures within the colonial system of power:

una posición teórica decolonial no es aquella que busca la recuperación de la identidad cultural de los pueblos colonizados. Tal recuperación no es más que una quimera, pues ha sido, precisamente, el sistema-mundo moderno/colonial el espacio en que se han constituido las identidades de cada uno de los elementos que entraron en esa matriz de relaciones jerárquicas ... Pretender la conservación de la identidad cultural de los pueblos colonizados, o bien su retorno a una matriz identitaria ancestral, poco tiene que ver con una política emancipadora. Este tipo de representación que afirma la diferencia, pero sacándola de la red de antagonismos que la hace posible para contemplarla como un objeto impoluto y distante, no es otra cosa que una representación colonial.^{xxxi} (Castro-Gómez 186–87)

From the very conception of this dissertation, my own theoretical decolonial posture does not seek the creation of a digital archive that belongs to and represents exclusively marginalized epistemologies in and from Latin America. On the contrary, in focusing on global networks of bio-diverse knowledges, I intend to push for a digital library that recognizes its ties with a colonial system of power and opens spaces for decolonial systems of knowledge that restructure and reappropriate Western and Global-North-centric paradigms: “No se trata, pues, en nombre de la decolonización, de liberarse de la universalidad (por considerarla un instrumento del colonizador),

sino de apropiarse de ella para mostrar que esta es incompleta, que ha dejado algo por fuera”^{xxxii} (188).^{xxxiii} Similarly, in critiquing BHL, I aim to shed light upon the shortcomings of its *global* and *open* approach. This is not to say that globality and openness lack value or use. On the contrary, the goal of this dissertation is precisely to reveal the imperfections of their current application in archives such as BHL. In Enlightenment 2.0, the global and the open are not questioned and become, instead, beacons of hoarding purposes. In other words, the sole recognized shortcoming of globality and openness in Enlightenment 2.0 is quantity, as these concepts are fueled by the pursuit of a total(izing) collection. In contrast, if we take a step back and focus on the more primeval issues of the very meaning and constitution of globality and openness as guiding concepts, then the shortcomings become historical, epistemological, and geopolitical. Only if current applications of globality and openness to BHL are recognized as inherently imperfect can the systems of knowledge they fuel be restructured and, in that sense, decolonized.

This perspective echoes as well in my arguments around inclusion as presence and decolonial inclusion in Chapter 3 of this thesis. The mere hoarding of Latin American materials, for example, is not the goal of the decolonization of archives. Instead, I propose a restructuring of the system of collection and annotation that excludes such materials and the marginalized actors behind them from its roots—that is what decolonization entails. Decolonization cannot be achieved by attempting to build more inclusive structures on top of the already existing systems of archiving; decolonization is only possible through a reformation of the foundations of such systems. Thus, I argue not for the incorporation of Latin America into BHL’s epistemic order but for a restructuring of the Library’s order itself (Castro-Gómez 196). The new order—the decolonial order—does not oppose globality or totality but biased understandings and applications of the concepts as well as the mechanisms through which they exclude “muchas, demasiadas, áreas de la experiencia históricosocial, o las acogen sólo de modo distorsionante”^{xxxiv} (Quijano 102). Decolonization—and

specifically epistemic decolonization—then stems from the intricate relationship between power and knowledge (Gordillo Sánchez 136), and requires a decentralization of European and Anglo-North-American identities, worldviews, and paradigms, that is, decolonization requires the valorization of “la existencia de otros protocolos y modos subalternizados de conocer, transmitir y producir saberes, los cuales se configurarían dentro de una nueva pluralidad epistemológica”^{xxxv} (137). In this sense, BHL as a CRSEUoB overlaps with Aníbal Quijano’s concept of a “totalidad histórico-social:”

Una totalidad histórico-social es en un campo de relaciones estructurado por la articulación heterogénea y discontinua de diversos ámbitos de existencia social, cada uno de ellos a su vez estructurado con elementos históricamente heterogéneos, discontinuos en el tiempo y conflictivos ... Cada elemento de una totalidad histórica es una particularidad y, al mismo tiempo, una especificidad, incluso, eventualmente, una singularidad. Todos ellos se mueven dentro de la tendencia general del conjunto, pero tienen o pueden tener una autonomía relativa y que puede ser, o llegar a ser, conflictiva con la del conjunto.^{xxxvi} (104)

The coexistence of and negotiation between the global and the local, the total and the particular, the singular and the plural, the human and the more-than-human constitute a system in which each (hi)story belongs to a greater narrative of (hi)stories, with-in which they interact, overlap, and conflict.

My thesis, then, argues for a decolonial approach to global open access that represents this network of intertwining and clashing narratives. Such a decolonial approach allows for diverse communities and audiences to “apropiarse y utilizar conocimientos que sean relevantes para la comprensión y solución de sus problemas [y], sobre todo, generar ellos mismos los conocimientos que sean necesarios para ello”^{xxxvii} (Olivé 19), a particularly crucial stance in the case of Latin American countries given the plurality of cultures and peoples in the region (20). The use, appropriation, and generation of knowledges by plural humanities constitute the multiplicity of

worlds that the CRSEUoB model entails, and are key aspects of decoloniality as I understand it throughout this dissertation. In this sense, I conceive decolonization as a reformation of systems of access, representation, and knowledge anchored in the recognition of the colonial past and present of such systems and that executes a reformulation of hegemonic and homogenizing epistemologies and practices to open spaces for the visibility of other(ed) (hi)stories and for the enactment of historically and geopolitically marginalized narratives, agencies, and subjectivities.^{xxxviii}

Building a cyborgian rhizomatic sympoietic existential utopia of (virtual) biodiversities that includes and respects plural humanities, biodiversities, and epistemologies requires decoloniality and decolonization of digital and non-digital spaces and knowledges. If digital archives are storytelling mechanisms, it matters what stories they tell but also for whom, by whom, and through what means. For BHL, the decolonization of these layers of storytelling requires a meticulous evaluation that tackles its collections, metadata and curatorial methods, and representation and dissemination practices from different angles, through a mixed methodology, as proposed throughout this thesis. Only through a multifaceted bio-diverse re-understanding of archival storytelling can we aim for the establishment of digital archives as CRSEUoBs. Such is the framework in which this dissertation is situated.

Notes for Introduction

ⁱ I use the terms Global South and Global North throughout this thesis to refer to the economic, colonial, and geopolitical differences between countries. I understand the Global South as comprising “regions that are historically and structurally excluded from institutionalized networks of power, authority, visibility, and access in global knowledge production” (Chan 20 n1). Given the topic of this dissertation, the distinction often translates as a difference between colonial and neocolonial powers (western Europe and the United States) and countries that have been colonized and whose current challenges are a result of colonial processes (Latin America, the Caribbean, Africa, Asia). I acknowledge, however, that this distinction poses challenges when considering countries such as Australia and Japan and those that fall into what Martin Müller calls the Global East (734), as well as certain countries in eastern Europe (Chan 20 n1). I have chosen, therefore, to refer to such countries individually when and where relevant for the purposes of this dissertation.

ⁱⁱ All methods and metrics are explained in Chapter 1.

ⁱⁱⁱ According to Philipp Mayer, “biodiversity is the variety of life on Earth. Within this framework, different thought styles (e.g., natural history, science, and environmentalism) focus on different features of this variety, in value-free or value-laden ways” (109). However, I argue that, given its strictly human construction, there are no value-free ways to discuss biodiversity.

^{iv} I further explore the impact of technology on our relationships with nature later in this Introduction, in my discussions of the concept of virtual biodiversities.

^v I further explore the issues of humanity and biodiversity later in this Introduction, especially in relation to the Anthropocene. It is also a main theme across this thesis.

^{vi} I split the preposition with-in to further highlight the multiple relationships between and positionalities of plural humanities and biodiversities: humanities with biodiversities, humanities in

biodiversities, and humanities within biodiversities. These multifaceted relationships—highlighted by my use of prepositions—are part of my proposal of a model to rethink biodiversities and how we relate to them, as explained later in this Introduction.

^{vii} I would add, of course, they were all, first and foremost, human.

^{viii} I am emphasizing the word “outside” to highlight the issues of exclusion that the paradigm of Truth arises in all contexts, in this case, in Science as the emblem (and the weapon) of progress and knowledge.

^{ix} From here on, I follow Jamie Lorimer in using the plural form of the word *biodiversity* in relation to “important strands of work in the social and natural sciences [that] build from a vital materialist ontology to propose political ecologies that are sensitive to nonhuman difference – and the multiple ways in which it might evolve and be governed. This pluralizing of the forms, spaces and times for biodiversities is interwoven with a critical assessment of the epistemological and political techniques through which they are made present and disputed” (598).

^x I analyze the issues of biodiversity in the context of the Anthropocene (and the Anthropocene itself) in the next section of this Introduction.

^{xi} In general terms, the Anthropocene refers to the current geological era, in which humans act as a geological force, that is, human activities play a decisive role in geological processes. In the following section of this Introduction, I explore the diverse meanings, uses, and controversies that surround the concept of the Anthropocene. I agree with many of the shortcomings of the concept that are outlined in this Introduction and highlighted by several authors. However, and even though I prefer Donna Haraway’s sympoietic *Chthulucene* (Haraway, *Staying with the Trouble: Making Kin in the Chthulucene* 31–33), I use the term *Anthropocene* from a different stand point, also outlined later in this Introduction, and for legibility within current studies of this era, especially in the (non)humanities—

or *humusities*, to go back to Haraway (32).

^{xii} I would like to take a moment to delve into something that Paul Crutzen mentions in passing. He states that using reason to counteract environmental crises must be the goal of science as long as human activities have geological impact: “Unless there is a global catastrophe—a meteorite impact, a world war *or a pandemic*—mankind will remain a major environmental force for many millennia” (23, emphasis mine). Writing this part of my dissertation during the COVID-19 pandemic in 2020 inevitably forces me to stop and further reflect on Crutzen’s words. There could be no better moment to question our actions and our becoming a geological force, especially when it is a virus, a microscopic companion species, the one interrupting the very human activities that gave rise to the Anthropocene.

^{xiii} Using the allegory of Plato’s Cave, Latour dissects and pushes against the construction of Science as one, true, and unquestionable (9–10), the Scientist as the powerful saviour and bearer of Truth (10–11), and the supposedly necessary separation between Science and politics (13–17).

^{xiv} I am using this term to also highlight the increasing importance of technology and digital spaces in contemporary sciences and the construction and dissemination of scientific knowledge. This topic is further discussed later in this Introduction.

^{xv} Haraway evokes cat’s cradle, the spider *pimoi cthulhu*, and tentacles to build her concept of the Chthulucene, a present and future era that requires inter and intraspecies alliances and stories (*Staying with the Trouble: Making Kin in the Chthulucene* 31). Her images of SF and “tentacular thinking” (30) are the main inspiration for my model. Nevertheless, it is also inspired by Deleuze and Guattari’s rhizome:

An assemblage is precisely this increase in the dimensions of a multiplicity that necessarily changes in nature as it expands its connections. There are no points or positions in a

rhizome, such as those found in a structure, tree, or root. There are only lines. ... All multiplicities are flat, in the sense that they fill or occupy all of their dimensions: we will therefore speak of a plane of consistency of multiplicities, even though the dimensions of this “plane” increase with the number of connections that are made on it. (*A Thousand Plateaus: Capitalism and Schizophrenia* 8–9)

I further explore the idea of the rhizome in the section dedicated to biodiversities in the Anthropocene in this Introduction.

^{xvi} It is notable that such a landmark occurred, precisely, in Latin America, whose (hi)stories clearly intertwine with those of local and global biodiversity and Western science and conservationism. An interesting observation given the focus of this thesis.

^{xvii} These impacts include “the transformation of ecosystems for human use, a process leading to the loss of wilderness and multiple impacts on ecosystems from biotic homogenization to the rapid erosion of species richness in the most highly transformed areas of Earth. At global scales, evidence is mounting that humans are precipitating Earth’s sixth mass extinction and the collapse of its life support systems” (Seddon et al. 1).

^{xviii} On a personal note, I have chosen to write this dissertation in English for two main reasons. First, because its interdisciplinary nature required that I communicated with scholars and peers of different backgrounds with whom I share English as a common language, including BHL staff. Second, because the *Biodiversity Heritage Library*, as well as the software and text mining tools that I employ throughout this dissertation, are programmed in English. Nevertheless, because of my own positionality and identity and given that this thesis is deeply and in multiple ways tied to Latin America, I feel the responsibility of taking the stance of not translating quotes in Spanish, my mother tongue, in the body of the text. I will provide translations, all mine, as endnotes throughout

this thesis. I problematize my own positionality in the context of decolonization in the final section of this introduction.

^{xix} the emergence from displacements and reconfigurations of alliances in which the human enters and is immunized, of a radical in-humanity.

^{xx} In Chakrabarty's third thesis of his discussions about climate change and the Anthropocene, he analyzes the historical relation between natural history and the history of capital. His third thesis reads "The Geological Hypothesis Regarding the Anthropocene Requires Us to Put Global Histories of Capital in Conversation with the Species History of Humans" ("The Climate of History: Four Theses" 212–20). In turn, Haraway discusses the use of the term *Capitalocene* as an alternative to *Anthropocene* (*Staying with the Trouble: Making Kin in the Chthulucene* 47–51). The term *Capitalocene* has acquired importance in more local discussions of the Anthropocene (See Ulloa 67–72 for a discussion of the use of both terms from a Latin American perspective).

^{xxi} Initially, I intended to use the term *humanities* alone, but I recognize that it can be easily confused, of course, with the humanities as disciplines, which is why I am adding the reiterative adjective "plural."

^{xxii} Mignolo considers the *anthropos* has three options vis-à-vis the power of the *humanitas*: she can surrender, be assimilated to the discourses and systems of the *humanitas*, or follow the decolonial option (90).

^{xxiii} Nature is also impacted by our use of technology. I am focusing on virtual experiences of nature because they are more clearly relevant for this dissertation, but the environmental costs of technology and their real impact on biodiversities must not go unnoticed, especially in relation to the Global South (Sinclair and Posthumus 372–73; Guha 417–18, 420–421; Ulloa 69; Klier and Folguera 187–90; Carruth 357–58).

^{xxiv} I would not want to assume, as is a commonplace, that digital knowledge is by definition easily accessible. Responding to my own ideal of plural humanities, I acknowledge that such a commonplace is the product of normalized privilege that obscures inequalities, especially in terms of class/wealth, race/ethnicity, and the so-called development of nations.

^{xxv} The concepts of *place* and *sense of place* are the backbones of Chapter 3 of this thesis.

^{xxvi} Mexico's CONABIO is an important focus of this dissertation given its role in the BHL México project, one of my main objects of study within BHL's work.

^{xxvii} These and other issues around *ownership* and *repatriation* are the core of the arguments presented in Chapter 2 of this thesis.

^{xxviii} The concept of *heritage* in relation to biodiversity and BHL is further explored in Chapter 1 of this thesis.

^{xxix} See note xviii above.

^{xxx} I am referring not only to my place as a Ph.D. student at McGill University but also to the works and authors that my theoretical model incorporates. Conflictive as it might be, and certainly flawed and problematic in many ways, I also see my approach and framework as a way to appropriate the theories, tools, and resources of the Global North in my efforts to call for changes that aim for a broader and more meaningful representation of the Global South.

^{xxxi} a theoretical decolonial position is not one that seeks the recovery of the cultural identity of the colonized peoples. Such recovery is nothing but a chimera, as it has been, precisely, the modern/colonial world-system the space in which the identities of each element that entered that matrix of hierarchical relationships have been constituted. ... To seek the conservation of the cultural identity of the colonized peoples, or their return to an ancestral identity matrix, has little to do with emancipatory politics. This kind of representation that affirms difference but removes it

from the network of antagonisms that enables it in order to contemplate it as an untainted and distant object, is nothing more than colonial representation.

^{xxxii} It is not about freeing oneself, in the name of decolonization, of universality (for considering it an instrument of the colonizer) but to appropriate it to demonstrate that it is incomplete, that it has left something out.

^{xxxiii} I do consider the approach to universality inherited from the Enlightenment to be an instrument of the colonizer. However, I agree with Castro-Gómez that certain concepts—universality, globality, openness—can be questioned and reframed to serve the purposes of decolonial projects.

^{xxxiv} many, too many, areas of the historic and social experience, or incorporates them only in distorting ways.

^{xxxv} the existence of other protocols and subaltern modes of knowing, transmitting and producing knowledges, which would be configured in a new epistemic plurality.

^{xxxvi} A historic-social totality lies in a field of relations structured by the heterogenous and discontinuous articulation of diverse spheres of the social existence, each of them, in turn, structured through historically heterogenous elements, that are discontinuous in time and conflictive ... Each element of a historic totality is a particularity and, at the same time, a specificity—even, eventually, a singularity. All of them move within the general tendency of the whole but have or can have relative autonomy, which can be or become conflictive towards that of the whole.

^{xxxvii} appropriate and utilize knowledges that are relevant for the understanding and solution of their problems [and], especially, to generate themselves the necessary knowledges.

^{xxxviii} While I focus here on the decolonization of knowledges, it is fundamental to not overlook actual decolonization of land and artifacts. I discuss such processes more in the section on virtual repatriation in Chapter 2 of this thesis.

Chapter 1

Accessing Bio-Diverse (Hi)Stories: BHL's Glocality and the Case of BHL México

Establishing a cyborgian rhizomatic sympoietic existential utopia of biodiversities (CRSEUoB) for digital archives entails the coexistence of multiple and plural bio-diverse (hi)stories, including those of plural humanities, and transcends the ideal of the *humanitas* in favour of the equitable participation of the *anthropos* as agents of decoloniality in the Anthropocene.ⁱ For humans, bio-diverse (hi)stories are narrated through texts which are, in the case of the *Biodiversity Heritage Library* (BHL), digital texts that retell the experiences of humans with-in biodiversities through the storytelling layers of digital archives. Being a repository of these texts, BHL—in its path towards plurality and multiplicity during the Anthropocene—has the responsibility not only of sharing and providing access to those (hi)stories but also of reflecting on its archival practices and the possibilities of decolonizing the plural knowledges contained and communicated through its materials, especially with a global and plural outlook.

As explained in the Introduction to this thesis, and given the narrative nature of CRSEUoBs, I believe that archives, both digital and nondigital, are storytelling mechanisms. When compiling literature about global biodiversity, as in the case of BHL, the stories that are told refer not only to humans but also to nonhumans. When considering the diversity of humans as species, archives highlight the stories not of humanity but of a multiplicity of humanities. When thinking about our relationships with-in biodiversities, archives unveil the virtual nature of such relationships, which is especially relevant for digital artifacts. In digital archives, these bio-diverse stories are told, curated, and disseminated at various levels, from the texts themselves to the archival and dissemination practices that provide access and visibility to those texts.

This chapter focuses on the layer of *access* to BHL as a digital storytelling archive from the perspective of the decolonization of online bio-diverse plural knowledges and plural humanities.

Here I delve into BHL's constitution as a digital library and examine issues surrounding geopolitical access to its collections, particularly concerning the participation and engagement of diverse audiences, specifically from Latin America. Given that the guiding question of this chapter deals with *who* can access the (hi)stories told by BHL, I analyze the Library's global partnerships and work in Latin America, with a focus on the BHL México project, as means to understand the (hi)stories of plural humanities in the context of the epistemic relationships between the Global South and North. Overall, this chapter considers the broad exchange between BHL and Latin America, and between BHL and Mexican institutions, in terms of its decolonial possibilities for the establishment of a CRSEUoB.

1.1 Dissecting the Library: Biodiversity + Heritage + Library

To understand the functioning and implications of the *Biodiversity Heritage Library*, it is essential to scrutinize its conception and its archival nature, beginning with an analysis of the three components of its name. While the term *biodiversity* has already been explored in the Introduction of this thesis, in BHL it intertwines with two more terms, *heritage* and *library*. The confluence of these terms greatly attests to the geopolitical nature of the bio-diverse knowledges contained in the Library's collections.

So far, I have been using both *library* and *archive* interchangeably to refer to BHL.ⁱⁱ Both terms invoke repositories of organized collections of materials, widely understood (Reitz). In general—and perhaps simplistic—terms, the key differences between a library and an archive concern the kinds of materials they hold and the guidelines for access to those materials. In the case of archives, materials can be published or unpublished and often include documentation about governments, individuals, and stewardship of institutions, belongings, and others (*ibid.*), which are frequently considered “unique, specialized, or rare objects, meaning very few of them exist in the world, or they are the only ones of their kind” (Society of American Archivists). This also means

that access to these objects can be prohibited or restricted, either to protect the materials themselves or because they contain sensitive information (*ibid.*). In turn, the main goal of libraries is to provide access to their materials, for use in a wide variety of contexts (Reitz; Society of American Archivists). Nevertheless, despite their different approaches to access, archive and library are concepts that constantly overlap (Society of American Archivists), and while the archive is not always necessarily a library, a library can in most cases be considered an archive (Añón 260).

The boundaries between archives and libraries blur even more when considering their existence in digital spaces. For instance, the *Online Dictionary for Library and Information Science* defines *digital archive* as “[a]rchival materials that have been converted to machine-readable format, usually for the sake of preservation or to make them more accessible to users,” and *digital library* as “[a] library in which a significant proportion of the resources are available in machine-readable format (as opposed to print or microform), accessible by means of computers” (Reitz). These two definitions clearly manifest the almost complete overlapping between digital archives and digital libraries. In both cases, digital technologies and the online availability of materials take center stage, as they do in the case of BHL, which is defined by its Secretariat as “a proven initiative empowering discovery through *free and open access* to biodiversity literature” (Kalfatovic and Rinaldo 3; emphasis mine). In this sense, the accessibility differences between “traditional” archives and libraries, do not apply to their digital counterparts. Moreover, “some of the resources in BHL are both primary and secondary sources. They are taken up at times as artifacts in themselves,” which would constitute an archive, and “at other times they provide information for researchers,” meaning they are considered library materials (Zien). Thus, BHL can be seen as both an archive and a library,ⁱⁱⁱ and the *library* component of its name points not only to the collections of materials it houses but, especially, to the facilitation of access to those materials.

As an online library/archive, open access is, then, one of the goals and key characteristics of

BHL. Discussions of open access are of particular interest because it is a notion that can contribute to both a diversified production of knowledge and a starker polarization of global inequalities. In the case of Latin America, for example, budgetary limitations, the lack of infrastructure, and insufficient international collaboration often lead to scarce access and dissemination of academic and scientific research (Dorta-Duque and Babini 37), all challenges to knowledge distribution that can be overcome by open access projects. On the other hand, open access implies a *global* community, a notion that poses significant challenges when considering the geopolitical meanings advanced by globality. While open access can potentially aid “the flow of knowledge between the South and North, East and West, South-South, and vice versa” (39), it can also reinforce power relationships between these regions.

The democratization of knowledge runs the risk of blurring the unequal role of the Global South and North in such a process (Chan 14) by implying a parallel standing between both and obscuring the epistemic, technological, and economic inequalities that determine their relationship. In this regard, the Open and Collaborative Science in Development Network (OCSDNet) points to essential principles that should inform open access from an equitable and inclusive perspective. Their second principle, for instance, establishes “that all individuals and communities, regardless of their culture, gender, socioeconomic status, or language, should be able to fully exercise their capabilities to use, share, and create knowledge,” this with a clear consciousness of the existence of diverse “ways of knowing” (Albornoz et al. 30) and the false Enlightened idea of science as “neutral and objective” (31). In terms of technology, the OCSDNet also considers that inclusivity must be an objective of infrastructure design to “promote greater interaction between data providers and data users, and enable all the actors to produce, gather, share, collaborate, and use scientific knowledge” (39). Therefore, especially in the context of a CRSEUoB as reflected by digital archives in their storytelling practices, open access must not be sought after per se but questioned and adapted from

an ethical perspective (Chan 17).

For BHL, a critical approach to open access is even more crucial when considering the distribution of *heritage*, the third and middle component of the Library's name. In general terms, heritage can be understood as "the full range of our inherited traditions, monuments, objects, and culture," including "the range of contemporary activities, meanings, and behaviours that we draw from them" (UMass Amherst Center for Heritage and Society). In this sense, heritage can be "both tangible and intangible" (*ibid.*). Because it is a library/archive, it is possible to associate BHL with tangible heritage, which would refer to the actual texts it includes. Nevertheless, the goal of BHL is not the dissemination of texts, which in most cases are housed in and contributed by other institutions, but the dissemination of biodiversity-related *knowledge*. Therefore, it is perhaps more suited—and more compelling—to think of BHL in terms of intangible cultural heritage. This concept, introduced in 1982 at a UNESCO conference (Legrand-Galarza 76), "provides a new perspective on continually evolving *living and creative cultural processes*, encouraging us to focus our attention on *dynamic elements* and the *holders* of these human heritages" (77; emphases mine). Even if it emphasizes the *human* aspect of heritage, this definition can encompass bio-diverse narrative multiplicity and consider its value in the interactions and coexistence of species and the (hi)stories they continue to tell. Given that UNESCO identifies "Knowledge and practices on nature and the universe" as intangible cultural heritage (Legrand-Galarza 81), we can understand the (hi)stories of human and nonhuman biodiversities as a form of intangible natural-cultural heritage.^{iv} Thus, intangible natural-cultural heritage can incorporate both human (*anthropos*) and nonhuman (hi)stories, especially those of plural humanities.

In the context of intangible natural-cultural heritage, it is essential to remember that the *heritage* in BHL's name does not exist in isolation but is accompanied by *biodiversity*, which means it refers to biodiversity *as* heritage. The human values associated with *biodiversity* then drive bio-diverse

heritage (as explained in the Introduction to this thesis), meaning that BHL is going beyond the *physical* existence of *biodiversity* and into the (co)existence of the plural *anthropos* with-in *biodiversity*. Moreover, while, on the one hand, “BHL seeks to provide the most comprehensive collection of legacy botanical and zoological taxonomic literature possible” (Kalfatovic and Rinaldo 10), on the other, it holds the vision of “[i]nspiring discovery through free access to *biodiversity knowledge*” (Biodiversity Heritage Library, *BHL Bylaws*; emphasis mine). Considering as well that BHL’s purpose is “to improve and make more efficient the methodology of research in biodiversity studies by collaboratively making biodiversity literature openly available to the world as part of a global biodiversity community” (*ibid.*), it becomes more apparent that the *heritage* in the Library’s name refers not only to the material texts but to the (hi)stories and plural knowledges they contain.

Given the connotations of all three elements in its name, BHL posits itself as an archive that offers online open access to intangible natural-cultural heritage by digitizing the tangible texts of its partner institutions, which, additionally, “lose” their physical materiality and acquire a more digital tangibility.^v Thus, the natural-cultural heritage dimension of this archive can potentially advance the deconstruction of binaries between humans and nonhumans (as determined by the traditional schism between nature and culture) by building upon a coexistence rather than a hierarchy, a goal that aligns with the CRSEUoB model. After dissecting the three parts of its name, one could define BHL as an open-access digital archive that seeks to (digitally) preserve and disseminate the intangible natural-cultural heritage of the (hi)stories of biodiversities and plural humanities.

1.2 Archival Glocality: BHL México and BHL’s Global Outlook

If the global open-access outlook and precepts of the Library shall seek to promote equitable intra and interspecies relationships, an essential part of BHL’s mission should lie in addressing issues of representation, one of which relates to the presence and inclusion of plural humanities, that is, a

focus on the *anthropos* (as opposed to the *humanitas*) that can lead to a truly bio-diverse and decolonial digital library. Nevertheless, BHL still faces important challenges that pertain to geopolitical inequalities that deeply hinder the Library's global outlook. BHL originated in the Global North and, while it has consistently performed commendable efforts to become a global repository and transcend the boundaries between the Global South and North, it still has a long way to go to become a truly decolonial option as a CRSEUoB.

A decolonial archive that equitably represents plural humanities must transcend the hierarchical relationship between the Global South and North as sites of knowledge production. While BHL is defined as “a large-scale digitization project that provides open access to the published literature of biodiversity for scientists and others” (Rinaldo 259), such access was initially provided by the original member institutions of BHL, which include museums, libraries, and universities exclusively located in the United States and the United Kingdom^{vi} (Pilsch et al. 137–38). Similarly, BHL's Secretariat was established “at the Smithsonian Libraries in Washington, DC” in the United States (Kalfatovic and Rinaldo 2). All of these institutions can be considered major players in the production, dissemination, and legitimization of “global” knowledge, but the obvious centring of BHL around the US and Europe—and anchored in English as the major language for the creation and publication of bio-diverse knowledge^{vii}—overlooked, at least in its origins, the role of the Global South and Indigenous cultures in knowledge production related to bio-diverse epistemologies. Such an omission occurred despite much of the knowledge in the collections of these institutions pertaining, precisely, to the Global South and Indigenous cultures. In other words, the ownership, curation, (online) presence, and production of knowledge *about* biodiversity from the Global South and Indigenous communities were—and continue to be—in the hands of Global North Anglophone hegemonic institutions.

These originally limited geographical and cultural affiliations notwithstanding, BHL has

gradually approached its goal of becoming a more global open-access repository of global literature on biodiversity. In this regard, an essential objective of BHL has been to “expand [its] international footprint” by incorporating “mirrored content” and “ingest[ing] from global data providers” (Freeland). From the outset, this objective was in line with modern technologies and archival approaches that “were attracting research institutions, natural history museums, taxonomists, and libraries” and constituted “the beginning of bridging across silos of information and closed communities of practice to create integrated communities of knowledge” (Pilsk et al. 137). With this global digital outlook for a community of bio-diverse global knowledge, BHL undertook two main strategies. On the one hand, being a cornerstone of the Encyclopedia of Life (EOL) (Rinaldo 259), the Library established connections with other institutions and organizations with similar scopes,^{viii} as well as “with society and commercial publishers” and “content aggregators such as BioOne” (260). On the other hand, BHL sought to establish global nodes with partners in different parts of the world that would contribute to its collections by making more diverse biodiversity-related materials available through its catalogue. The first BHL global nodes were BHL-Europe and BHL-China, both initiated in 2009 (Pilsk et al. 153–54). These nodes were followed by several others around the globe, with different participation schemes in their partnerships with BHL:

BHL global partners are located in Europe, China, Australia, Brazil, Egypt, Sub-Saharan Africa, Singapore, and Mexico. Some global partners (BHL Singapore, BHL Mexico and BHL Australia) have opted for full BHL Membership; others, (BHL Africa, Naturalis, Museum of Nature) have chosen BHL Affiliate status. Discussions are ongoing with the remaining global partners to formalize their BHL status. Areas of future growth^{ix} include India, Russia, Canada, Latin America, Japan, and others. (Kalfatovic and Rinaldo 6)

These efforts have moved the archive away from its initial US/UK-centric consortium.

Furthermore, the widening of the Library’s network of partners has also impacted its reach amongst

global audiences, with “millions of users in all countries, territories, and regions enumerated by Google Analytics—including Antarctica” (2). Moreover, the networking efforts of BHL have resulted in collections that encompass a broad arrange of genres. With partners and users across the globe, BHL has been able to incorporate a global diversity of materials not only “on the core literature of biodiversity that supports taxonomic research” but also “from the areas of agronomy and other tangential areas (e.g. geology, anthropology)” (8) as well as varied materials, from books, journals, and articles to “field notes, diaries, correspondence and related images” (10). In this sense, the collections of BHL seem to follow E.O. Wilson’s idea of biodiversity as applicable to *everything*, in this case, to bio-diverse (hi)stories recorded in a wide array of digital and digitized literature.

After implementing these networking strategies, BHL has moved towards a more global approach, with a catalogue characterized by a multiplicity of genres, topics, disciplines, and audiences. On the one hand, this multiplicity aligns with the CRSEUoB model through the incorporation of diverse and plural humanities and biodiversities, as well as diverse modes of narrating their (hi)stories at the various storytelling layers of digital archives. On the other, however, that same multiplicity highlights the need to address and contend the colonial background and dynamics of and around the texts included in the Library’s catalogue, as well as its archival standards, which are fundamental steps that could lead to a real decolonial option for a CRSEUoB. This decolonial move, in its pursuit of multiplicity and plurality, requires that globality intertwines with locality, creating a global community that nonetheless recognizes and emphasizes the value of the local.^x

The importance of decolonial glocality for BHL is perhaps more clearly exemplified by its global nodes in the Global South, such as BHL Africa, BHL SciELO, and, the main focus of this dissertation, BHL México. BHL México was conceived in 2014 and established in 2015 through a partnership between BHL and several Mexican institutions and organisms.^{xi} At the head of the

project is Mexico's Comisión Nacional para el Conocimiento y Uso de la Biodiversidad (CONABIO, National Commission for the Knowledge and Use of Biodiversity), a government organism in charge of the protection of biodiversity in Mexico and the dissemination of plural knowledges, with an emphasis on Indigenous cultures, especially concerning sustainability and conservation. CONABIO was founded in 1992 and is constituted by ten government departments in Mexico^{xiii} (Comisión Nacional para el Conocimiento y Uso de la Biodiversidad (CONABIO), '¿Qué Hacemos?'). This conglomerate incorporates different perspectives and spheres of public administration into the activities, policies, and goals of CONABIO concerning biodiversity and natural resources, from national management to international relations. In this regard, the BHL-CONABIO partnership was, precisely, a result of CONABIO's involvement in and commitment to national and international conservation efforts:

Comisión Nacional para el Conocimiento y Uso de la Biodiversidad (CONABIO) was a long time participant in the Encyclopedia of Life (EOL). José Sarukhán Kermez (National Coordinator, CONABIO) precipitated CONABIO's involvement in BHL during Encyclopedia of Life meetings attended with BHL Chair, Nancy E. Gwinn in 2014. These discussions led to a workshop held at the CONABIO offices in Mexico City during the first week of December 2014 where CONABIO signed BHL MOU to create BHL México.

(Kalfatovic and Rinaldo 8)

More specifically, CONABIO and its work, including its partnership with BHL, are part of the Mexican's government *Estrategia Nacional sobre Biodiversidad de México y Plan de Acción 2016-2030* (ENBioMex, National Strategy on Biodiversity of Mexico and Plan of Action 2016-2030), which aims to promote the national appreciation and conservation of biodiversity and includes a fifteen-year plan of action in several spheres of public management (Sarukhán Kermez 5). ENBioMex and BHL México became a reality around the same time, and in both projects, CONABIO is the central

agent. Despite its mostly national scope, ENBioMex responds to, aligns with, and seeks to collaborate in international conventions and efforts to protect biodiversity. ENBioMex's strategic axes closely follow the Aichi Biodiversity Targets established by the Convention on Biological Diversity (CBD)^{xiii} in its plan for 2011-2020 (7). Each strategic axis in ENBioMex incorporates the corresponding objectives of the CBD and Aichi Targets to highlight not only the national plan of the government but also its commitment to international (i.e. global) goals (Comisión Nacional para el Conocimiento y Uso de la Biodiversidad (CONABIO), *Estrategia Nacional Sobre Biodiversidad de México (ENBioMex) y Plan de Acción 2016-2030* 19). Thus, given its local and global scope—an outlook shared with BHL—CONABIO has sought to increase its work with Mexican communities, especially Indigenous groups, as well as with international institutions, such as BHL.

CONABIO's partnerships and collaboration initiatives have two main objectives. First, tied to BHL's efforts towards multiplicity, the CONABIO-BHL partnership was conceived as an opportunity to share Mexican plural knowledges with global audiences; and second, the partnership is a means to ensure the digital preservation of Mexican biodiversity-related collections. Regarding preservation, this has long been an important concern of digitization and archival projects (Rodríguez Reséndiz X). However, in Latin America, digitization initiatives tend to focus on access but not so much on digital preservation (Voutssas 85), thus forgetting that “[p]reserving how we experience and apprehend the record is as much an archival objective as preserving what the record contains” (Prelinger 21). In Mexico and other Latin American countries, this situation is often due to the lack of funding, awareness, and long-term planning and strategies (Miranda Trigueros and Ramírez Islas 26; Voutssas 86). Therefore, digital preservation often requires collaboration between different local and international institutions to ensure the permanence of digitized heritage in the long term (Rodríguez Reséndiz XII), and collaboration with international consortia is an ideal option to guarantee the preservation of digital/digitized heritage. In this context, BHL México and the

collaboration between BHL, CONABIO, and several branches of Universidad Nacional Autónoma de México (UNAM, National Autonomous University of Mexico) benefit Mexican institutions both in terms of access and circulation and regarding long-term preservation (Ríos Ortega XXI).

This was one of the main concerns of UNAM's Instituto de Biología [IB, Institute of Biology], a fundamental actor in BHL México that has contributed a considerable number of materials to its collection.^{xiv} Beginning in 2010, IB had faced important challenges concerning its historical archives: on the one hand, many (physical) materials in its collection required special care to ensure their conservation, for which a special collection archive was created; on the other, this special collection led to the consecration of the archive, which became an obstacle for public access to its materials, thus contradicting the very objective of conservation (Tapia Tinajero and Guzmán Vera 51). As a result, the institute began digitization efforts to reconcile both of its missions, that is, access and preservation (52). Additionally, IB sought to establish partnerships that could aid both objectives, which resulted, amongst other collaborative agreements, in the institute's association with BHL and CONABIO, and, thus, its affiliation to BHL México (54). This example evidences one of the main objectives and values of the partnership between Mexican institutions and BHL and follows the seven principles of digital preservation identified by Juan Voutssas: quality, permanence, accessibility, availability, functionality, and trustworthiness (89-90). In terms of quality, BHL, in partnership with the Internet Archive, provides guidance and infrastructure to its partners for adequate digitization that produces high-quality digital objects. Regarding permanence, accessibility, and availability, BHL and the Internet Archive ensure the long-term preservation of and access to partner collections. In terms of functionality, BHL follows international standards for metadata^{xv} while working towards the opening of spaces for contextualized and collaborative metadata. Finally, concerning trustworthiness, BHL's consolidated status as a global digital archive^{xvi} strengthens the status of its partner collections worldwide.

From its inception, BHL has been situated in complex epistemic and bio-diverse global and local networks that evidence the intricacy of its global outlook, which requires a deeper understanding of the geopolitical nuances of local and global bio-diverse digital archives. While BHL, particularly in the case of BHL México, has become a means for its partners to ensure the digital preservation of local materials and serves to enhance public local and global access to them, it still contributes to the schism between the Global South and North as sites of knowledge production. As mentioned before, both globality and open access must be re-framed and re-understood from an equitable and decolonial standpoint. For BHL to become a digital archive in line with the CRSEUoB model that posits the *anthropos* as the human decolonial agent of the Anthropocene, it is imperative not only to seek the incorporation and preservation of global materials but, especially, to diversify its access by pluralizing its practices of cultural representation and engagement.

1.3 Decolonial Collections: Towards Plural Linguistic Representation

In light of ENBioMex's, CONABIO's, and BHL's glocal scope—and back to the importance of BHL's multiplicity towards a CRSEUoB—diversified and decolonial *access* is another essential goal of national and international collaboration around bio-diverse knowledges. In addition to preservation, partnerships for a (digital) archive under the CRSEUoB model can and should promote awareness of the value of plural epistemologies as well as plural global and local access to them. In terms of the archive, these goals accentuate the question of *who* can access the (hi)stories it (re)tells, with one of the initial entryways—and barriers—being the language of those (hi)stories.

Seeking precisely to promote access, awareness, and plurality, one of BHL México's objectives was to increase the number of materials in Spanish available in BHL (Tapia Tinajero and Guzmán Vera 56). Prior to the establishment of the partnership for the creation of BHL México,

BHL included 600 texts *about* Mexico, only 44 of which were written in Spanish (*ibid.*). The rest of these texts, written in other languages, were produced *outside* of Mexico, mainly in the US and Europe, that is, these were texts in which Mexican biodiversity was the *object* of study, but Mexico was not the *site of production of that knowledge*. Thus, before its partnership with CONABIO, BHL was reproducing a hierarchical epistemological relationship between the Global North as the Subject of knowledge and Mexico as its object. On the contrary, the vast majority of BHL México's texts—now incorporated into BHL collections—are written and published in Mexico. Therefore, through their partnership, CONABIO has reached out to global and plural audiences and BHL has opened spaces for the incorporation of plural knowledges and, most importantly, plural sites of knowledge production, taking a step beyond the traditional colonial epistemic relationship between the Global South and North. Moreover, BHL México's texts are currently grouped in BHL's collection *Publicaciones en español*, to date,^{xvii} the only listed collection on BHL that is built around a specific language and not presented in English. With this and other similar moves, BHL seems to be expanding its collection and services to become a multilingual platform,^{xviii} which is a fundamental part of the decolonization of digital archives as it goes hand in hand with multicultural representation.

Despite the Library's multilingual goals, BHL's collections—including those pertaining to its general catalogue as well as those pertaining to its global nodes—are still quite far from truly diverse linguistic representation, as they continue to be heavily dominated by English and centred in the Global North. In this regard, it is interesting to note that materials in the BHL catalogue—now at 156,957 records^{xix}—are mostly in English even for projects such as BHL China, BHL Africa, and BHL Singapore.^{xx} For instance, the BHL China collection in the Internet Archive, with which the “BHL partners ... for file staging and storage” (Kalfatovic and Rinaldo 8), incorporates 133 texts in English, five in German, three in French and one in Latin (Figure 2). In turn, the BHL Singapore

collection in this same repository includes 490 texts in English, 13 in French, five in Dutch, five in German, five in Japanese, five in Latin, and one in Romanian (Figure 3). Therefore, more than 90% of the texts in both BHL China and BHL Singapore are in English.

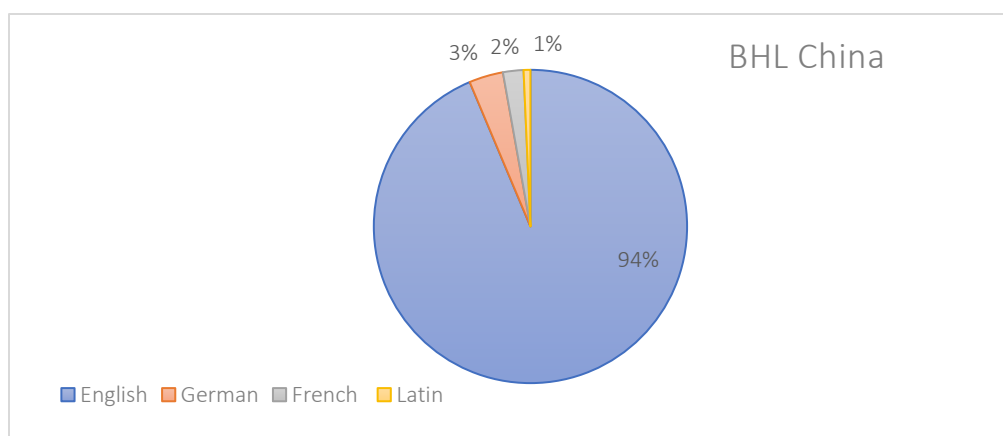


Figure 2 Language distribution for BHL China in the Internet Archive (as of June 2020).

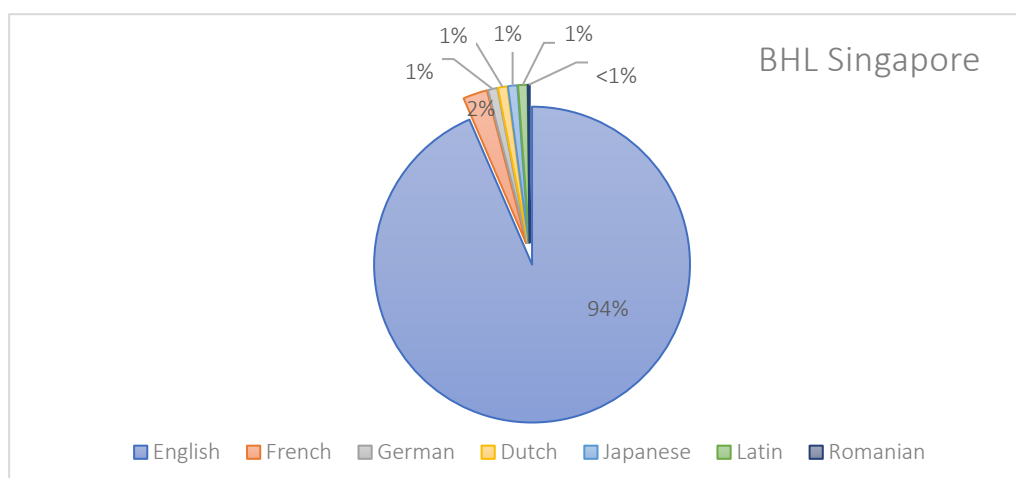


Figure 3 Language distribution for BHL Singapore in the Internet Archive (as of June 2020).

Similarly, the BHL Africa collection consists of 349 texts in English, 26 in German, 20 in French, 18 in Latin, five in Dutch, four in Swedish, two in Italian, seven texts with no language classification, and three mislabelled materials. Of the seven unclassified objects, six are not texts but photographs or drawings while the remaining one is in English. Of the three mislabelled objects, one is marked as being in Afrikaans and the other two in unidentifiable codes for languages, but all three are in English. As a result, over 80% of the BHL Africa collection is, in fact, in English (Figure 4).

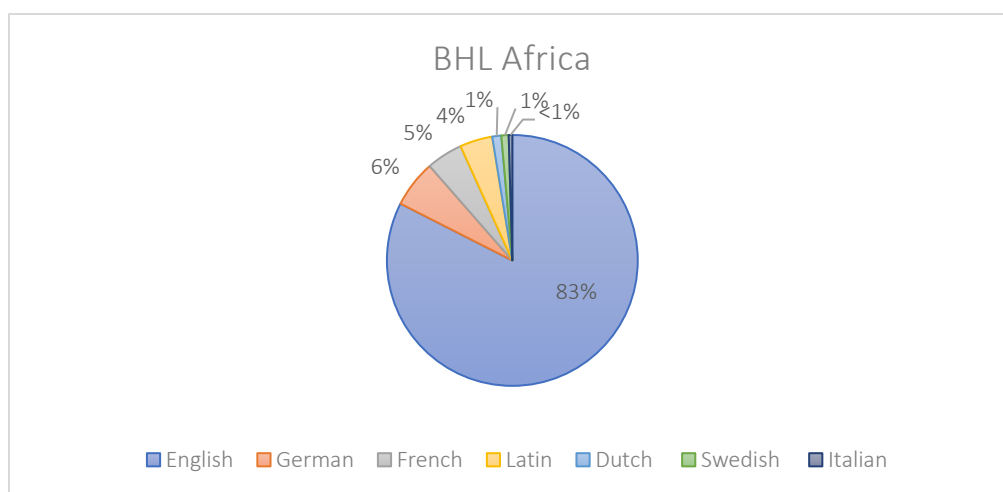


Figure 4 Language distribution for BHL Africa in the Internet Archive (as of June 2020).

On the other hand, BHL México and BHL SciELO (the node for Brazil) favour their countries' official/imperial^{xxi} languages—Spanish and Portuguese—in their collections. BHL SciELO includes 480 texts in Portuguese, 39 in French, 29 in English, nine in German, five in Spanish, three multilingual, one in Danish, and three in Latin (Figure 5). In turn, BHL México's collection is almost completely in Spanish, with 1172^{xxii} materials in this language and only one in English and one in French (Figure 6) ('BHL México').

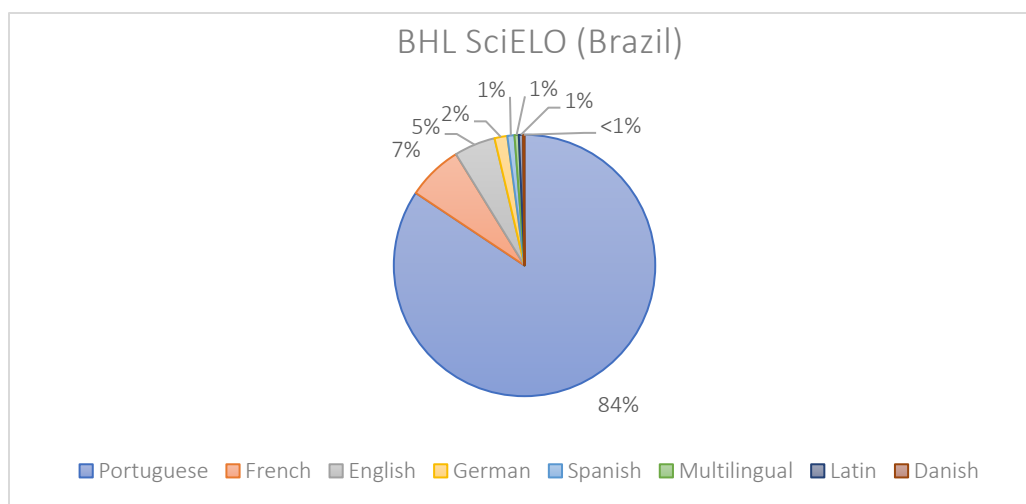


Figure 5 Language distribution for BHL SciELO in the Internet Archive (as of June 2020).

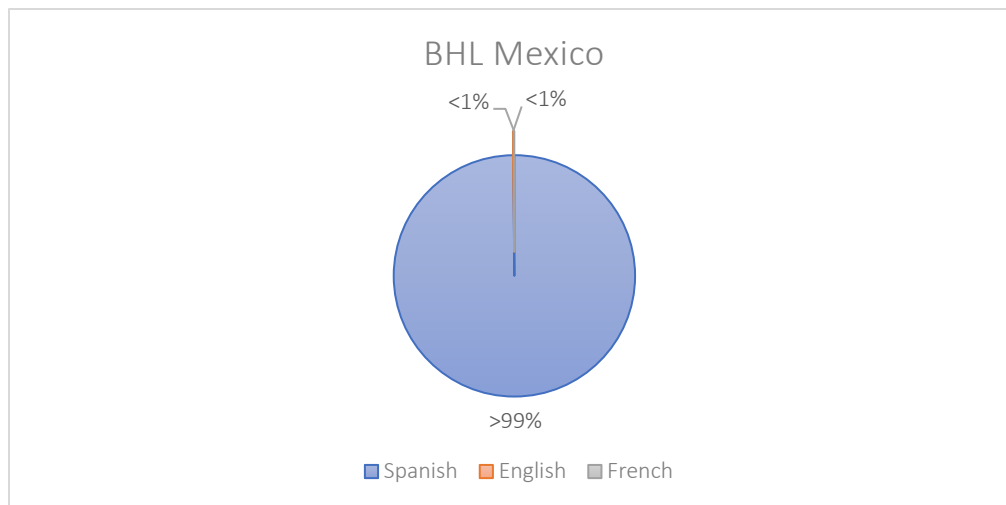


Figure 6 Language distribution for BHL México in the Internet Archive (as of June 2020).

The figures for BHL's Mexican and Brazilian nodes thus highlight the value of global partnerships in strengthening the presence of languages other than English in bio-diverse epistemologies. However, the numbers of these five collections together also reveal a still heavily Anglocentric catalogue, suggesting that, while many languages other than English are present in its collections, BHL necessitates a deeper restructuring of its multilingual representation practices if it is to achieve equitable linguistic representation and become a truly global and plural archive. In this regard, decolonizing the Internet requires an equitable representation of a multiplicity of cultural communities, which is often tied to languages but should transcend into the realm of cultural production. Decolonization is a necessary political reorientation of knowledge production (TallBear), meaning that BHL can only decolonize its collections by reversing traditional epistemic hierarchies. In this case, multilingualism and multiculturalism should aim at counteracting the hegemony of English and the Global North in the production of bio-diverse knowledge, which can be achieved by critically approaching and diversifying BHL's archive.

The partnerships for projects such as BHL China, BHL Singapore, BHL Africa, BHL México, and BHL SciELO must move beyond the mere establishment of nodes outside the geographical confinements of the Global North and build collections from a geopolitical and

decolonial epistemic standpoint. BHL Africa, for example, should not be simply a node located in the African continent but must incorporate multilingual and multicultural knowledge production originated in Africa by diverse and plural communities. Decolonization is not the same as mere inclusion^{xxiii} (TallBear), meaning that having a partner or set of partners in the Global South without questioning the colonial nature of the materials and archival practices that they, as well as BHL, reproduce, is insufficient. These shortcomings of BHL and biodiversity collections continue to fuel the epistemic, political, geographical, and cultural power dynamics between the *humanitas* and the *anthropos*, that is, between the Global South and North.

Even where we find apparent diversification—for example, in the inclusion of languages other than English—BHL is still subject to the Eurocentrism of archives, as there are, for instance, almost no materials in the Library in non-hegemonic languages. In the case of BHL México and SciELO, it is noteworthy that, even if they challenge Anglocentrism, Spanish and Portuguese are still imperial/European languages. Furthermore, all five collections previously discussed—BHL China, BHL Africa, BHL Singapore, BHL SciELO, and BHL México—lack materials in Indigenous languages, despite the cultural Indigenous richness of these regions and countries. In Mexico, the absence of Indigenous languages is even more relevant considering that ENBioMex establishes as one of its main goals the inclusion and re-valorization of Indigenous bio-diverse knowledge and sustainable practices, a goal that CONABIO has also consistently pursued: “se debe resaltar la importancia de los pueblos indígenas, los afrodescendientes y las comunidades locales en la conservación y el uso sustentable del patrimonio natural de México”^{xxiv} (Comisión Nacional para el Conocimiento y Uso de la Biodiversidad (CONABIO), *Estrategia Nacional Sobre Biodiversidad de México (ENBioMex)* y *Plan de Acción 2016-2030* 19). Thus, BHL’s numbers accentuate a need to focus on such re-valorization not only from the local but also towards the global. Here, again, glocality becomes a central mission for BHL’s global nodes. If the BHL-CONABIO partnership is a move to

further the latter's goals—which are also the goals of Mexican environmental policies at large—it is fundamental for BHL México to move away from imperial linguistic representation and towards the inclusion of nonhegemonic languages. In this sense, CONABIO is in a privileged position to advocate for the incorporation of Indigenous knowledges, materials, and languages in BHL, which has the added potential of increasing the Mexican organism's agency concerning not only the inclusion but the re-positioning and decolonization of Mexico's bio-diverse epistemologies in BHL's catalogue.

Nevertheless, it is fundamental to acknowledge the advantages of multilingual inclusivity, even in the case of Spanish. Despite the absence of Indigenous languages in BHL, incorporating and highlighting the importance of other languages—even if they are still hegemonic and imperial, as is Spanish—is at least a move away from English privilege. Such a move is especially crucial in online and digital spaces given that “[t]he language used to tell the stories in archives matters a great deal because English has been key to establishing Western thinking and histories” (Cushman, ‘Supporting Manuscript Translation in Library and Archival Collections: Toward Decolonial Translation Methods’ 54), especially online. Additionally, emphasizing knowledge production in Spanish can counteract “the increasing globalization of English as the *lingua franca*” (66), not only concerning online presence but as “the *lingua franca* of imperialism, knowledge work, and global capitalism” (Cushman, ‘Wampum, Sequoyan, and Story: Decolonizing the Digital Archive.’ 121). Although Ellen Cushman is referring to Indigenous languages and translation of archives into those Indigenous languages, the author also notes that translation and inclusive efforts can aid “any language Othered by those who wield imperial languages and displace others” (58). In the case of BHL, having a considerable number of materials in Spanish is a first and valuable move away from the digital hegemony of English and an opening to non-anglophone communities. The BHL México project, despite its shortcomings, can still be characterized as a decolonizing initiative that can aid in

reorienting knowledge production (TallBear) by positing Mexico and Spanish at the center of bio-diverse epistemic networks vis-à-vis English and the Global North.

Furthermore, including, promoting, and growing the selection of texts in Spanish in BHL is a potential step forward in providing access to Indigenous communities,^{xxv} especially in Latin America. In this region, out of 522 identified Indigenous peoples, 99 have lost their language and speak either Spanish or Portuguese (UNICEF España). Additionally, the majority of Latin American Indigenous peoples are bilingual (speakers of an Indigenous language plus Spanish or Portuguese), with the number of monolinguals of Spanish and Portuguese growing every year (López). In this sense, increasing the online presence of materials in these two languages, albeit imperial languages, could potentially mean increased access to these materials for certain Indigenous communities.

The situation is, however, much more complex, not only because of the digital divide^{xxvi} but especially since a considerable number of Indigenous languages in Latin America are endangered because of the privileged position of Spanish vis-à-vis Indigenous languages. On the one hand, this is due to the colonial perspective of Spanish as the language of progress, and, on the other, because speakers of Indigenous languages often experience discrimination (López 90–92). This situation relates to an imbalanced appreciation of bilingualism, which is considered positive when it refers to Spanish and another hegemonic language—in most cases English being the first on the list—and negative when it refers to Spanish and an Indigenous language (94). This is an intricate panorama for digital archives; while increasing the online presence of Spanish is a move away from Anglophone digital neoimperialism, it is simultaneously a contribution to the consolidation of Spanish as the language of knowledge and progress—as opposed to Indigenous languages—in Latin America.

Once more, while multilingualism is a fundamental goal for decolonial digital archives, not considering the local and global geopolitics and colonial history of cultures and languages can lead to a reinforcement of colonial and hierarchical structures of power, in this case, anchored in networks

of bio-diverse knowledge. Although the decision-making process, in this case, is not easy, these are issues that need to be addressed and emphasized, especially in online epistemic practices: “we must recognize a diverse landscape of needs, histories, cultural politics, and local and intranational agendas” (Christen 2009). Ideally, a site of knowledge production and dissemination such as BHL includes all languages, starting with those that have historically been most oppressed, such as Indigenous languages, a fundamental task that should be shared and encouraged amongst partners in their local practices.

Nevertheless, as shown by the case of Spanish, making space for materials in languages other than English in BHL is a decolonizing first move that can contribute to the deconstruction of epistemic hierarchies in digital archives. The importance of Spanish and BHL México attests to the claim “that archival work happening in languages other than English is central to understanding the everyday rhetorical work occurring in communities” (Cushman, ‘Wampum, Sequoyan, and Story: Decolonizing the Digital Archive.’ 116). Moreover, it is a positive point of departure

to re-place peoples within a global earth, to help realize more fully human peoples, and to help create pluriversal options and knowledges ... to question discipline building altogether, to make connections across differences, to appreciate knowledges and languages as equally valuable while respecting and understanding the social injustices and hierarchical arrangements creating those differences, to find alternative ways of structuring being and knowing in this world. (Cushman, ‘Supporting Manuscript Translation in Library and Archival Collections: Toward Decolonial Translation Methods’ 58)

While addressing its challenges and shortcomings is essential, it is important to highlight the value of taking steps into the creation of a multilingual library that, bit by bit (meaning both piece by piece and binary digit by binary digit), might lead to the plural and diverse inclusiveness required by a CRSEUoB for the *anthropos* in the Anthropocene.

1.4 Decolonial Access: Towards Plural Audience Engagement

Transcending the realm of language—as discussed in terms of Spanish and access for Indigenous communities in the case of Mexico—multilingual diverse representation in BHL is and should be deeply tied to diverse access for diverse global and local communities. The repositioning of the Global South as a site of bio-diverse knowledge production in BHL must be translated into the inclusive and decolonial facilitation for the participation of diverse plural humanities. Thus, along with diverse language representation, it is essential to consider the geopolitics of access to and engagement with BHL from a glocal standpoint. For BHL to become a decolonial digital archive within the CRSEUoB model, it is imperative to understand *who* can engage in bio-diverse storytelling through the Library and how such access can be further diversified and decolonized, in this case, for Latin American audiences.

Web analytic data, especially metrics related to traffic,^{xxvii} are a useful point of entry to understand audience engagement with BHL and, as a point of comparison, with CONABIO's websites. These metrics are particularly insightful as they all evidence essential processes in networks of “user-system-information interactions” (Jansen 6) in the context of biodiversity-related epistemologies. Thus, in this section I discuss web analytic data obtained mainly from Similarweb^{xxviii} between April and July 2020 for six websites:^{xxix}

1. BHL's main website (biodiversitylibrary.org)
2. CONABIO's biodiversity site (biodiversidad.gob.mx)
3. CONABIO's library, Bioteca (bioteca.biodiversidad.gob.mx)
4. CONABIO's social network, NaturaLista (naturalista.mx)
5. UNAM's Repositorio Institucional (RI-UNAM) [Institutional Repository]
(repositorio.unam.mx)^{xxx}
6. MEXICANA: Repositorio del Patrimonio Cultural de México [Repository of the

Cultural Heritage of Mexico] (mexicana.cultura.gob.mx)^{xxxii}

Web analytic data on these six websites provide an interesting panorama on how audiences engage with biodiversity-related content and online archives, in this case, from the perspective of Latin America and, in particular, Mexico. Through a comparative analysis of web analytic data, it is possible to reflect on the status of these websites in these regions and to open spaces for a dialogue towards collaboration and archival practices aiming at a CRSEUoB as a decolonial option in the Anthropocene. Furthermore, this comparative approach to web analytics—a key component of the mixed methods employed throughout this dissertation—allows for a better and more nuanced understanding of the layer of *access* in the storytelling mechanism that is BHL.

To understand the question of access, first, it is necessary to consider and compare the number of visits each of these websites receives. For instance, CONABIO's biodiversity website (CONABIO from here on) registered significantly high numbers of total visits^{xxxiii} between April and June 2020 when compared to Bioteca—CONABIO's digital library—which has considerably lower numbers in comparison to both CONABIO and BHL, the latter being in the middle but with numbers closer to those of CONABIO (Figure 7).



Domain	Total Visits
 biodiversitylibrary.org	782,923
 biodiversidad.gob.mx	1,307,387
 bioteca.biodiversidad.gob.mx	101,356
 naturalista.mx	1,090,726

Figure 7 Total visits to BHL and CONABIO's websites (April-June 2020). Table generated on Similarweb.

When compared to the three other biodiversity-related and/or archival Mexican websites selected for analysis (UNAM's Repository, MEXICANA, and NaturaLista), CONABIO still has the highest average number of visits in terms of daily traffic, closely followed by NaturaLista—the CONABIO-led biodiversity social media platform—and BHL. However, the traffic to BHL is more consistent

and steadier, as shown by data of daily access during June 2020, which presents fewer peaks, both positive and negative, for BHL. In contrast, the daily traffic to CONABIO occasionally drops below both NaturaLista and BHL (although never below Bioteca), especially during weekends, which might suggest that BHL has a more consolidated and constant audience (Figure 8).



Figure 8 Daily traffic comparison of BHL and CONABIO's websites (June 2020). Graph generated on Similarweb.




While data on traffic position CONABIO and NaturaLista as the sites with the highest traffic rates, CONABIO's library, Bioteca, has surprisingly low numbers of visits. This is important because Bioteca is the repository of CONABIO's materials, which indicates that, while audiences might be frequently engaging with CONABIO, they do so mostly through its main biodiversity website—which includes short articles and links to other resources—but not so much through its library, which houses its core knowledge production. In this sense, the BHL-CONABIO partnership holds great value in making the materials housed in Bioteca available as part of BHL's collections. If, as the figures show, BHL has a more consolidated audience, this partnership could mean that CONABIO's collections have a stronger possibility of reaching a greater and more diverse multiplicity of audiences as a result of BHL México, a positive outcome of the partnership that also aligns with the language representation and accessibility goals of the project's collection.

In addition to general traffic trends, traffic by country to these sites is especially relevant when considering BHL's multilingual efforts and shortcomings, tied to the participation of plural audiences, as they reflect the geopolitics at play in audience access to biodiversity-related websites.

As the data show, the first country in the top-10 list of traffic by country to BHL, CONABIO, and Bioteca (to which I refer as the triad moving forward) between April and June 2020 is, not surprisingly, Mexico, with a traffic share^{xxxiii} of 47% (Figure 9). Likewise, when considering BHL, CONABIO, and the three additional websites, 58.06% of traffic comes from Mexico (Figure 10).

Traffic Share by Country

Apr 2020 - Jun 2020 | Worldwide

 biodiversitylibrary.org  biodiversidad.gob.mx  bioteca.biodiversidad.gob.mx

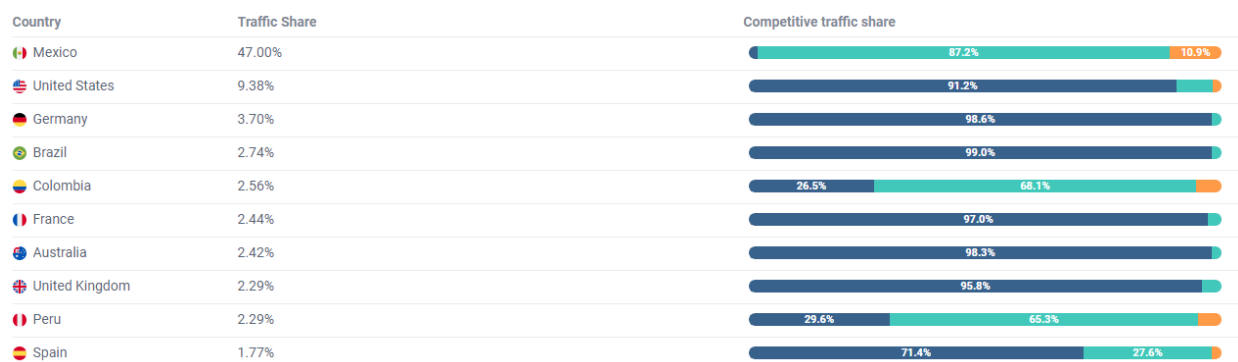







Figure 9 Traffic share by country to BHL, CONABIO, and Bioteca (April-June 2020). Graph generated on Similarweb.

Traffic Share by Country

Apr 2020 - Jun 2020 | Worldwide

 biodiversitylibrary.org  biodiversidad.gob.mx  mexicana.cultura.gob.mx  repositorio.unam.mx  naturalista.mx

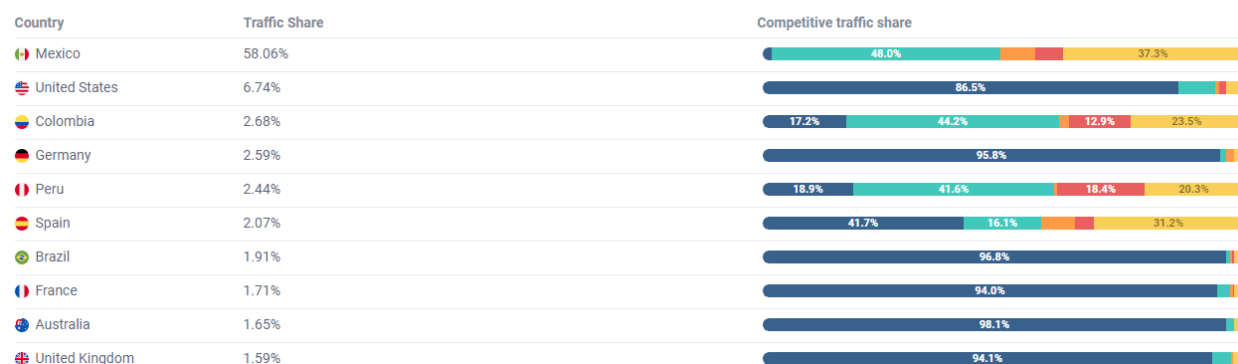


Figure 10 Traffic share by country to BHL, CONABIO, RI-UNAM, MEXICANA, and NaturaLista (April-June 2020). Graph generated on Similarweb.

What is interesting, though, is that BHL has a considerably lower percentage of visits from Mexico when compared to the other websites (1.9% for the triad, 1.1% amongst additional websites). In contrast, CONABIO and its Bioteca take 98.1% of traffic from Mexico in the first comparison (87.2% and 10.9% respectively), and CONABIO and NaturaLista together take 85.3% in the second comparison (48% and 37.3% respectively). These figures suggest that Mexican audiences prefer local

websites when engaging with online biodiversity-related knowledge and that BHL has a low comparative penetration in the country.

These data are particularly telling from the perspective of the global and the local. Given that CONABIO seems to have a consolidated status in Mexico, the BHL México project could be accessed primarily by international (i.e. non-Mexican) audiences, meaning that its representation of Mexican bio-diverse knowledge has a more global outlook. As a result, the decolonization of BHL's catalogue and collections becomes even more fundamental, especially because BHL might be acting as an international window into Mexican bio-diverse knowledge production.

Moreover, this responsibility and necessary ethical stance vis-à-vis Mexico is particularly relevant since BHL has significantly higher traffic numbers in many of the other countries on the list, especially outside of Latin America. For example, while audiences from the United States register access to all six websites, BHL has considerably higher traffic shares: 91.2% in the triad and 86.5% in the second comparison. In both cases, BHL is followed by CONABIO with only 7.9% and 7.5% respectively. Similarly, Germany, the third country with the highest share of traffic to the triad, registers access to four websites, BHL, CONABIO, MEXICANA, and NaturaLista, but access to the last three is minimum, with BHL at 98.6% when compared to CONABIO (1.4%) and 95.8% when compared to CONABIO (1.4%), MEXICANA (1.7%), and NaturaLista (1%). Likewise, Australia, seventh place in traffic share to the triad, registered low access to CONABIO with 1.7%, the remaining 98.3% going to BHL. These figures are very similar to those of the second comparison, where CONABIO received 1.7% and NaturaLista 0.2% of Australian traffic, while BHL received 98.1%. Finally, while the United Kingdom registers traffic to all websites except RI-UNAM and Bioteca, and France registers traffic to all websites except Bioteca, the figures for these countries follow a similar trend to that of other European countries, with over 94% of traffic going to BHL in all comparisons. These data thus show the prominence of BHL amongst audiences in the

Global North. Such figures highlight, once again, the ethical responsibility of BHL in terms of its representation of Global South knowledges and biodiversities vis-à-vis its international audiences. Although open access and BHL's global outlook point to a trans-geographical digital environment, data on traffic by country evidence the geopolitical dynamics of "an ontology that ties knowledge to location as a singular and essential quality of place" (Abraham 210). Therefore, while a global/international outlook is part of the mission of BHL, a clear ethical stance concerning its politics of representation is fundamental in the decolonizing process of its collections and its practices of representation toward diverse audiences.

While these numbers show that BHL has considerably higher penetration amongst audiences in Europe and the United States, countries in Latin America show a different pattern of access to these websites. For instance, in the triad comparison, CONABIO shows traffic shares of 68.1% from Colombia and 65.3% from Peru, being the top website in both countries. Furthermore, Colombia and Peru register access to all six websites, with considerably higher percentages of traffic shares to Mexican sites, especially CONABIO, NaturaLista, and RI-UNAM.

These data show an important interest in Mexican platforms amongst Colombian and Peruvian audiences when engaging with biodiversity-related knowledge online. Additionally, as shown by data from *Sitechecker* (Figure 11), CONABIO's audiences come, primarily, from Mexico (76.11%) but are followed by Peru (4.4%), Ecuador (4.15%), Colombia (3.61%), and the United States (2.54%) (Sitechecker). Therefore, audiences in Peru and Colombia seem to have a certain preference for online bio-diverse knowledge produced in Mexico and considerable interest in CONABIO's website specifically.

Traffic by countries

Figure 11 Traffic by countries to CONABIO's website, July 2020. Graph and data from Sitechecker.

These tendencies might be explained by the strong bond that exists between the three countries concerning conservation and sustainable use of biodiversity. Colombia, Peru, and Mexico are part of the group of megadiverse countries as established by Conservation International, meaning that they belong to a group of 17 countries that have around 70% of the world's species diversity (Comisión Nacional para el Conocimiento y Uso de la Biodiversidad (CONABIO), 'México megadiverso'). Additionally, Colombia, Peru, and Mexico are members of the Group of Like-Minded Megadiverse Countries (LMMC), a conglomerate of countries that are not only megadiverse but also the home of numerous Indigenous cultures and knowledges, and located in Latin America, Asia, and Africa: Brazil, China, Colombia, Costa Rica, Ecuador, India, Indonesia, Kenya, Mexico, Peru, South Africa, and Venezuela (Department of Environmental Affairs South Africa). To date, this group has also been joined by Bolivia, Malaysia, the Philippines, Guatemala, and Iran (Benítez-Díaz). In their founding declaration,^{xxxiv} signed in 2002 in Cancún, Mexico,^{xxxv} these countries recognize their similarities and establish shared goals in terms of their sovereignty over their natural resources; the importance of national, gender, and ethnic equity; the centrality of natural heritage; the value of Indigenous and local knowledges and cultures; the need for biodiversity-related local and international policy; and their place in the global networks of biodiversity and natural resources (LMMC). Furthermore, in 2016, at the Biodiversity Convention Conference (also held in Cancún), Peru, Egypt, China, and Mexico agreed to form a coalition to work on the world biodiversity agenda

for 2050 (Turkish Radio and Television Corporation). In that same year, Mexico and Colombia signed an agreement for a bilateral accord on environmental topics, including conservation and sustainable use of biodiversity (Secretaría de Medio Ambiente y Recursos Naturales). Also in 2016, in Cartagena de Indias, in Colombia, the host country, Mexico, Peru, and Chile, in the framework of the Alianza del Pacífico [Pacific Alliance], signed a declaration of commitment to sustainable development, with one of their goals being “realizar acciones para asegurar la conservación de la diversidad biológica y los servicios ecosistémicos”^{xxxvi} (SEMARNAT México et al.). Thus, the prolific relationship between Mexico, Colombia, and Peru around topics of biodiversity has been continuous since the early 2000s. The networks of bio-diverse collaboration that originate from this relationship could explain the interest of Peruvian and Colombian audiences in Mexican biodiversity-related websites, which show a significant penetration in Latin America when compared to BHL.

The contrast between European audiences, which show greater access to BHL, and Latin American audiences, which demonstrate a meaningful interest in Mexican websites, is further evidenced by the case of Spain. In contrast to Latin American countries, Spain is the only Spanish-speaking country where BHL has the greatest traffic share, at 71.4% in the triad and 41.7% in the second comparison, followed by NaturaLista at 31.2% and CONABIO at 16.1%. Although less stark than in the case of other European countries, the traffic statistics of Spain show a considerably higher penetration of BHL in this country, confirming its status amongst European audiences and perhaps pointing to a less robust relationship between Spain and Latin American countries in terms of biodiversity-related topics and efforts. This, in turn, could be symptomatic of a less robust Global South-Global North collaboration not only regarding biodiversity-related archives but also biodiversity-related cultural production, politics, and international relationships.^{xxxvii} It is here where BHL, in undertaking decolonizing strategies for its archive, could aid in the promotion of more

meaningful Global South-Global North bio-diverse interactions, which is another possible advantage of projects such as BHL México.

Nevertheless, Spain is still part of the group of countries that register traffic to *all six* websites. Of all listed countries, only five—Mexico, the US, Colombia, Spain, and Peru—registered access to *all* compared websites. Interestingly, according to the Instituto Cervantes in Spain, as of 2019, these countries are amongst the six countries with the largest number of native speakers of Spanish in the world,^{xxxviii} Mexico being first with approximately 121.9 million native speakers of Spanish, followed by Colombia with 49.4 million, Spain with 42.9 million, the US with 41 million, and Peru with 32.5 million (Instituto Cervantes 7–9). Considering that Spanish is also the third most used language on the Internet (50), these figures continue to evidence the importance of this language for digital archives such as BHL, emphasizing, once again, the relevance of projects such as BHL México and BHL's *Publicaciones en español* collection in the diversification of the Library's audiences.

The centrality of language and multilingualism in increasing traffic to biodiversity-related websites is further attested by the case of Brazil, which appears in the lists for both comparisons and registers access to all websites except Bioteca. However, Brazil is the only Latin American country where almost all traffic goes to BHL: in the triad, 99% of Brazilian traffic went to BHL and only 1% to CONABIO; in the second comparison, BHL received 96.8% of Brazilian traffic, followed by CONABIO at 1.8%, NaturaLista at 1.2%, and RI-UNAM and MEXICANA at 0.5% each. Given the fact that Brazil is the only one of the listed Latin American countries where Spanish is not the most spoken language, traffic shares by country can be perceived as highly influenced by these websites' main languages.^{xxxix}

The significance of language manifests as well in comparative data of traffic to BHL and CONABIO only. While most countries on the list remain the same, data for June 2020 show the

incorporation of Ecuador, with a traffic share of 91.8% to CONABIO and 8.2% to BHL (Figure 12). Despite Ecuador being a smaller country with less population and, therefore, fewer Spanish speakers than the previously mentioned ones, its high traffic share to CONABIO in June 2020 is considerably high, being the third country with the highest traffic to this website, even above Colombia (Figure 12; see also Figure 11 above). Thus, Ecuador's case can further evidence the relevance of language, as well as of Latin American collaboration, in terms of audiences and traffic to these websites.

Traffic Share by Country

Jun 2020 | Worldwide

bhl biodiversitylibrary.org | biodiversidad.gob.mx

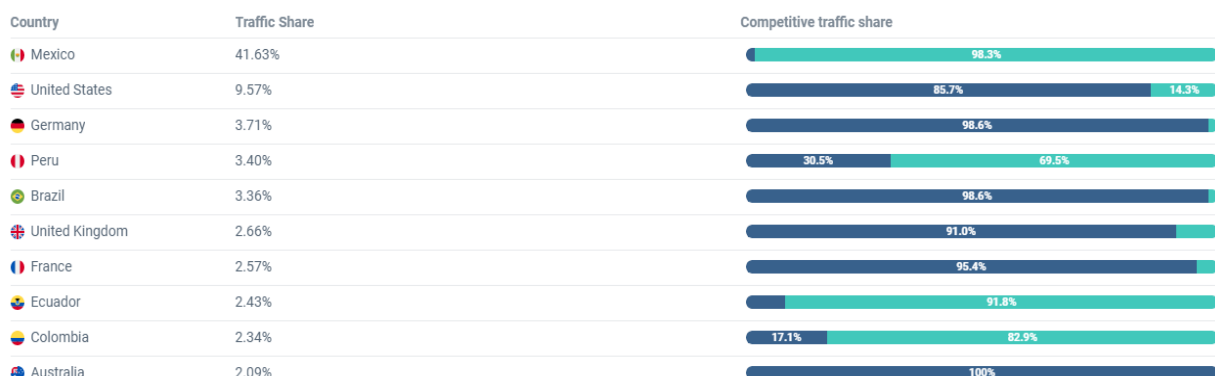


Figure 12 Traffic share by country to BHL and CONABIO only (June 2020). Graph generated on Similarweb.

Nonetheless, the arguments about the value of language are not necessarily true for all countries. While Spain and the US register access to all websites and are two of the countries with the largest number of Spanish speakers in the world, these countries show a considerably greater traffic share to BHL, at 71.4% and 91.2% respectively in the triad. Even the case of Ecuador showcases the need to promote not only a diversity of languages but also a diversity of biodiversity-related networks. For instance, as previously noted, Ecuador is also a member of the LMMC group. Additionally, both Ecuador and Mexico, alongside Belize and Costa Rica, are members of Ecology Project International, an organism that promotes environmental education in these four countries (Ecology Project International). Therefore, Ecuador's important traffic to CONABIO could respond to both

language and the substantial relationship between the two countries in matters related to environmental and biodiversity-related projects, similar to the cases of Colombia and Peru.

It is at this point that the complex panorama of traffic by country moves beyond language and into the sphere of knowledge production, thereby underscoring the possibilities and importance of the BHL-CONABIO partnership. In this regard, the case of Spain is particularly illuminating, as this country shows an interest in all websites that could be explained by language representation but, at the same time, seems to be closer to the preferences of European audiences than to those of Hispanic (i.e. Spanish-speaking) users. Thus, this example reveals, on the one hand, that CONABIO's and BHL's conjoint efforts to increase the presence of materials in Spanish in BHL collections can promote a greater penetration of Mexican knowledge production in countries where audiences prefer BHL. On the other, the engagement of Spain versus Latin America might suggest that a mere linguistic approach is insufficient for the creation of more equitable networks of bio-diverse knowledge production online. The data on traffic by country show a still polarized system of knowledge production as the access to Mexican biodiversity-related websites seems to be still limited to Latin American audiences, while they are far from achieving high penetration in the Global North. Furthermore, the cases of Brazil and Spain together emphasize the need for a strategy that simultaneously considers plural linguistic and geographical representation and that aims to widen the networks of online bio-diverse knowledges beyond the constraints of hegemonic languages and geo-cultural barriers.

Multilingualism and diverse linguistic representation are but the first steps of what should be a deeper restructuring of the networks of bio-diverse knowledge that transcends the hierarchical dichotomy between Latin America and Europe and Northern America. As the data show, CONABIO has less penetration in the US and European countries, which continues to foster such dichotomies. In contrast, the BHL-CONABIO partnership could potentially help highlight local

Mexican systems of knowledge in the global context and promote access to global knowledge in Latin America. For example, data on traffic by country to the Mexican websites only (that is, eliminating BHL from the comparison), show a majority of Latin American countries, the two exceptions being, once more, Spain and the US, which, nevertheless and as explained before, are countries where Spanish is spoken in great numbers (Figure 13).

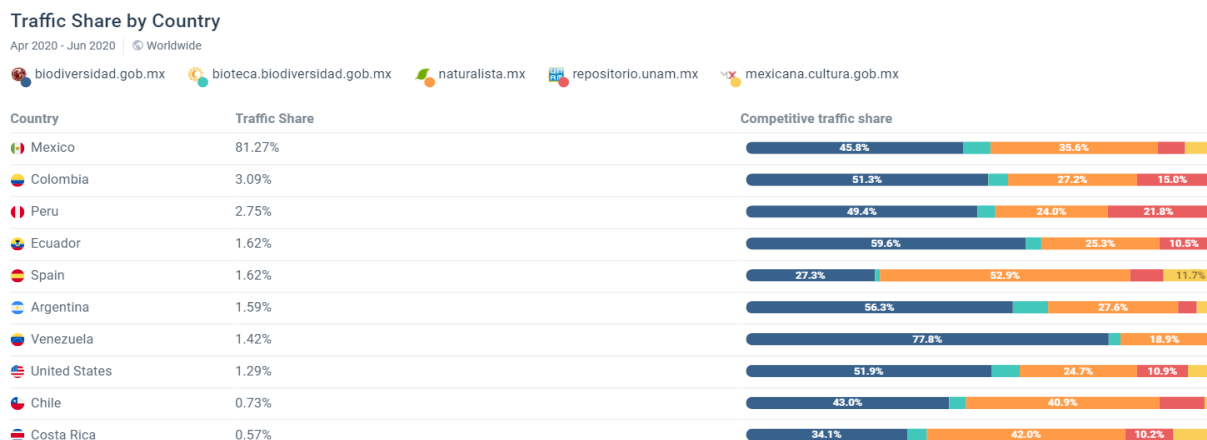


Figure 13 Traffic by country to the five selected Mexican websites (April-June 2020). Graph generated on Similarweb.

Thus, even if language is an essential aspect to consider, Mexican networks of bio-diverse knowledges need to move beyond the language dimension to open their geographic niche to other countries as well, which can certainly happen through collaboration with BHL. In this sense, audiences from Europe and the US can access local Mexican knowledges through the Library, thus helping decentralize epistemic production and move towards more global audiences for Mexican epistemologies and, perhaps, more global networks of bio-diverse knowledges. In turn, while the availability of texts in Spanish is a great asset for Mexican websites such as CONABIO, including them in BHL can make room for more participation of Latin American communities in the Library and in global networks of bio-diverse knowledge, especially considering the important access to and interest in Mexican epistemologies in the region.

Additionally, it is fundamental to highlight that even in the data for the Mexican websites

only, CONABIO's Bioteca continues to register considerably lower traffic shares (Figure 13 above). As previously indicated, Bioteca is CONABIO's digital library; thus, these figures indicate that regardless of traffic to CONABIO, knowledge production from this organism is still scarcely engaged. This is true even for traffic from Mexico, where Bioteca is the least accessed website with a share of 5.7% (closely followed by RI-UNAM at 5.8% and MEXICANA at 7.1%). Therefore, the BHL-CONABIO partnership, which promotes Bioteca's materials, shows vast potential to aid in the diffusion of Mexican knowledge production, even within Latin America.

As seen thus far, the collaboration between BHL and CONABIO can mean greater access to bio-diverse Mexican knowledges, both from Spanish and non-Spanish speaking communities and Latin American and non-Latin American audiences. Furthermore, these circuits of bio-diverse knowledge can engender new local and global epistemologies and relationships that stem from those made available online through BHL, that is, a diversification of the bio-diverse storytelling enabled by the Library. Such diversification of access and participation aligns with the goals of the decolonization of digital environments and archives as they seek to “address gaps in knowledge produced [and disseminated] online, ... make legible narratives and histories that have gone untold, ... locate the subaltern in cyberspace, ... [and] use technologies to push back against existing forms of representation” (Risam, ‘Decolonizing the Digital Humanities in Theory and Practice’ 78). These goals of digital decolonization highlight the importance of data collection and analysis—as well as the mixed methods I utilize throughout this dissertation—as they reveal, precisely, the epistemic gaps as well as the modes and opportunities for the participation of Global South, non-Western, non-privileged, and non-Anglophone communities. As a goal of this thesis, digital (archival) studies should aim for a restructuring of digital spaces that address the issues of digital colonial violence that often translates into “reproducing colonial influences in the production of digital knowledge and centering epistemologies and ontologies of the Global North, namely the U.S. and western Europe,

which in turn decenters those of Indigenous communities and the Global South” (79).

Multilingualism and global cooperation as initiated by BHL and as represented by BHL México thus become the columns of the decolonization of the Library. Moreover, highlighting knowledge production in and from the Global South can counteract widespread beliefs that consider that such production does not or cannot exist given a lack of infrastructure and funding in the region and, instead, focus on the valuable work that, despite such economic, political, and social barriers, is taking place in and from the communities in the Global South (Gil 184). In the end, moving towards a CRSEUoB, a linguistic, cultural, narrative, and participatory plurality with-in multiple biodiversities as (re)told by BHL can hopefully aid in the creation of more equitable relations between the Global South and North as sites of bio-diverse knowledge production.

Despite this potential and in the context of projects and initiatives like the LMMC group that are engendered in and enacted from the Global South, it is notable that the data show no presence of Asian and African countries in terms of access to both BHL and Mexican biodiversity-related websites, which suggests a minimal to non-existent cross-Global-South interaction. In this regard, a CRSEUoB would require a stronger decentralization of knowledge production through greater collaboration and engagement with and between countries outside of Europe and the United States. This might be better undertaken by CONABIO and its affiliated websites. Since this organism has established important political and economic liaisons with other countries in the Global South, it would be enriching to participate in archival efforts and projects with and from these countries as well. In turn, BHL could function as a point of contact between them, especially considering the establishment of BHL Singapore, BHL Africa, BHL SciELO, and BHL China, as well as BHL’s plans to expand their partnerships to other countries in Latin America and Asia (Kalfatovic and Rinaldo 6). Promoting a collaboration not only directly with BHL but also amongst its global nodes would be a further step into opening a truly global and decolonial (online) dialogue

around multiple biodiversities, as well as engendering greater and more plural participation and engagement.

Overall, BHL's global outlook calls for an ethical and decolonial approach that considers diverse representation and inclusion both in relation to its collections and catalogue and in relation to its global audiences, all of this with the greater goal of providing and promoting access for marginalized and Global South audiences. Such an approach requires the acknowledgement and counteraction of Global North-centric and hegemonic geopolitics and linguistic and epistemic representation that continue to perpetuate colonial archival practices and relationships between the Global South and North. Only through the contestation of such oppressive dynamics can BHL aim to become a decolonial archive—an archive for a CRSEUoB—in the Anthropocene.

1.5 Avenues for Access: Web Responsiveness and Adaptability

The decentralization of the Global North as the center of BHL's structure, as well as the promotion of engagement of diverse audiences in the Library, can be aided by a critical approach to devices, especially considering the cyborgian aspect of a CRSEUoB. As our relationship with bio-diverse knowledges takes place in and through technology, the device used for access, in this case, to BHL, plays a central role in the engagement of diversified audiences, particularly from the Global South.

Such an approach is fundamental in relation to Latin America given the importance and penetration of mobile networks in the region. Back to the comparison between the selected biodiversity-related websites introduced in the previous section, web analytic data shows that BHL has a considerably lower traffic share from mobile devices compared to desktop devices (21.89% versus 78.11% from April to June). This means that audiences access BHL on desktop devices more than three times more often than on mobile ones. In contrast, CONABIO's traffic trends show a more balanced share between mobile (43.56%) and desktop (56.44%) devices, and NaturaLista

records an almost 50/50 split of traffic shares by device (Figure 14). In comparative data of BHL and CONABIO, visit shares to both websites on desktop devices are considerably balanced, with BHL at 45.32% and CONABIO at 54.68%, but mobile visits favour CONABIO by more than three times the share of BHL (76.87% versus 23.13%) (Figure 15).

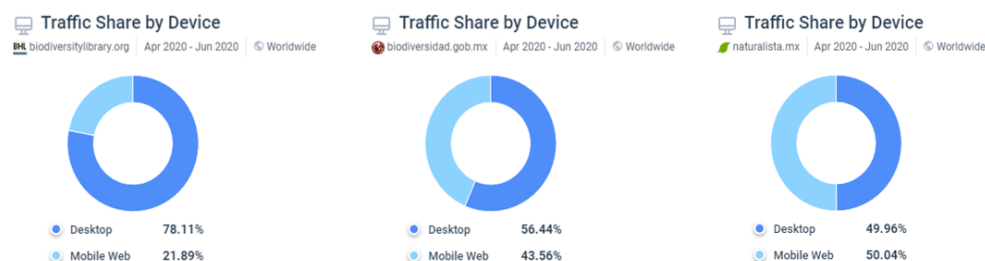


Figure 14 Traffic share by device to BHL (left), CONABIO (center), and NaturaLista (right) (April-June 2020). Graphs generated on Similarweb.



Figure 15 Visits share by device to BHL and CONABIO, April-June 2020. Graph created on Similarweb.

This trend, which shows the preponderance of mobile devices in access to CONABIO, could be explained by two factors: the availability of mobile apps affiliated with these websites and the increasing importance of mobile devices in Latin America, especially in Mexico. In terms of mobile apps, on the one hand, CONABIO has developed an app for its partner website EncicloVida.^{xi} This simple app allows users to search for specific species to obtain information about their characteristics, lifestyle, habitat, geographical location, status, and taxonomic classification, as well as photographs.^{xii} As of July 2020, this app has been downloaded more than 10,000 times from the Google Play Store. On the other hand, NaturaLista is a project directly inspired by and in partnership with California-based iNaturalist and constitutes its Mexican branch. Therefore, it is this

organism that has developed a mobile app, which registers over a million downloads from the Google Play Store. Even though the app is called iNaturalist, users can select their geographic affiliation from a list that includes NaturaLista for Mexico, connecting the user with the social network in the selected country.^{xlii} In both cases, for CONABIO and NaturaLista, the mobile apps link to the affiliated website, which can increase the traffic received through mobile web by connecting to app users. In contrast, BHL does not have a mobile app, which could, at least in part, explain its lower traffic share from mobile devices, thus hindering access from mobile audiences.

In addition to the availability of mobile apps, mobile traffic speaks to the penetration of mobile devices in Latin America, particularly in Mexico. For instance, access to mobile phones in Latin America is expected to increase from 67% in 2018 to 73% by 2025 (Statista). According to the Mexican *Asociación de Internet* [Internet Association], in 2018, 76% of Internet users in this country owned a smartphone, 89% preferred to access the web on a smartphone, and the use of desktop devices in the country decreased by 17% compared to 2017 (Asociación de Internet.mx). Likewise, in 2019, the use of smartphones in Mexico continued to increase: of the 80.6 million Internet users in the country, 95.3% used a smartphone to access the web (Instituto Federal de Telecomunicaciones). Moreover, as of January 2020, Latin America has registered very high percentages of mobile connectivity, with Mexico and Central America having 99% of mobile connections compared to the countries' total population, while South America registered 106%, which also reveals that individual users often utilize multiple connections simultaneously (we are social and Hootsuite).

The penetration of mobile devices, especially smartphones, in Latin America and Mexico, in addition to the availability of mobile apps, could then account for the higher traffic shares to biodiversity-related Mexican websites through mobile web and devices compared to BHL. In this regard, it would be important for BHL to consider mobile networks—especially access via

smartphones—as part of their engagement strategies given the importance and continuous growth of mobile users in regions such as Latin America. According to Scott La Counte, despite the increasing number of available mobile apps in the Apple and Google stores, very few libraries, digital and non-digital, have developed apps to promote their work, which can, in turn, negatively impact their influence, especially on younger generations (8). Going back to the traffic trends by country to BHL and Mexican websites, this argument becomes crucial as population median ages in Latin American countries are significantly lower than those in Europe and Northern America.^{xliii} Given that these countries register important access to BHL and/or Mexican biodiversity-related websites, age becomes another central consideration for BHL in its efforts to increase engagement from and with Latin American (younger) audiences, especially through mobile devices. Additionally, this is a fundamental consideration in terms of intersectional approaches, in this case, considering ethnicity and age, which constitute a central aspect of the *anthropos*, that is, the move away from the Enlightenment paradigm of the *human*, as explained in the Introduction to this thesis.

Along with mobile apps, device-based engagement relates to web responsiveness. For instance, having a “mobile-friendly website” is “the very least” libraries must do to increase access to their collections (La Counte 11). In this sense, it is interesting to note that BHL does not have a website enhanced for mobile devices (as of June 2020). While the layout for consulting materials included in the Library is quite user-friendly,^{xliv} it is not optimized for visualization on mobile devices, especially on reduced screens, rendering the materials a challenge to consult through the mobile web. In contrast, implementing such optimization would be in line with patterns of the responsive web, which seeks to enhance website effectiveness and user interaction by adapting website design and development to different devices and screen sizes (Carver). The goal of such adaptation—and of the responsive web at large—is to enhance accessibility and “improve a Website to meet better the expectations” of its users (Jansen 29). Thus, the principles of accessibility and web

responsiveness are critical requirements for the decolonization and decentralization of online knowledge production as they determine *who* can be a *user*. Given the importance of mobile devices in Latin America, for instance, the lack of a mobile version of the BHL website can decrease the opportunities for Latin American audiences to become *users* of BHL and, therefore, active participants in the storytelling mechanism of this archive, that is, bio-diverse storytellers. On the contrary, having an enhanced mobile website could potentially lead to greater engagement of Latin American audiences and thus promote the participation of Latin American users in the networks of bio-diverse knowledge and (hi)stories promoted by BHL. Moreover, this constitutes a paramount move in fostering equitable intra and interspecies exchanges given that limited access from Latin American audiences to BHL translates into hindered bio-diverse relationships between those audiences and global biodiversity. As a result, considering the significance of mobile devices and following the premises of the responsive Web can become tools for equity by contributing to the diversification of access to BHL materials and helping transcend the geopolitical barriers faced by online networks of bio-diverse knowledge.

As mentioned before and to further accommodate mobile users, BHL could consider the development of mobile apps, in addition to the optimization of their website. Though this may seem a monumental task, there are simple and user-friendly avenues through which it could be made possible. For example, following the iNaturalist-NaturaLista model, BHL could establish a similar partnership with platforms such as BiblioCommons, which offers several resources for public libraries to develop apps through which they can make their catalogues available to users and continue to promote the materials in their collections (BiblioCommons). This strategy could potentially benefit not only BHL but also its global partners, precisely by promoting shared materials and collections from BHL's global nodes. Thus, a mobile outlook for BHL would incorporate web responsiveness and app development to help promote diversified community engagement and

participation worldwide, as well as the dissemination of biodiversity-related global knowledge, with a focus on the re-positioning of the Global South as a site of bio-diverse knowledge production, and of its audiences as agents of bio-diverse online storytelling.

In the local Mexican context, for example, CONABIO could seek to develop a specific app for Bioteca, as it did for EncicloVida, to continue to promote its materials and, thus, the Mexican knowledgebase it contains. Given that Bioteca is an online library, a partnership with organisms like BiblioCommons might offer viable options as well. Like BHL, Bioteca presents a stark contrast between traffic from desktop devices and that from mobile devices, with its desktop traffic share at 83.64% and its mobile traffic share at 16.36%, a difference even greater than that presented in data for BHL (Figure 16). This further highlights the damaging tendency followed by libraries that often overlook the importance of mobile websites and apps (La Counte 8). In this regard, CONABIO too could consider the development of a mobile app for its local library as a means to promote its collections and, especially, the knowledge production taking place through the organism's work in Mexico. Given the intertwined glocal paths of BHL and CONABIO, if both organisms were to focus on strategies to further promote mobile engagement, Latin American communities might have more inclusive and diversified opportunities for bio-diverse participation.

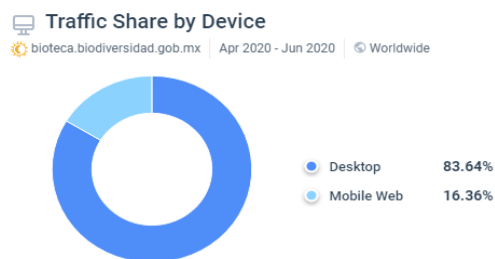


Figure 16 Traffic share by device to Bioteca (April-June 2020). Graph generated on Similarweb.

In terms of the production of biodiversity-related knowledge, mobile websites and apps foster citizen science, that is, the creation of scientific knowledge at the level of its citizenry. Citizen science promotes “public participation in science and supports alternative models of knowledge

production” (Hecker et al. 2). It engages diverse communities and societies “in knowledge production, knowledge assessment and decision-making,” an approach that makes it possible for citizens to engage in activities including “actively setting the agenda, crowdsourcing via web platforms, and collecting and analysing a broad spectrum of scientific data” (Moedas v).

CONABIO’s affiliated apps and websites, particularly NaturaLista, have as a core and explicit objective to promote citizen science amongst their users, which has contributed to the advancement of scientific and cultural research and has strengthened conservation efforts (Machado Chavarin). Thinking of citizen science as the main goal to pursue, CONABIO could continue with this approach by developing an app for Bioteca or even collaborating with BHL to develop an app for BHL México.

Citizen science is particularly important because it strongly aligns with the CRSEUoB model in its goal of promoting multiple bio-diverse knowledges and giving value to the epistemic practices of plural humanities, especially anchored in the inclusion and participation of the *anthropos*.^{xlv} An example of citizen science in the promotion of sympoietic epistemologies and intraspecies relationships in Mexico is the Jinetes de los Machado project. During this project, the identification of species through NaturaLista raised awareness of the diverse endangered species in the area of Jinetes de los Machado in Sonora, Mexico. This project started as a local effort for the area to be designated as Área destinada voluntariamente a la conservación [Voluntary conservation area], especially because of the presence of jaguars, a status that would lead to the recognition of Jinetes de los Machado as protected by the Federal government. Through citizen science on NaturaLista, what started as a project to work on the conservation of jaguars, has led to a broader awareness of the multiple endangered species that live in this region (Machado Chavarin). As a result, the local community now strives to find solutions toward equitable and sustainable coexistence of human and non-human species. For example, the community stopped the previously common killing of the

snake *crotalus basiliscus*, known in Spanish as Cascabel del Pacífico, often called Mexican West Coast Rattlesnake (Encyclopedia of Life). Instead, locals have observed this species and learned about its importance for the environment, opening ways for a true bio-diverse coexistence. Likewise, the identification of endangered species through NaturaLista has promoted local efforts to stop the illegal hunting of these species. Furthermore, citizen science has led to international collaboration in this community. In 2019, the global initiative City Nature Challenge led to a local movement, Reto Naturalista Urbano. The participation of the community of Jinetes de los Machado resulted in over two thousand observations of almost five hundred species, as well as nearly four thousand identifications of species, the highest results in Mexico (Machado Chavarin). Thus, initiatives like the Jinetes de los Machado project involve local and global communities, researchers, governments, and institutions in the development of citizen science and move towards a CRSEUoB by utilizing technology for the establishment of rhizomatic and sympoietic intraspecies relationships.

Similarly, BHL could adopt the citizen science framework to develop an app that would not only make its materials easily accessible to plural communities on multiple devices but would engage them in knowledge production, such as contextualizing (hi)stories or developing alternative curatorial practices.^{xlvi} Furthermore, such approaches and strategies would put the power of knowledge production in the hands of plural humanities, i.e., the *anthropos*, thus promoting agency amongst otherwise marginalized communities and helping transcend the dichotomy between the Global South and North. If collaboration and citizen science were promoted beyond geopolitical and cultural barriers, the networks of bio-diverse knowledge production could be decentralized and diversified. Keeping in mind the cyborgian aspect of a CRSEUoB and the virtuality of our human relationships with-in biodiversities (as explained in the Introduction to this thesis), diversifying modes of access to online biodiversity-related knowledge is an essential step toward the epistemic pluralization and decolonization that the model entails.

1.6 Communicating Archives: Engagement and the Mexican Archival Panorama

Despite not having an optimized website for mobile devices or a mobile app, BHL performs considerably well in terms of engagement metrics.^{xlvii} The Library's overall very high numbers concerning average time per visit, pages per visit, and bounce rate (Figure 17) potentially mean that BHL users spend significant time engaging with the Library's content. Between April and June 2020, the average duration of a visit to the BHL website was close to sixteen minutes, followed by CONABIO with around seven and a half minutes, and NaturaLista, with a little over six minutes per visit. In contrast, MEXICANA, RI-UNAM, and Bioteca have significantly lower visit durations, the latter being at the lowest with approximately two minutes.

Engagement Metrics
Apr 2020 - Jun 2020 | Worldwide

Domain	Monthly visits	Unique Visitors	Visits / Unique visitors	Visit duration	Pages/Visit	Bounce rate
biodiversitylibrary.org	260,974	131,756	1.98	00:15:56	19.65	33.42%
biodiversidad.gob.mx	435,796	311,624	1.40	00:07:37	2.07	73.82%
bioteca.biodiversidad.gob.mx	33,785	23,233	1.45	00:02:02	2.23	73.02%

Engagement Metrics
Apr 2020 - Jun 2020 | Worldwide

Domain	Monthly visits	Unique Visitors	Visits / Unique visitors	Visit duration	Pages/Visit	Bounce rate
biodiversidad.gob.mx	435,796	311,624	1.40	00:07:37	2.07	73.82%
bioteca.biodiversidad.gob.mx	33,785	23,233	1.45	00:02:02	2.23	73.02%
naturalista.mx	363,575	220,030	1.65	00:06:13	4.43	57.65%
mexicana.cultura.gob.mx	64,995	48,670	1.34	00:02:37	4.26	68.52%
repositorio.unam.mx	51,953	36,696	1.42	00:02:32	3.08	39.77%

Figure 17 Comparative engagement metrics for BHL, CONABIO, and Bioteca (top), and for the selected Mexican websites (bottom) (April-June 2020). Tables generated on Similarweb.

In terms of bounce rate, BHL has the lowest percentage of the six websites at 33.42%, followed closely by RI-UNAM at 39.77%, which means that users accessing BHL and RI-UNAM are more likely to visit more than one page within these websites. NaturaLista and MEXICANA come next with bounce rates of 57.65% and 68.52% respectively. In contrast, CONABIO and Bioteca have the highest bounce rates, above 73%. In this sense, CONABIO's high bounce rates diverge from its high traffic share percentages, especially in Mexico and Latin America. While it has the highest number of monthly visits and unique visitors,^{xlviii} the average time per visit and bounce rates make

those visits considerably briefer than the average visit to BHL. This, however, can be explained by the different nature of these platforms. CONABIO's biodiversity website is an informative site. It offers brief articles on biodiversity-related topics as well as several internal and external resources, such as CONABIO's publications and multimedia production, including the organism's journal *Biodiversitas*,^{xlix} and websites affiliated to CONABIO or the Mexican government, such as SNIB,^l México: El país de las maravillas,^{li} CONABIO's geoportal,^{lii} and the local websites of certain state governments in Mexico. Thus, since it is an information repository, it is more likely for users to spend less time in CONABIO as they are often redirected to other websites and resources.

Nevertheless, in terms of visits and the nature of these websites, what is particularly interesting to consider is the stark contrast between BHL and MEXICANA, and, especially, between BHL and Bioteca. Since these three websites are digital archives, such contrast cannot be explained by the nature of the websites themselves. Despite pertaining to the same genre of website, BHL's average visit seems to have higher numbers in metrics related to engagement, as shown by the average time spent on the platform and pages per visit. In turn, MEXICANA has considerably lower numbers in these same metrics, despite its user-friendly, interactive, and bilingual (Spanish-English) portal.^{liii} Likewise, despite CONABIO's overall positive traffic trends, these do not favour Bioteca, its online repository, which not only has the lowest number of visits but also the most deficient engagement figures. While it is not possible to know the actual reasons for BHL's higher duration of visits or number of pages visited—which could be due, for example, to a higher difficulty finding certain materials on the website (Jansen 14)—high figures in these metrics usually point to a more substantial engagement with the website's content, while shorter visits can signal a lack of user interest (31). If that were the case, the low figures of MEXICANA and Bioteca could suggest less meaningful user engagement within their platforms when compared to BHL. Such a hypothesis further highlights the potential benefits of the BHL-CONABIO partnership, as users

could be engaging more actively and meaningfully with the materials housed in Bioteca through BHL's collections associated with BHL México, even if access to and engagement with Bioteca itself are significantly lower.

The situation of MEXICANA and Bioteca could also respond to the several challenges that the diffusion of digital projects, especially archival ones, faces in Mexico. Despite the existence of successful digital repositories and archives, of which prime examples are those curated by UNAM, many such projects in Mexico fail to succeed due to the lack of thoughtful and long-term planning, sufficient funding, and support from involved institutions, which is ultimately linked to a devaluing of these initiatives in the country (Galina Russell 143). Here, again, the role of BHL becomes essential to transcend the gap between the Global South and North, a gap that, in this case, strongly relates to the lack of infrastructure, a core component of successful digital archives and one of the central contributions of BHL to its partners (Kalfatovic and Rinaldo 6–8). In this regard, it is of utmost importance to understand that infrastructure and geopolitics matter and that the unbalanced representation of the Global South and North in global digital repositories of bio-diverse knowledge has deep roots in the colonial past and present of the local contexts from which they originate. This highlights, once more, the ethical responsibility of BHL vis-à-vis its partners and audiences in the Global South. By establishing partnerships within this context, BHL could aid in the long-term planning and preservation of materials in and from the Global South, which translates into a more equitable representation of knowledges from the Global South, positioning the region, again, as a fundamental site of bio-diverse knowledge production.

Another core challenge for Mexican online archival projects is that they often do not collect information about their establishment and impact, and the little information that is gathered is rarely shared. The lack of data collection, as well as deficient communication and data sharing, obstruct the development of effective strategies that could aid similar initiatives (Galina Russell 139). Considering

that audiences engaging with MEXICANA^{liv} and Bioteca are mostly from Mexico, this national panorama concerning digital archives and collections can greatly influence the access rates of these and similar portals. Once more, especially in the case of Bioteca, national and international partnerships can prove a useful means to promote Mexican archival digital projects. As previously mentioned, for example, all materials in Bioteca are part of BHL México, which means that, while Bioteca's website might not have important access or engagement, audiences may be engaging with its content—most of which is produced in Mexico—through BHL. To reiterate, this means the BHL México partnership is a promising strategy not only to position Mexico as a site of biodiversity-related knowledge production but also to positively impact the valorization and success of local archival initiatives in the country.

Furthermore, information gathering via modes including web analytics is essential for the long-term success and decolonization of digital projects. If both CONABIO and BHL collect data for specific audiences—as I do in this dissertation—and, more importantly, share and compare these data, these two organisms could further understand whether and how global audiences are engaging with bio-diverse (Mexican) knowledge. This collaborative strategy points to one of the key aspects of the analysis of web analytic data, which is “to discern the impact” that users' behaviours have on a website's status and traffic (Lovett 126) so that the website can improve its development as a result of that analysis. In the case of BHL—and this thesis^{lv}—considering data for and from Latin America specifically is yet another step towards the decentralization and the pluralization of the networks of online bio-diverse knowledges that it includes and promotes.

Given BHL's and CONABIO's role in promoting access to local Mexican bio-diverse knowledge through BHL México, it would be another positive move to browse other local archives' collections for biodiversity-related materials. For example, MEXICANA includes collections from Mediateca INAH,^{lvi} a multimedia repository for Mexico's Instituto Nacional de Antropología e

Historia (INAH) [National Institute of Anthropology and History]. In its collections, INAH includes texts from the Archivo Histórico Casa de Morelos [Historical Archive House of Morelos], which has several documents regarding the organization and administration of *cabildos*, that is, administrative councils managed by the Spanish empire in colonial Mexico. Documentation related to *cabildos*, and contained in MEXICANA, includes information about the use and collection of plants and nonhuman animals in several practices such as agriculture and cattle breeding, as well as records of taxes paid for them. These texts are then fundamental from the perspective of a CRSEUoB, particularly as they constitute a fabric of (Mexican) human and nonhuman (hi)stories that highlight their shared—albeit diverse—experiences of colonization, narrating intertwining bio-diverse human and nonhuman (hi)stories in the context of Mexico’s colonial past. Nonetheless, these texts are not included in BHL because they are not part of CONABIO’s collections. This might be symptomatic of issues of communication around digital archives, not only concerning communication to the public but also communication within and between Mexican institutions, in this case, INAH and CONABIO. This is also evidenced by the fact that MEXICANA does not include CONABIO’s collections, potentially signalling a lack of collaborative efforts between Mexican governmental projects. Furthermore, this absence, considering that MEXICANA is called Repositorio del patrimonio cultural de México [Repository of the cultural heritage of Mexico], evidences the shortcomings of local archival networks and continues to separate *cultural* heritage from *natural* heritage, a problematic split that hampers the understanding of the (hi)stories of humanities with-in the (hi)stories of biodiversity, as explained in the Introduction to this thesis.

Moreover, these shortcomings impact the presence of certain archives in digital global repositories, such as BHL and the Internet Archive. While CONABIO has a meaningful relationship with BHL that has led to the considerable representation of Mexican knowledges in the Library, a lack of communication between local organisms prevents the inclusion of more (and more diverse)

local archives in global repositories and, thus, continues to fuel geopolitical epistemic barriers. Therefore, the establishment of plural networks of bio-diverse plural knowledges within the framework of a CRSEUoB requires glocality, that is, the promotion of networks of communication at both the local and global levels. If an exchange of knowledge occurs at the level of Mexican archives, then more materials representative of Mexican knowledge production can be incorporated into global repositories and accessed by Mexican and global audiences alike. Such a move would, on the one hand, further advocate Mexican representation and advance the decolonization and decentralization of global digital archives, and, on the other, promote a sympoietic and rhizomatic understanding of human and nonhuman (hi)stories, thus engendering more equitable intra and interspecies relationships around bio-diverse knowledge production.

To further promote digital archival projects, initiatives such as MEXICANA and Bioteca must establish partnerships within their local and global contexts. Organisms such as CONABIO, which have already established important international partnerships, should develop local relationships that can inform and be informed by their global ones. In the case of the Archivo Histórico Casa de Morelos, for example, no one may have given value to these documents within biodiversity studies. In this sense, their incorporation into CONABIO's collections and, therefore, BHL, has the potential to promote biological and ecological perspectives in disciplines such as history and archaeology and transcend the nature-culture binary. As mentioned by BHL's Secretariat, BHL "reinforces current scientific research and provides *a historical perspective* on species abundance, habitat alteration, and human exploration, culture, and discovery" (Kalfatovic and Rinaldo 3; emphasis mine). Therefore, considering BHL's historical approach to biodiversity, it would be to the benefit of CONABIO to look at other less specific national archives (i.e., not explicitly related to biodiversity), such as MEXICANA and INAH, and seek their collaboration and their inclusion in global repositories, in this case, BHL.

Given BHL's good performance in terms of engagement, if the BHL-CONABIO partnership develops stronger roots in Mexico, it can become a more efficient vehicle for the dissemination of local Mexican knowledges and human and nonhuman (hi)stories. In turn, this can promote more meaningful engagement with and from these knowledges and (hi)stories amongst local and global communities, that is, it has the potential of diversifying the storytelling participation and mechanisms of BHL and its Mexican partners. Here, once more, the local and the global can intertwine through national and international partnerships to encourage the development of plural epistemologies on biodiversity, a purpose clearly in line with a cyborgian rhizomatic sympoietic existential utopia of biodiversities.

Notes for Chapter 1

ⁱ All key concepts of this chapter, including but not limited to *plural humanities*, *biodiversities* (pluralized), *anthropos*, and *Anthropocene*, as well as all components of the CRSEUoB model, are explained in the Introduction.

ⁱⁱ Throughout this thesis I employ as well the term *catalogue*, which I utilize especially in the context of metadata.

ⁱⁱⁱ Given this panorama, I will continue to conflate both terms throughout this dissertation.

^{iv} I propose the compound *natural-cultural heritage* as a way to transcend the nature-culture binary and highlight the participation of human and nonhuman actors.

^v I further analyze the materiality of BHL's texts in the discussions of virtual repatriation in Chapter 2 of this thesis.

^{vi} The original BHL members are “the American Museum of Natural History (New York, NY), Harvard University Botany Libraries (Cambridge, MA); the Ernst Mayr Library of the Museum of Comparative Zoology, Harvard University (Cambridge, MA); MBLWHOI Library of the Marine Biological Laboratory and Woods Hole Oceanographic Institution, (Woods Hole, MA); Missouri Botanical Garden (St. Louis, MO); the Natural History Museum (London); New York Botanical Garden, LuEsther T. Mertz Library (New York, NY); the Royal Botanic Gardens, Kew (London); and Smithsonian Institution Libraries (Washington, D.C)” (Pilsk et al. 137–38).

^{vii} I explore the issue of language later in this chapter and in my analyses of metadata in Chapter 3.

^{viii} Some of these organisms were “the Global Biodiversity Information Facility (GBIF), International Commission on Zoological Nomenclature (ICZN), European Distributed Institute of Taxonomy (EDIT), Atlas of Living Australia, Chinese Academy of Sciences, and Museum für

Naturkunde der Humboldt-Universität” (Rinaldo 260).

^{ix} It will be interesting to see if and when these plans are concretised and whether nodes such as India, Russia, and Japan—as well as through Latin America—generate important changes in the diversification of BHL’s collections.

^x While the global outlook and efforts of BHL are highly valuable, there is still a long way to go for it to achieve true plurality. In this sense, it is particularly interesting to look at the Library’s mapping of its global partners, which shows a network still heavily dominated by the Global North (See Google map “Biodiversity Heritage Library Partners”).

^{xi} While CONABIO is the head of BHL México, this project encompasses several Mexican institutions and organisms: Centro de Investigación Científica y de Educación Superior de Ensenada (CICESE) [Ensenada Centre of Scientific Research and Higher Education], Colegio de la Frontera Sur (ECOSUR) [Southern Frontier College], Facultad de Ciencias Biológicas, Universidad Autónoma de Nuevo León [Faculty of Biological Sciences of the Autonomous University of Nuevo León], Instituto de Ecología (INECOL) [Institute of Ecology], Instituto Nacional de Ecología y Cambio Climático (INECC) [National Institute of Ecology and Climate Change], UNAM’s Instituto de Biología [Institute of Biology], UNAM’s Instituto de Ecología [Institute of Ecology], UNAM’s Instituto de Ciencias del Mar y Limnología [Institute of Marine Sciences and Limnology], and UNAM’s Facultad de Ciencias [Faculty of Sciences] (Tapia Tinajero and Guzmán Vera 55–56).

^{xii} CONABIO’s ten affiliated organisms in Mexico are Secretaría de Medio Ambiente y Recursos Naturales (SEMARNAT) [Department of Environment and Natural Resources], Secretaría de Agricultura y Desarrollo Rural (SADER) [Department of Agriculture and Rural Development], Secretaría de Bienestar [Department of Welfare], Secretaría de Economía (SE) [Department of Economy], Secretaría de Educación Pública (SEP) [Department of Public Education], Secretaría de

Energía (SENER) [Department of Energy], Secretaría de Hacienda y Crédito Público (SHCP) [Department of Internal Revenue and Public Credit], Secretaría de Relaciones Exteriores (SRE) [Department of Foreign Relations], and Secretaría de Salud y Turismo (SECTUR) [Department of Health and Tourism] (Comisión Nacional para el Conocimiento y Uso de la Biodiversidad (CONABIO), ‘¿Qué Hacemos?’).

^{xiii} The Convention on Biological Diversity was created in response to the United Nations Environment Programme in 1993. It was established as “a dramatic step forward in the conservation of biological diversity, the sustainable use of its components, and the fair and equitable sharing of benefits arising from the use of genetic resources” (Biosafety Unit).

^{xiv} As of August 2020, UNAM’s Instituto de Biología has added 166 volumes to BHL, for a total of 10,183 digitized pages (Biodiversity Heritage Library, ‘Browse Instituto de Biología UNAM’).

^{xv} In general terms, *data* refers to the contents of the archive, the objects and materials themselves, and *metadata* refers to all data *about* that data, that is, details about the creation, format, affiliations, etc. of those contents. Metadata in BHL are published via the Open Archives Initiative Protocol for Metadata Harvesting and follow Metadata Object Description Schema and Dublin Core standards (Biodiversity Heritage Library, ‘Developer and Data Tools – About BHL’; Lagoze et al.; MODS; DCMI). For further analyses on metadata, see Chapter 2 and, particularly, Chapter 3 of this thesis.

^{xvi} I further analyze BHL’s status, especially in terms of authority website, in Chapter 3 of this thesis.

^{xvii} As of February 2021.

^{xviii} These multilingual efforts are not exclusive to BHL México. For instance, BHL has been

working on “improvements to [its] platform” that include “better support for Arabic and Asian-language texts” as well as “multilingual support” (Kalfatovic and Rinaldo 12). Additionally, these initiatives intertwine with local efforts for multilingualism, such as “institutions in BHL Europe [that] will develop a multiple language interface and strengthen the underlying infrastructure of BHL by providing more data storage and mirror sites” (Rinaldo 264).

^{xix} There were a total of 156,957 titles in BHL at the moment of writing, that is, June 2020. These data are updated throughout this dissertation to account for the most up-to-date data at the moment of writing and/or performing analyses. The numbers and dates are always specified in endnotes.

^{xx} All data about these collections are as of June 2020. It is worth noting as well the very small numbers in these collections when compared to the total number of titles in BHL (see previous note).

^{xxi} I am using the combined terms official/imperial not only to highlight the colonial history of these countries but also because Mexico has no official language per se. While the Brazilian Constitution (Chapter III, Article 13) establishes Portuguese as the national official language (República Federativa de Brasil), the Mexican Constitution does not contemplate an official language for the country. In 2003, a proposal for an amendment to the Constitution was presented to Mexican President Vicente Fox by the Cámara de Diputados, requesting that Spanish was institutionalized as the official language of the country (Arredondo García). While the amendment was not ratified, in that same year, the *Ley General de Derechos Lingüísticos de los Pueblos Indígenas* (General Law for the Linguistic Rights of Indigenous Peoples) was instituted. This law establishes that “[l]as lenguas indígenas serán válidas, al igual que el español, para cualquier asunto o trámite de carácter público, así como para acceder plenamente a la gestión, servicios e información pública”

[Indigenous languages will be valid, as is Spanish, for any public matter or process, as well as for fully accessing public management, services, and information] (Cámara de Diputados del Honorable Congreso de la Unión). Thus, while Spanish might be generally thought to be the official language of Mexico, it holds no such standing in Mexican laws and is not the only language accepted and used for public management. Some issues around the standing and use of Indigenous languages in Latin America and BHL are further explored later in this chapter and in discussions about metadata in Chapter 3.

^{xxii} It is worth highlighting as well that BHL México is, by far, the collection with the most number of materials amongst the ones presented here, although it still accounts for only a small fraction (~0.75%) of the total number of titles in BHL (see note xvii above).

^{xxiii} I further explore the nuances of inclusion in Chapter 3 of this thesis.

^{xxiv} it is essential to highlight the importance of Indigenous peoples, Afro-descendant peoples, and local communities in the conservation and sustainable use of the natural heritage of Mexico.

^{xxv} This is, of course, without considering the digital divide, which promotes and perpetuates stark social, racial, political, and economic inequalities. In the case of Mexico, only 67% of the population above 6 years old has access to the Internet (Asociación de Internet.mx). Additionally, the Southern and South Eastern regions of the country—which include the States of Campeche, Quintana Roo, Tabasco, Yucatán, Chiapas, Guerrero, and Oaxaca—have the lowest percentage of access to the Internet (*ibid.*). These regions are characterized by both the highest rates of poverty in Mexico (Consejo Nacional de Evaluación de la Política de Desarrollo Social) and the largest concentrations of Indigenous communities in the country (Comisión Nacional para el Desarrollo de los Pueblos Indígenas and Programa de las Naciones Unidas para el Desarrollo). Therefore, while I

still argue that promoting the inclusion and dissemination of materials in Spanish can *potentially* increase access for Indigenous communities, the geopolitical and economic local landscape of Mexico that fuels its internal and global digital divide, must not go unaddressed.

^{xxvi} See previous note.

^{xxvii} All metrics employed in this analysis are based on unobtrusive methods, that is, “research practices that do not require the researcher to intrude in the context of the actors and thus do not involve direct elicitation of data from the research participants or actors” (Jansen 16).

^{xxviii} All web analytic data analyzed in this section were collected through custom comparative reports obtained from Similarweb (<https://www.similarweb.com>), except when otherwise indicated.

^{xxix} For a full description of these websites see Appendix.

^{xxx} This archive has contributed digital materials on biodiversities from several UNAM faculties and institutions to BHL via CONABIO. RI-UNAM acts in these analyses as an important mid-point of reference because it includes materials specific to Mexican and other biodiversities (many of which are part of BHL México) but also a wide array of non-biodiversity-related materials.

^{xxxi} MEXICANA is the digital archive of national cultural heritage of the Mexican government, instituted as a repository of Mexican distinct cultural artifacts to be shared with the national population and other communities worldwide. While MEXICANA has no explicit connection to BHL, CONABIO, or biodiversities, its incorporation in this analysis highlights several issues around digital archives and archival practices in the country and overlaps with the idea of heritage behind bio-diverse knowledges and BHL itself.

^{xxxii} The metric *total visits* refers to “the sum of all visits to the analyzed domain [during the] time period analyzed” and is often employed “to understand the overall number of interactions with a website” (Similarweb).

^{xxxiii} *Traffic shares* refer to “the percent of traffic sent to a website” (Similarweb), in this case, the percentage of total traffic that comes from a specific country. This metric is often employed “to understand the level of competitiveness/ fragmentation across domains/ devices/ countries/ keywords/ traffic sources, etc.” (*ibid.*). Nevertheless, it is important to note, in the case of traffic shares by country, that these data can be obstructed by factors such as country-specific restrictions or individuals’ use of virtual private networks (VPNs).

^{xxxiv} The Cancún Declaration defines LMMC as a “mechanism of cooperation to promote [members’] interests regarding biological diversity and in particular the protection of traditional knowledge, access to genetic resources and the fair and equitable sharing of benefits derived from their use” (Benítez-Díaz).

^{xxxv} Although beyond the scope of this dissertation, it is notable that Mexico has been an important place of change and exchange in matters of biodiversity and the environment. As mentioned in the Introduction to this thesis, it was also in Mexico that Paul Crutzen and Eugene Stoermer formalized the use of the term *Anthropocene* (see note xvi for the Introduction).

^{xxxvi} to take action to ensure the conservation of biodiversity and ecosystemic services.

^{xxxvii} This is not to say, however, that there are no such initiatives or projects. For instance, in the framework of collaborative efforts between Spain and Mexico, the Agencia Española de Cooperación Internacional para el Desarrollo (AECID, Spanish Agency for International Cooperation for Development) established a partnership with Mexico’s Secretaría de Medio Ambiente y Recursos Naturales (SEMARNAT, Department of Environment and Natural Resources) to create the Fondo Mixto de Cooperación Técnica-Científica México-España [Mixed Fund for Techno-Scientific Cooperation Mexico-Spain]. One of the results of this agreement, for example, was a CONABIO-AECID-led project to implement biodiversity protection strategies in

several regions in Mexico (Comisión Nacional para el Conocimiento y Uso de la Biodiversidad (CONABIO), ‘CONABIO-España’; AECID México).

^{xxxviii} The country missing from the data of traffic by country is Argentina, which is the third country with the largest number of Spanish speakers in the world, with approximately 44 million (Instituto Cervantes 7). However, it does register important access to all Mexican websites (see Figure 13).

^{xxxix} Although beyond the scope of this thesis, BHL’s higher penetration in Brazil might also be related to the existence of BHL SciELO (BHL’s global node for Brazil).

^{xl} EncicloVida is CONABIO’s online species catalogue. It is a platform that compiles information about species and taxonomic groups of Mexican biodiversities. Its main website, <http://enciclovida.mx>, links to digital scientific collections and citizen science repositories and platforms, including NaturaLista. It also offers a knowledge network and highlights CONABIO’s national and international partners, including BHL. Like all CONABIO-affiliated projects and websites, EncicloVida aims at promoting citizen science.

^{xli} In this regard, EncicloVida incorporates several fundamental requirements for a CRSEUoB in its opening of digital avenues for intraspecies interaction and its incorporation of bio-diverse (hi)stories.

^{xlii} Although beyond the scope of this analysis, the partnership between iNaturalist and NaturaLista is another interesting example of the collaboration between global and local networks of bio-diverse knowledges, especially concerning citizen science and social media.

^{xliii} For instance, median ages in Ecuador, Peru, Mexico, and Colombia range between 27 and 30 years, while median ages in the United States, Australia, the United Kingdom, France, and Spain range between 38 and 43 years (World Population Review).

^{xliv} BHL's PDF viewer includes simple tools such as different view styles, page up/down, and zoom options. It features a page menu indicating the nature of each page (i.e. text, image, cover, etc.), a scientific names finder that links to the Encyclopedia of Life, text search for the material's contents, condensed and linked metadata, and OCR'd text of the selected object. It also offers the possibility to download or print an object, whether in its full version or as a selection of pages.

^{xlv} Citizen science overlaps with the CRSEUoB model in various ways, from promoting plural epistemologies to moving science beyond the Enlightenment paradigm. Additionally, citizen science relates to other core concepts of this thesis, such as Indigenous knowledges, bio-diverse coexistence, and the multiplicity of narratives and (hi)stories. Moreover, speaking of *citizen* science points to the idea of digital citizenship, which, despite being often considered only as digital literacy, should go beyond mere skills and become a means to expose, evaluate, and counteract social inequalities and exploitation that are reproduced in digital spaces (Emejulu and McGregor 132). This is a fundamental goal of this thesis and of a CRSEUoB as a decolonial option.

^{xlvi} I further explore contextualized metadata and practices in Chapter 3 of this thesis.

^{xlvii} Metrics for engagement are used to “measure visitor engagement to a given website or mobile app” and include average visit duration (i.e. “[a]verage time on a site for the selected time period”), average page per visit (i.e. average number of pages per user visit), and bounce rate (i.e. “[a]verage percentage of users who view only one page before leaving the website”) (Similarweb).

^{xlviii} Unique visitors refer to unique visits, i.e. visits that are “not deduplicated,” meaning there are no repeats. This metric can help “assess the actual reach of a website” and is “the foundation of many of [Similarweb's] other traffic and engagement metrics” (Similarweb).

^{xlx} All numbers of *Biodiversitas* are available on CONABIO's Bioteca. They are also part of the BHL México collection and can be accessed through BHL.

ⁱ SNIB stands for Sistema Nacional de Información sobre Biodiversidad de México [National System of Information about Biodiversity in Mexico]. It is CONABIO's online biological repository, which compiles and makes available information about Mexican biodiversities such as species specimens, biological and taxonomic data, geomatics, and professional networks. SNIB is available at <http://www.snib.mx/>.

ⁱⁱ México, el país de las maravillas [Mexico, the country of wonders (or wonderland)] (<http://www.paismaravillas.mx/>; available also in English) is CONABIO's educational website for children and teachers. It offers user-friendly functionalities and didactic materials on Mexican biodiversities.

ⁱⁱⁱ CONABIO's geoportal is a particularly interesting project, especially from the perspective of a CRSEUoB. The geoportal, housed on Google, offers geographical information about Mexican species. It includes maps of and search by species, topics, and novelties/recommendations. Maps are created according to these topics and can be visualized in layers. The geoportal includes several maps based on topics of biodiversities and landscape, some of which provide references to cultural, agricultural, and historical data on certain species, as well as individual information about each point or vector registered in a map. Additionally, it offers video tutorials for the geoportal's basic functionalities. The metadata available for each map include author, name of map, description, conditions for use, sources, spatial representation methods, type and number of data, spatial reference system, glossary for attributes used in classifying the data, and links for access (map, metadata in html and xml, preview, license, csv, and SQLite). Plus, each map includes a link to a separate page with its full metadata. Thus, this geoportal incorporates plural knowledges of and on human and nonhuman bio-diversities. CONABIO's geoportal is available at <http://geoportal.conabio.gob.mx/>.

^{liii} Out of all five websites, MEXICANA is arguably the one that offers more options for customization (such as user-generated collections) and multimedia content (such as interactive digital collections and exhibits from different Mexican institutions, mainly museums, libraries, and TV broadcasters). Its collections are also multimedia, similar to those of CONABIO. One of MEXICANA's most attractive features is an interactive timeline that chronologically organizes and displays all objects available in the repository.

^{liv} During casual conversations with family and friends from and in Mexico, I discovered that none of them had ever heard about MEXICANA, despite it being a considerably important project regarding Mexico's digital agenda and archives. Additionally, a quick Google search (as of June 2020) for the repository shows several results of news sites announcing the portal's launch but little to no information beyond that. It is also considerably hard to find the website by only typing *MEXICANA* in web browsers. It is much more efficient but noticeably less practical to search for the website's full name, *MEXICANA: Repositorio del Patrimonio Cultural de México*. Finally, I was unable to find any advertising campaign for it outside of its website and social media accounts. This means that a user needs to know of the repository's existence in order to find it online, but the portal's little to no presence in other websites and media keeps that existence in the dark for many. Given that MEXICANA is a quite recent project (it was initiated in 2017 and launched in 2018), this situation and the portal's status might improve with time.

^{lv} I am very grateful for the several opportunities I had to collaborate with BHL and share my data and analyses with its Secretariat. As of February 2022, I have been able to publish three short articles on BHL's blog, give a keynote address during BHL's Annual Meeting (BHL Day 2021: Reflections in Crises), and work as a collection analysis intern for BHL and collaborate in the Library's *Acknowledgement of harmful content* during the summer of 2021.

^{lvi} Mediateca INAH includes important digitized and multimedia versions of fundamental documents and artifacts of Mexico's natural-cultural heritage. It houses, among others, the interactive version of Martín de la Cruz's *Libellus de Medicinalibus Indorum Herbis*, an important work of Indigenous medicine discussed in the conclusion of this thesis.

Chapter 2

Whose Stories? Towards the Bio-Diverse Decolonization of Representation and Knowledge Production

As proposed by this dissertation, BHL's quest for decolonization must aim at becoming not only a storytelling mechanism for human and nonhuman (hi)stories but a decolonized and decolonial storytelling platform for a cyborgian rhizomatic sympoietic existential utopia of biodiversities (CRSEUoB) in the Anthropocene, that is, a digital archive anchored in the bio-diverse (hi)stories of the *anthropos*. As discussed in Chapter 1 of this dissertation, promoting global open access while considering the linguistic and geopolitical barriers and possibilities to diversify said access is one of BHL's essential responsibilities vis-à-vis its Latin American audiences and global nodes.

Considerations of language representation, audience engagement, and web optimization are fundamental steps for the promotion of an inclusive global library that disseminates global and local bio-diverse knowledges and contributes to the debunking of the Global South versus North hierarchy. A decolonial archive thus links plural humanities—the *anthropos*—to a multiplicity of bio-diverse (hi)stories and global and local intra and interspecies interactions.

Nonetheless, although practices around audiences and access are exceptionally valuable, the path BHL must follow towards a truly decolonial option in the Anthropocene requires a more profound restructuring of its archival practices, especially considering the historical and present relationships between the Global South and North as sites of knowledge production and the establishment of equitable and participatory practices of representation. Therefore, this chapter considers not only the question of *who* can participate in the bio-diverse storytelling enabled by BHL but, especially, *whose stories* are being told and *by whom*, with an emphasis on the *ownership* of these narratives. Drawing upon web analytic and content data from social media and BHL's catalogue, as well as a critical approach to (virtual) repatriation, this chapter focuses on the exploration of the

Library's possibilities towards decolonization concerning BHL's online presence, dissemination, and ownership of knowledge from and of the Global South and, specifically, Latin America.

2.1 Representing and Communicating (Hi)Stories: BHL's Social Media Landscape

The storytelling enabled by BHL comprises several layers that require a critical approach to the opportunities, existing and non-existing, for a plural and diverse *representation* in its networks of bio-diverse (hi)stories. Given their possibilities for the “enhanc[ement of] public participation” in the context of Web 2.0 (Fredericks and Foth 245), a key aspect in the representation of narratives and the promotion of diverse involvement with-in bio-diverse epistemologies relates to the Library's presence and activity on social media platforms. Thus, social media is a prime dimension to consider to understand digital archives' practices of representation that affect community engagement and the intertwining of archival layers of storytelling.

The increasing importance of social media platforms not only in the dissemination of knowledge but also in the networking and promotion of content makes them a valuable entryway to the analysis of user engagement, which is in itself often tied to social media analytics (Szabo et al. xviii). An important criticism around social media data, however, points to the ethics of the collection and use of such data, particularly in terms of the lack of user agreement in such processes (Kennedy 193). Nonetheless, I believe, following Helen Kennedy, that, while social media data can be ethically problematic and promote “new forms of discrimination, exclusion, privacy invasion, surveillance, control, monetisation and exploitation” (42), they also possess significant “problem-solving potential” (190) and can be used “as tools of democratisation, inclusion and enablement” (8) and “make a positive contribution to society” (9). This is especially relevant when aiming for a social media strategy that transcends mere representation and moves towards “true participatory approaches” that avoid “top-down information dissemination” and “tokenism,” implementing plural

and diversified representation mechanisms (Fredericks and Foth 246). Thus, in the context of the mixed-methods approach of this dissertation, social media data can become an invaluable tool in the decolonization of digital archives when employed in ways that counteract the reproduction of “colonial influences in the production of digital knowledge” and the overfocus on “epistemologies and ontologies of the Global North” (Risam, ‘Decolonizing the Digital Humanities in Theory and Practice’ 79). In this case, I strongly believe that a careful analysis of social media dataⁱ can lead to more inclusive and diverse development of the *Biodiversity Heritage Library* and, as a result, more equitable archival and representational practices that seek, precisely, to counteract the discrimination and concealment of (online) communities and knowledges from and in Latin America.

Social media data are mainly behavioural, that is, they are based on the monitoring of social media activity and provide insight into users’ patterns of behaviour on social media platforms (Jansen 2–4; Lovett 125; Sudulich et al. 2). User behaviours refer to the “observable activity” of users as well as user responses to online content and interactions (Jansen 9), that is, “what is said and shared, who is saying and sharing it, where they are located, to whom they are linked, how influential and active they are, what their previous activity patterns look like and what this suggests about their likely preferences and future activities” (Kennedy 9). Of particular relevance for BHL, the narrative nature of these and other related questions points again to digital archives as storytelling mechanisms, with (hi)stories that are told and disseminated through means other than the collections themselves, such as social media content.

Prior to analyzing the social media practices of representation of BHL, it is essential to understand how and which audiences access the Library’s social media content, which can be done through certain metrics of web analytics. One of the shortcomings of the behavioural approach to and of social media data is the narrowing they promote as they “dismi[ss] the inward experiential and procedural aspects” of user interaction in digital environments (Jansen 7). Nevertheless,

behaviourism in web analytics does not deny these “inner aspects” but simply focuses on “outward behaviors” (*ibid.*). Therefore, even if social media data do not necessarily offer “insight into the motivations or decision processes” of users (2), social media trafficⁱⁱ to BHL’s and CONABIO’s websites—following the comparison introduced in Chapter 1—can evidence “usage patterns” (13) that enlighten some of the ways, frequencies, and platforms that determine audience engagement. Similarly, social media traffic can enlighten the status of (BHL’s and CONABIO’s) websites and their possibilities of reach within global and local contexts.

Social media thus evidences the various digital environments in which the online flow of bio-diverse (hi)stories—(re)told and disseminated by BHL—take place, as well as the need to decolonize all layers of these storytelling processes and consider the local needs and behaviours of audiences. In terms of social traffic,ⁱⁱⁱ and back to the websites selected for comparison and introduced in the previous chapter,^{iv} CONABIO and Bioteca—CONABIO’s digital library—registered a majority of traffic from Facebook (more than 90%) between April and June 2020 (Figure 18).



Figure 18 Social traffic to BHL (top left), CONABIO (top right), Bioteca (bottom left), and NaturaLista (bottom right) (April-June 2020). Graphs generated on Similarweb.

Likewise, almost half of all social traffic to NaturaLista—CONABIO’s social media network—came

from Facebook, with YouTube being another important source of social traffic, with 36.52%. In contrast, social traffic to BHL comes primarily from Pinterest (51.12%), followed by Facebook (17.17%), Twitter (10.73%), YouTube (9.4%), and ResearchGate (4.43%), with the remaining 7.16% coming from other platforms, most likely Instagram and Flickr, two important social networks on which BHL has focused regarding its social media strategy^v (Biodiversity Heritage Library, *Biodiversity Heritage Library Outreach*).

Social media data and traffic per platform are particularly important from the perspective of Latin America and Mexico in terms of engagement and representation, especially considering the extensive presence and use of social media in these regions. For instance, in Mexico and Central America, 64% of the total population are active social media users, as well as 51% in the Caribbean and 67% in South America (we are social and Hootsuite). For reference, the highest percentage in the world is Eastern Asia with 71%, followed by Northern America (US and Canada) with 69%, and Northern Europe and South America with 67% each (*ibid.*). Furthermore, when considering only the population aged 13 and above, the highest percentage of active social media users is found in Mexico and Central America, and Eastern Asia, with 84% each, followed by South America with 83% and Northern America with 82% (*ibid.*). A similar trend occurs in Mexico, where 90% of the population aged 13 and above are active social media users (*ibid.*) and, as of 2018, 99% of Internet users had at least one social media account, the average being five social media accounts per user (Asociación de Internet.mx). These figures have grown to an average of ten social media accounts per user in 2020 (we are social and Hootsuite). Additionally, according to the Mexican Instituto Federal de Telecomunicaciones [Federal Institute of Telecommunications], 80.8% of smartphone owners in Mexico downloaded and installed social media apps in 2019 (Instituto Federal de Telecomunicaciones). As of 2018, Facebook was the most popular social media platform in Mexico, with 98% of users having an active account, followed by WhatsApp (91%) and YouTube (82%). In

contrast, only 49% of users in Mexico had a Twitter account, 17% less than in 2017 (Asociación de Internet.mx). Finally, while the number of users and active sessions on social media platforms has not changed, the COVID-19 pandemic in early 2020 did cause an increase of 42% in the average time Mexican users spend on social media (Nielsen IBOPE).

Overall, this landscape highlights the importance and growing presence of social media platforms in Latin America and demonstrates that social media approaches are key when devising strategies for BHL to further the participation of Latin American audiences and the dissemination of bio-diverse knowledges in the region. In general terms, the Latin American and Mexican social media panoramas—similar to the data on traffic by device explored in Chapter 1 of this dissertation—reveal the discrepancies between BHL’s social media traffic and the use of social media platforms in these locations. For instance, Facebook and YouTube are not important referrers to BHL as opposed to CONABIO, which can also mean a lower engagement from and with Mexican audiences, given the popularity of these platforms in the country. CONABIO, in contrast, has a consistent and meaningful presence on these social media platforms, which further consolidates its standing amongst Mexican users. Furthermore, monitoring CONABIO’s and BHL’s activity on social media platforms (namely Facebook, Twitter, YouTube, and Instagram) between May and July 2020 revealed that the most active account was CONABIO on Facebook, consistently sharing multimedia and interactive content, especially frequent (sometimes daily) live sessions (informative capsules, expert talks, interviews, workshops, etc.), with their YouTube channel being considerably active as well.^{vi}

These data indicate that a diversified and balanced distribution of content through different social media platforms can potentially enable more Latin American participation with-in bio-diverse epistemologies as represented by BHL on social media. In this regard, a plural and inclusive social media approach—in line with a CRSEUoB—requires engaging communities on various platforms as

an opening for diverse participatory opportunities. For instance, while the BHL-CONABIO social media landscape is complex, the figures above suggest that increasing BHL's activities on Facebook might lead to a greater engagement with and from countries like Mexico, where Facebook is still the most used and accessed social media platform. Although less important in Mexico, greater activity on YouTube might have similarly positive outcomes for BHL. In turn, increasing CONABIO's activity on platforms such as Instagram might boost the organism's reach beyond Mexican audiences, which is also consistent with the data on traffic by country, as explained in the previous chapter of this thesis. Social media data and possible approaches thus point back to the need for strategies based upon and promoting dialogue, interconnectedness, and exchange between the local and the global and transcending the Global South-Global North schism.

Moreover, concerning global and local collaboration, a meaningful move would be to promote a joint effort between CONABIO and BHL to strengthen their relationship on social media platforms. Such an approach can include simple strategies such as sharing conversations, creating shared hashtags, or featuring each other's content. As argued in Chapter 1, sharing data is another point of collaboration that can help identify the weaknesses of practices of representation and outreach. In this regard, the exchange of social media data and activity reports—and “actionable” plans that respond to them (Jansen 41)—as well as cooperative social media strategies, should also become a key point of collaboration between BHL and CONABIO. This would entail that the BHL México partnership transcends the mere inclusion of materials in the Library and moves towards a more glocal and plural relationship that encompasses different layers of collaboration.

Collaboration is needed not only as a form of exchange of materials but also in ensuring the equitable representation of diverse human and nonhuman (hi)stories. In terms of diverse global representation, some existing projects show that BHL has already taken steps to promote the

visibility of its global partners and the content they have contributed to its collections. For example, according to BHL's report presented by Grace Constantino, former BHL Outreach and Communication Manager, during BHL's 2020 Virtual Annual Meeting,^{vii} partners and affiliates of the Library can nominate content to be featured on BHL's social media accounts, including in their yearly social media hashtag campaigns, and can also participate in the Library's Book of the Month blog series (Biodiversity Heritage Library, *Biodiversity Heritage Library Outreach*). These events constitute important avenues for partner institutions to promote their work, making them an outstanding opportunity to represent local and diverse knowledge production.

Nevertheless, these opportunities are not used as much as could be expected or desired. For instance, of the 61 blog posts^{viii} tagged *book of the month* in BHL's blog, only one is also tagged *BHL México*. This one blog post is a short article written by Minerva Castro Escamilla, librarian at one of UNAM's branches that participates in BHL collections via BHL México, the Biblioteca Conjunta de Ciencias de la Tierra [Joint Library of Earth Sciences]. Castro Escamilla's post features the work of 19th Century Mexican zoologist Jesús Sánchez, *Datos para la zoología médica mexicana: arácnidos é insectos* (Castro Escamilla), and is, in fact, a noteworthy example of what plural collaboration could look like. This post was published in September 2016 and highlights not only the contributions of Jesús Sánchez to Mexican medical zoology but also the importance of his works being available on BHL. Castro Escamilla's text, for example, features several works by Sánchez that are part of the BHL collection and mentions that the Library holds a digitized version of the only edition of Sánchez's *Datos*, which was never edited nor printed again (*ibid.*). Such focal points emphasize the value of the collaboration between BHL and Mexican institutions, and the diversity behind the Library's catalogue. Furthermore, the metadata of the post, as well as its author's short bio, underline the affiliation of Castro Escamilla, Sánchez, the featured book, and the blog post itself to the BHL México project. Thus, this example showcases Mexican bio-diverse knowledge and emphasizes the

advantages of collaboration between BHL and its global nodes. However, despite the quality of this particular contribution, it is striking that, as of September 2020, this was the only time a record contributed to BHL via its Mexican node was featured as *Book of the Month*. Similarly, while there are several posts tagged *BHL Australia*, there is only one post tagged *BHL Africa*, one tagged *BHL Singapore*, and none tagged *BHL SciELO* (BHL's node for Brazil). These numbers suggest that the partners of BHL, especially in the Global South, are not often contributing blog posts or content to BHL's series, despite the Library's opening of these opportunities. In consequence, the global collaborative approach of BHL can be overshadowed at the level of representation and outreach, that is, visibility, and the possibilities for counteracting colonial and hierarchical relations of power, especially between the Global South and North, are undermined.

Such is the case of BHL's hashtag campaigns as well. As explained by Grace Constantino in her presentation of BHL's outreach report, a major event that boosts the presence and relevance of the Library on social media platforms is its yearly hashtag campaigns (Biodiversity Heritage Library, *Biodiversity Heritage Library Outreach*). In 2019, the chosen hashtag was #HerNaturalHistory, which sought to highlight the contributions of women to global natural history and counterbalance the historical and present underrepresentation of women's work in the sciences. This campaign "occurred throughout Women's History Month" between the 8th and the 31st of March 2019 (*ibid.*). According to the BHL website, the campaign aimed "to increase awareness of and information about women in the biodiversity sciences," which was to be achieved "[t]hrough social media and blog posts, interactive programming and citizen science opportunities" (Biodiversity Heritage Library, 'Her Natural History'). Indeed, BHL's data reveal that the use of the #HerNaturalHistory hashtag brought about an increase of 41% in the average engagement per social media post throughout their social media accounts and of 50% in the average views on blog posts when compared to the same period in 2018 (Biodiversity Heritage Library, *Biodiversity Heritage Library*

Outreach). Moreover, and particularly relevant to the CRSEUoB model, this hashtag exemplifies the connection between plural human and nonhuman (hi)stories of oppression, embodied by nonhuman species as the object of study of natural history and the epistemologies advanced and developed by women, with some of the posts also emphasizing the work of racialized women and the importance of intersectionality within the sciences, further linking this initiative to the plurality required by a CRSEUoB during the Anthropocene.

Nonetheless, despite the campaign's favourable numbers, positive outcome, and plural and bio-diverse background, the involvement and participation of BHL México and affiliated organizations and branches were considerably low. There was only one contribution directly tied to BHL México, a blog post by Mónica Aguilar-Rocha, Digital Library Coordinator of BHL México at CONABIO, on the life and work of Dr. Helia Bravo Hollis, "the first certified biologist of Mexico" (Aguilar-Rocha). Like Castro Escamilla's post, Aguilar-Rocha's text focuses on the contributions of Dr. Bravo Hollis to history and biology, emphasizing the relevance of her work as a female scientist (*ibid.*). While the blog post does not explicitly point out the availability of Bravo Hollis's works as part of the BHL México collection (as did Castro Escamilla's piece), it does include a link to Bravo Hollis's book *Las cactáceas de México* in BHL's catalogue. Furthermore, this post was published in the BHL blog and featured on the Library's official accounts on Twitter and Facebook (Figure 19). Once more, this post and its presence on social media as part of the #HerNaturalHistory campaign hold great value as representative of bio-diverse intersectional female epistemologies produced in Mexico and made available globally through BHL—an exceptional example of a practice in line with a CRSEUoB.



Figure 19 BHL's Facebook post promoting the work of Dr. Bravo Hollis and linking to Aguilar-Rocha's post as part of the #HerNaturalHistory campaign. Originally published on March 22, 2019. Screenshot taken on June 2020.

While the value of this entry is undeniable, what is striking is the lack of *more* content related to BHL México. During this hashtag campaign, there was a clear scarcity of content developed in and focused on not only Mexico but other places outside of the Anglophone Global North. In this regard, and in contrast to its bio-diverse outlook, the #HerNaturalHistory campaign on BHL's social media accounts shows low numbers in terms of contributions from the Global South, thus pointing to a lack of diversity in the shared posts. For instance, the Library's Instagram account (@biodivlibrary) shared 35 posts plus introductory and concluding posts regarding the campaign itself. The 35 content posts included images and works currently housed by organizations mostly from the Anglophone Global North, specifically, from institutions in the US and the UK. In terms of BHL's global nodes, there was only one post on Instagram related to this campaign that also pertained to one of their nodes (#BHLAustralia). While a very similar trend can be observed for this campaign on Facebook, on this platform, two blog posts for BHL's global nodes were shared in addition to those that were also posted on Instagram. The first one is Mónica Aguilar-Rocha's text, mentioned before. The second one is a short piece about the work of South African naturalist and museum official Marjorie Eileen Doris Courtenay-Latimer. This post was written by retired Senior Librarian Sally Schramm, former employee at the South African Institute for Aquatic Biodiversity,

an organism affiliated with BHL Africa (Schramm). Thus, these posts are tied to BHL México and BHL Africa respectively. Nonetheless, while the posts themselves—as presented in the BHL blog—include the specific tags for these nodes (*BHL México*, *BHL Africa*), when they were featured on BHL’s Facebook account, there were no (hash)tags pointing to this affiliation. This seemingly minor detail means that users that did not follow the link or failed to pay attention to the tags at the end of each blog post, would not know that the contents and authors of these articles are affiliated with these global collaborative projects.

Therefore, while the #HerNaturalHistory campaign was successful in general terms, it does not concretely show a diversified approach to social media and missed the opportunity to feature BHL’s global nodes. This important shortcoming suggests that BHL’s global outlook is still biased towards the Global North, which might be influenced by the limited diversity of its collections. Given that BHL’s catalogue, as explained in the previous chapter, still privileges English as the language of biodiversity-related knowledge as well as Western epistemologies and institutions as sources of its materials,^{ix} the possibilities of featuring posts outside of these parameters on social media are hindered too. This interrelation showcases the importance of a critical approach to *all* layers of storytelling in the Library and of the mixed methodology employed in this dissertation. In this sense, greater diversity in the Library’s archive alongside stronger collaboration strategies with BHL partners can lead to a more equitable representation of communities and bio-diverse knowledges on social media, thus diversifying and decolonizing BHL’s content throughout the many layers in which its bio-diverse storytelling occurs.

2.2 Interspecies (De)Colonial Representation: The Travel (Hi)Stories of *pyrosteugia venusta*

The shortcomings in the diversification and plurality of BHL’s social media activity are further evidenced when considering other layers of meaning, such as the intersections between geopolitics

and biodiversity. For instance, the majority of posts related to the #HerNaturalHistory campaign on both Instagram and Facebook presented knowledge produced in the Anglophone Global North and that refers to nonhuman species in the Global North as well, leaving both Global South plural humanities and biodiversities out of the picture. The remaining works shared were mostly examples in which the knowledge production took place in the Global North but had as its focus the biodiversities of the Global South, further fostering the dichotomies North subject versus South object and human versus nonhuman. Such is the case, for example, of a post shared by BHL on Instagram featuring the work of Lena Lewis (Biodiversity Heritage Library, ‘Orange Trumpetvine (Pyrostegia Venusta)’)(Figure 20).



Figure 20 BHL's Instagram post on *pyrostegia venusta* as part of the #HerNaturalHistory campaign. Originally published on March 15, 2019. Screenshot taken on October 2020.

The case of Lena Lewis is a particularly rich example of the intertwining of historical narratives—(hi)stories—of human and nonhuman subjects and the different layers of storytelling in which such narratives are enacted. BHL's Instagram post featured Lewis's illustration of *Pyrostegia venusta*^x (known as orange trumpet vine or flamevine) from her work *Familiar Indian Flowers* (Biodiversity Heritage Library, 'Orange Trumpetvine (Pyrostegia Venusta)'). The post explains that *pyrostegia venusta* is a plant that “was originally endemic to Brazil, but [has] now been cultivated in gardens

around the world” (*ibid.*). However, in *Familiar Indian Flowers*, Lowis mentions that this plant “is a native of India” (96). As stated on Wikipedia,^{xi} Lena Lowis was an Indian-born British illustrator (‘Lena Lowis’). Her work, *Familiar Indian Flowers*, was published in 1878 and a digitized version of it was contributed to BHL by the University of Illinois. Nevertheless, according to the BHL catalogue (Biodiversity Heritage Library, ‘Bibliography for “Pyrostegia Venusta”’; Biodiversity Heritage Library, ‘Bibliography for “Bignonia Venusta”’) and the International Plant Names Index (‘Bignonia Venusta’), the earliest recorded mention of this species^{xii} is found in *The Botanical Register* by Sydenham Edwards and James Ridgway (volume 3) published in 1817, contributed to BHL by The Missouri Botanical Garden Peter H. Raven Library. In this work, Edwards and Ridgway mention that “the bulk” of species under the genus *Bignonia* “is indigenous in South America” (250). The authors also report that this species was introduced from Brazil to London around the time of publication of their register (*ibid.*) and was becoming popular amongst the London population (Edwards and Ridgway 251–52). Therefore, the species was most likely later introduced to India through British settlers and, by the time Lowis published her work, was popularized and normalized in both countries, with its origins blurred, as evidenced by Lowis’s affirmation of its supposed Indian origin (96). As explained in the Introduction to this thesis, and following the CRSEUoB model, the relationships between human and nonhuman species are narrative in nature (Rose 74). In this case, the network of bio-diverse (hi)stories around *pyrostegia venusta*—from the origin and (colonial-based) travels of the species to the authors that study and illustrate it to the holding institutions that share their work to BHL itself that disseminates it—points to the narrative plurality of a CRSEUoB, which can serve as a point of departure towards decolonial archival practices.

Nevertheless, while BHL’s Instagram post highlights the Brazilian origin of *pyrostegia venusta*, the narrative complexity of its (hi)stories could be further emphasized, not just as part of the Library’s social media activity but also regarding the metadata included in its catalogue records of

both Lewis's and Edwards and Ridgway's work (Figure 21). Other than author, year and place of publication, and holding institutions, metadata in the BHL catalogue for Lewis's book include the subjects *botany*, *flowers*, and *India* (Biodiversity Heritage Library, *Catalogue Record: Familiar Indian Flowers*). In contrast, subjects for Edwards and Ridgway's register are *1815*, *19th century*, *Botany*, *Copper engravings*, *England*, *Graphic media*, *Great Britain*, *Hand-colored*, *Icones*, *Periodicals*, *Pictorial works*, *Plant introduction*, *Plants*, *Ornamental* (Biodiversity Heritage Library, *Catalogue Record: The Botanical Register*).

By	By
Lewis, Lena.	Edwards, Sydenham, 1768-1819 Lindley, John, 1759-1865 Ridgway, James
Type	Type
Book	Journal
Material	Material
Published material	Published material
Publication info	Publication info
London :Published for the author by L. Reeve and Co. ;[1878]	London :James Ridgway,1829-1847.
Notes	Notes
Errata slip tipped in verso of t.p.	Plates colored by hand; v. 15-32 are copper engravings; v. 33 is lithographs. "Continued by John Lindley." Text by John Lindley.
Subjects	Subjects
Botany , Flowers , India	Pritzel (2nd) 2621. Stafleu (2nd) 1625, 5361. Nissen, C. Botanische Buchillustration (2. Aufl.) 2379. 1829, 19th century, Botanical illustration, Botany, Copper engraving, England, Engravings, Graphic media, Great Britain, Hand coloring, Hand-colored, Icones, Periodicals, Pictorial works, Plant introduction, Plants, Ornamental

Figure 21 Metadata in the BHL catalogue of Lewis's *Familiar Indian Flowers* (left) and Edwards and Ridgway's *Botanical Register* (right). Screenshots taken on April 2021.

BHL collects these metadata from collaborating institutions and partners ('BHL Metadata'), meaning that the differences, for example, in terms of how detailed these lists of subjects are can be explained by the local parameters of each holding institution. However, even if unintentionally, these differences communicate an unequal valorization of the work of male and female authors and of topics pertaining to the Global South and North. In this regard, for example, while the record of Edwards and Ridgway's work strongly emphasizes its pictorial nature, Lewis's rich illustrations are not highlighted in the subject metadata. Additionally, the metadata of both records erase the importance of South America as the starting point of the narratives around *pyrostegia venusta*. The geographical affiliations of these texts are limited to the nationality of the authors (British), the place

of publication of the books (London), the holding institutions (the United States), and the subjects of the texts (India and England respectively). None of these affiliations includes liaisons with South America. Furthermore, the knowledge production, linked to the authors, places of publication, and holding institutions, is located exclusively in the Global North, while India, the only geographical affiliation of these texts located in the Global South, is only a subject, that is, an *object of study*.

While I recognize that these works are catalogues of different species—whose origins can probably be traced around the world—and that metadata must be faithful to the information of each text—meaning that colonial geographical affiliations and authorship cannot be erased—what these records are missing is *contextualization*. Decolonial archival practices require a critical approach and reform to metadata and curatorial standards.^{xiii} In this case, incorporating metadata parameters that make room for diverse contextualization, for instance, to note that the described species in these books are of diverse global origins and often tied to colonial expansion and colonial scientific development, can promote a more inclusive and plural approach to archival practices. Contextualization can then lead to a more critical approach to the bio-diverse stories told by BHL, focusing not only on what stories are being told but *whose stories* those are and *how and by whom* they are narrated. Furthermore, specifying standards for metadata categories—such as the subject lists in these two cases—can also promote a more equitable representation of marginalized groups, in this case, women.

Here is where the different layers of storytelling of BHL intersect. If contextualized and specified, this network of (bio)diverse plural (hi)stories can continue to be communicated and disseminated across local and global communities from a strong decolonial stance, both in the Library's catalogue and on its social media posts and campaigns. While the task of contextualizing the hundreds of thousands of records present in the Library's catalogue can be overwhelming, contextualization constitutes an essential step in the decolonization of (digital) archives and archival

practices. Moreover, to attain these goals, archives require a strong commitment, in this case, from BHL and its global partners and collaborators. Like blog posts and social media, networking and collaborative efforts are at the core of metadata decolonization.

Indeed, some of the shortcomings of BHL's hashtag campaigns and social media activity in terms of bio-diverse representation and plurality can be attributed to a still insufficient network of collaboration and communication. For example, the hashtag #bhlmexico on Instagram shows 17 posts (as of September 2020), all of them from BHL's account. These posts—most of which were published during November 2017—feature content contributed to BHL's collections via its Mexican node and often include tags and hashtags related to CONABIO. However, of all posts, only one was liked by CONABIO's Instagram account. Similarly, while BHL's Twitter account shows several instances of the use of the same hashtag featuring content available on the Library through BHL México, CONABIO's Twitter activity shows minimum use of the hashtag as well as deficient interaction with BHL's posts and account. This situation points, once again, to the need not only of sharing documents and information but, especially, for networking, which should be performed by both sides of the relationship, that is, by BHL and by its partners, in this case, CONABIO.

While the availability of Mexican bio-diverse knowledges in BHL is a major part of the value of BHL México, it remains constrained to the realm of representation as presence, both in terms of the catalogue (i.e. having materials from Mexican partners included in BHL collections) and of social media activity (i.e. sharing said materials on BHL's social media accounts). Networking, on the contrary, can provide a basis for the development of representation as participation, engagement, and production, that is, promoting a shared commitment and agency towards a more inclusive and diversified online biodiversity library. Additionally, networking is an essential component of what John Lovett calls “the Triple-A Mindset,” which understands web analytics and website performance, especially in terms of social media, within the relationship between “Audience,

Activity, and Actions” (Lovett 127). From this perspective, efficient social media strategies require an understanding of audiences and how they behave online as a starting point for the development and the enacting of such strategies (127–28). In this regard, a critical approach to the geopolitics of access to BHL (as explained in Chapter 1) and to the politics of representation in the Library’s catalogue and overall online presence (through their blog and social media, for example) is fundamental in opening participatory online spaces for audiences from the Global South, in this case, Latin America. Furthermore, networking from this approach is also in line with web responsiveness (like the enhancement of websites for different devices explored in the previous chapter), as it directly responds to the needs and practices of users.

BHL’s establishment of global partnerships with countries such as Mexico should contemplate the availability and sharing of materials but should also move towards a true collaboration in the construction of a more inclusive Library as well as more inclusive networks of bio-diverse knowledges. In this sense, collaboration must strive to develop a network constituted as a cyborgian rhizomatic sympoietic existential utopia of biodiversities in which the narratives and epistemologies of plural humanities and biodiversities can be fairly represented. In sum, as evidenced by social traffic data and social media activity, the challenges ahead for BHL and CONABIO go beyond merely reaching each other’s audiences and into creating a more solid network of biodiversity-related websites and epistemologies. This goal can be facilitated by social media, given the contrasting but complementary presence of BHL and CONABIO on social media platforms. For example, BHL Australia has its own Twitter account, and through it, their interactions with BHL, as well as its audiences, are more collaborative and active. In this regard, having social media accounts for BHL México could aid in both promoting the work of CONABIO and furthering the conversation with BHL and its other global nodes.^{xiv}

Despite its emphasis on globality, BHL’s global(izing) scope necessitates a meaningful and

decolonial interaction with the local. For instance, BHL has acknowledged that global nodes can retain their context specificities—their locality—in their texts and their archival practices. Thus, while BHL’s model as established by the original consortium works as “a template for a series of global partners” (Kalfatovic and Rinaldo 1), especially in terms of metadata and digitization standards, the Library has recognized that “replicating BHL does not work across different regions and cultures, creates costly and inefficient redundancies, and leads to confusion in the biodiversity community” (6). BHL’s global nodes then require a dialectics of cooperation between the base (US/UK) model and their specific local needs and practices. Additionally, a centralized model can present the risk of replicating colonial structures, especially hierarchical epistemic relationships between the Global South and North (Risam, ‘Decolonizing the Digital Humanities in Theory and Practice’ 80), where globality can fall into the trap of what Donna Haraway calls a “false universal kinship,” which refers to the attitude of “[i]ntending to make kin while not seeing both past and ongoing colonial and other policies for extermination and/or assimilation” (207n12). In this sense, in interweaving globality and locality, it is imperative to acknowledge that geography—geopolitics—matters to and for the archive. All in all, a networking and collaborative strategy for social media that is rooted in the reformation of curatorial practices and metadata standards and considers the complexities of the interactions between the local and the global can aid BHL and its global partners in consolidating the Library not as a repository of knowledge but as a network of bio-diverse plural knowledges. This objective is, once more, in line with a CRSEUoB and could turn BHL into a truly decolonial global project in the Anthropocene.

2.3 My Stories, Your Stories, Our Stories: Virtual Repatriation and the Issue of Ownership

A mixed-methods analysis of the bio-diverse storytelling processes of BHL at the levels of the catalogue and its social media dissemination strategies reveals the importance of questions of agency

and ownership, in this case, *whose stories are being told and by whom*. Given BHL's deep connection to natural-cultural *heritage* (as explained in the previous chapter), as well as its global outlook that encompasses global partnerships and audiences, the Library does not only face issues of representation but inevitably brings to the front issues of nationhood, coloniality, belonging, and repatriation. The geopolitical panorama of BHL, the power dynamics between the Global South and North (especially considering historical and present coloniality), the digitality of the materials housed in the Library, and the virtual nature of our relationships with nonhumans complicate the relationship between the Library's global nodes and further highlight the need to reform and contextualize its archival practices as well as to question the geographical affiliations of its collections. The intersection between these aspects of BHL's archival storytelling points to the need to reframe ownership and materiality from a decolonial stance and towards the establishment of a CRSEUoB in the Anthropocene.

As mentioned in the Introduction to this thesis, plural biodiversities constitute an essential part of the *sense of place*^{xv} that often accompanies ideas of geographic and national belonging. Similarly, archives usually carry a national sense of meaning. For instance, UNESCO recognizes the value of archives in correlation with the nation, in that they serve as repositories, testimonies, and the basis of a country's history, culture, economy, identity, citizenship, stewardship, geography, sovereignty, and rights (Banton 50). Aspects related to the nation can transform an archive into “a national symbol of considerable importance” (Boserup 171). When the archive relates to tangible and intangible natural-cultural heritage—as is the case of BHL—its relevance and value as a national signifier are further emphasized because the physical records and their contained plural knowledges are of great importance to the history and identity of a given community.

The archival connection to nationhood has given rise to debates and polemics regarding displaced archives, that is, archives that contain documents pertaining to a cultural community but

are physically situated in the space of a divergent community. This situation engenders political and social disputes, especially when the *ownership* of the archive cannot be easily determined. For instance, going back to the example of *pyrostegia venusta*, the complex network of geographical affiliations not only of the nonhumans involved but also of the knowledge production about nonhumans question who *owns* those (hi)stories, who *has the right* to re-tell them, and to *whose* knowledge they refer. These complexities are particularly true for colonial archives, which concern the administration of the colonies but have historically been considered the property of the colonizing power. This is the case, for example, of the United Kingdom's "'displaced' or 'migrated' archives" (Banton 41), which are archives allegedly belonging to the UK but that record the culture and history of its former colonies. This information, on the one side, is considered sensitive and of exclusive use to British authorities (44) while, on the other, deals with matters of local stewardship that hold important historical and cultural value to former colonies in Africa and Latin America (43–45). Due to the tension between physical location and the characteristic of the archive as a holder of nation and culture, such controversies have led to sustained and unresolved conflict between countries.^{xvi} The failure of such efforts to resolve the conflict around displaced archives throughout the world attests to the strong national value they hold for both sides of the disputes. In this sense, *nation* continues to be the central concept in discussions of archives and their repatriation, including for Indigenous peoples:

Despite the multiplicity of identities that any one individual or group might possess (national, regional, religious, ethnic, sexual orientation, etc.), the nation-state has maintained dominance in the repatriation of cultural heritage – with one notable exception, namely, Indigenous, First Nation or Aboriginal communities ... However, indigenous tribes or communities are legally defined as 'nations', further legitimizing the role of the nation-state as primary arbiter in the exchange of cultural objects. (Frick 120)

Overall, when an archive or an object to be repatriated—that is, to be returned to its community of origin—is considered “a national symbol” (Boserup 171), ownership of the object becomes essential for the community members of all involved nations. This is why some repatriation efforts have focused on digital surrogates, arguing that digital versions of the analogue object can be as meaningful as the material object itself (*ibid.*), giving rise to initiatives and projects of what is known as *virtual repatriation*.

Virtual repatriation can be defined as the digitization of objects to be repatriated, which generates a surrogate virtual object that is then made available on digital, usually online, spaces so that it can be accessed by several communities, particularly its community of origin, often Indigenous (Espinosa de los Monteros 111). Online platforms thus provide primary access points as due databases and websites, a practice being increasingly adopted by institutions worldwide:

Museums have embraced digital technologies for their ability to make their collections visible on the Internet ... a paradigm shift in the ways that institutions and individual anthropologists can display and create access to their collections, digital technologies—paired with innovative programming and design that is responsive to the needs of community stakeholders—are providing significant possibilities for sharing curatorial and ethnographic authority with originating communities. (Hennessy 5)

This digitizing trend constitutes one of the central contributions of BHL according to its Secretariat. For instance, BHL’s Chair, Constance Rinaldo, and Program Director, Martin R. Kalfatovic, mention that, by digitizing and providing open access to historical and scientific materials across several hundreds of years and from all over the world, “BHL is *repatriating* scientific knowledge to all parts of the globe” (Kalfatovic and Rinaldo; emphasis mine). In a different work, Rinaldo builds upon this contribution of BHL and gives an example of virtual repatriation:

Another key reason to provide digital access is so that the taxonomic literature is repatriated: most

taxonomic literature is in the developed world, while most biodiversity is not. An important example of this is the distribution of copies of *Biologia Centrali-Americana*, a key resource for fauna and flora of Central America. There are eight copies of this 63-volume set in the United States and Canada, five copies in Europe, and two copies in Central America.

(Rinaldo 260; emphasis mine)

Despite Rinaldo's consideration of *Biologia Centrali-Americana* as a case of virtual repatriation, this example points to the need to address, highlight, and decolonize the historical context of the materials contained in BHL's archive before considering the Library's work as akin to repatriation. *Biologia Centrali-Americana* "is a sprawling encyclopedia on the natural history of Mexico and Central America, which was published in over 200 volumes from 1879-1915" and that contains knowledge on Mexican and Central American "zoology, archaeology, scientific expeditions, and indigenous peoples" (Smithsonian Libraries and Archives). It is a monumental compendium that was envisioned, coordinated, edited, and produced by British naturalists Frederick DuCane Godman and Osbert Salvin,^{xvii} who underwent several expeditions to Central America between 1857 and 1875 (Godman 3–7), followed by Godman's expeditions to Mexico in 1887-1888 (9-10). The *Biologia* was "privately issued in Parts" (Lyal 67), with each part authored by and including contributions from researchers and illustrators from Europe and the US (72–99). Most digitized versions of these volumes housed in BHL come from the Smithsonian Libraries and the Cornell University Library ("Search Results for *Biologia Centrali-Americana*"). Once again, this work establishes the Global South as an object of study, anchored in an epistemic association between nature and Indigenous peoples, while the knowledge production takes place and is disseminated and housed in the Global North. Furthermore, as in the case of *pyrostegia venusta*, metadata from the multiple volumes of *Biologia Centrali-Americana* include subjects such as "Central America," "Mexico," "Indians of Central America," "Indians of Mexico," "Mayas," and "West Indies" along with others referring to

nonhuman groups and species ('Search Results for *Biologia Centrali-Americana*'). Thus, the nature and geographical affiliations of *Biologia Centrali-Americana* speak to the colonial dynamics of the Global South and North and to the shared alterity of nonhumans and Indigenous peoples (as highlighted in the Introduction to this thesis).

Moreover, the knowledge production in the *Biologia* evidences the colonial roots of naturalistic research. In the Introductory Volume, for example, Godman describes the details of his endeavours, from the travels to the process of species collections. The labour involved in such scientific enterprise was, however, undertaken mainly by Indigenous workers:

I returned to San Gerónimo and then went to Buenaventura on the upper waters of the Montagua River, there called the Rio Grande, where I employed Indians to poison some nine miles of the water in order to make a collection of the fish. Before commencing operations I noticed one of the 'mozos' lying flat beside the river, wafting some burning material over the surface of the water, and, upon questioning him, I elicited that he was propitiating the spirit of the river in order that success might attend his efforts and the fish be permitted to die. (Godman 5)

In this passage, the European scientist requires the work and knowledge of the Indigenous communities to perform his scientific inquiries. Furthermore, his (European) modes of knowing and relating to nature are contrasted to and diverge from those of his Indigenous companion, emphasizing cultural difference. Paradoxically, remarks such as the ones found in Godman's work about Indigenous peoples are oftentimes also the only sources and registries about Indigenous cultures during those times. In this sense, the archive "resist[s] us to find about these peoples" and shows that Indigenous peoples do not exist in these records but are homogenized and separated from the materialities of their production (Longair).

Even after their expeditions, Indigenous researchers continued to be key to Godman and

Salvin's work but remained anonymous:

In addition to the material obtained during our various visits to Central America and that *sent us by the natives we had trained*, we found it necessary, for the sake of comparison, to acquire a more thorough knowledge of the South American fauna, and, with that view, *employed various expert collectors, whose names are recorded in the body of the work*, to visit special localities in Colombia, Ecuador, Peru, Guiana, and other places in South America. (Godman 7–8; emphases mine)

This passage from Godman's Introductory Volume to the *Biologia* highlights several issues surrounding the production of knowledge about Latin American biodiversities. For instance, the need to train Indigenous peoples so that they can follow the scientific methods and paradigms of Western epistemologies as well as the distinction between “natives” as collectors and “expert collectors” point to the unequal valorization of the work and knowledge production of the colonizer and the colonized. Later in his Introduction, Godman mentions that, in Orizaba, Mexico, he met US naturalist Herbert Huntingdon Smith and his wife, US taxidermist Amelia Smith (born Woolwirth) (Papavero and Ibáñez-Bernal 151–52). After working with them, Godman explains that Amelia Smith “was also skilled in skinning birds which were shot and brought to us by the Indians, and through her we made many additions to our store of ornithological treasures” (Godman 9). In this passage, while Indigenous workers are playing a key role in the production of knowledge about these birds, the “credit” for that knowledge is given to Smith. In this sense, then, the issue of knowledge production also relates to the attribution of that knowledge. As mentioned before, knowledge production is often associated with the authors and publication of a given work. In the case of the *Biologia*, the many authors and contributors of its multiple volumes do not include the work of Indigenous peoples, who are relegated, in the metadata and alongside nonhuman species, to the category of *subjects*^{xviii} (i.e. objects of study).^{xix}

Going back to the Library's three-component name and the values held by bio-diverse knowledge, the case of *Biologia Centrali-Americana* is one of many that continue to raise questions regarding the control of and rights to natural-cultural heritage as well as the colonial geopolitics that determine the archival curation, annotation, and presentation of biodiversity-related materials in BHL's catalogue. These are precisely the nuances of the archive that challenge the notion of repatriation. While providing open access to a monumental and fundamental work on Latin American biodiversity holds great value, whether it can be seen as virtual repatriation, given the still colonial dynamics that determine its content and distribution, is not an easy question to address. This is particularly so given that, as in the case of *pyrostegia venusta*, the geographical affiliations and appropriation of knowledge of *Biologia Centrali-Americana* perpetuate the dichotomy South object versus North subject (and locus of knowledge production). These disparities highlight that, even though BHL itself could be an instance of decolonization of knowledge in terms of accessibility, it is still ingrained in a long history of *epistemic* coloniality and violence:

the move to decolonize digital humanities requires redress of the traces of colonialism that appear in digital scholarship, which has political and epistemological implications. While digital humanities offers tremendous potential for democratizing scholarly knowledge, such possibilities are undercut by projects that recreate colonial dynamics or reinforce the Global North as the site of knowledge production. (Risam, 'Decolonizing the Digital Humanities in Theory and Practice' 79–80)

In this case, once more, institutional affiliation and curatorial practices continue to matter and are essential in the decolonization process of digital archives concerning issues of competition, ownership, and key historical documents. In this regard, a form of virtual repatriation in BHL occurs by digitizing materials being held in hosting institutions to provide open access to them for diverse communities, including (potentially) the object's originating community. Nevertheless, even if it is

possible to recognize the value of providing global open access to the knowledge contained in the texts shared by BHL, Rinaldo's example problematizes virtual repatriation by revealing the unequal and oppressive relationship between the Global South and North, especially as *sites* versus *objects* of knowledge production. Even if global audiences can access the *Biologia* through BHL's catalogue, the knowledge production contained in it is still centred in the Global North, and the insufficiently contextualized metadata categories perpetuate the colonial appropriation of Indigenous work and knowledge in which this work is rooted. Additionally, in the case of *Biologia Centrali-Americana*, which pertains in great part to Maya communities, it is still doubtful that the originating groups will indeed have access to this work, considering the linguistic and accessibility barriers faced by Indigenous peoples in Latin America, as explored in the previous chapter.

Geographical affiliations of collections and archival models evidence the relationship between the Global South and North as sites of knowledge production. This dichotomy constitutes one of the essential issues of archiving, especially concerning the place and means that make archives possible and, particularly, that determine their processes of production, selection, curation, circulation, and reception, all of which continue to happen mainly in Europe and the United States (Añón 263). The concentration of archival practices in the Global North, thus mirrors “la sinergia metropolitana que el orden colonial propició,”^{xx} perpetuating epistemic hegemonic geopolitics (*ibid.*). While globalizing and opening access through the Internet “has beneficially extended the reach of, and democratized access to, *our shared cultural heritage*” (Cohen 27; emphasis mine), access alone is not—and should not—be the goal.

At the same time, *sharing heritage* should not erase context specificities nor should it conceal historical and present colonial power structures. Thinking (hi)stories only as “shared cultural heritage” runs the risk of falling back into Enlightenment 2.0 and its ideals of universality, which are in no sense *universal* but colonial, imperial, Northern, European, Anglophone, and so on. Thus,

global open access as the main objective of a digital archive must be taken seriously and cautiously. Open access must go beyond *providing* access and pursue the goal of promoting the active participation of audiences. It is essential to understand and contend with the rather utopic belief that “digitizing and putting materials online” is sufficient to create an inclusive archive (Cohen 27). Quite the opposite, the traditional archive “rarely involves the public in the process of creating or curating archives, participating in these collections, or deciding what goes into them. It generally fails to engage in an active program that constantly increases visibility and use” (*ibid.*). In contrast, *ideal* open access should consider not only access as availability but especially as inclusive participation of diverse audiences.

Behind the democratization of knowledge as an inherited promise of open access, lie the silences and misrepresentations of colonial histories and discourses. Providing access is not akin to decolonization, just as digitizing is not akin to return, retribution, or reparation. *Biologia Centrali-Americana* is indeed available for researchers around the globe thanks to the efforts of BHL and its partner institutions. However, its digital presence in the Library’s collection does not involve by and in itself any form of colonial reparation. On the contrary, equating presence to inclusion can lead to tokenizing inclusion, that is, considering that the mere presence of these materials in online open-access spaces equals decolonization and creates inclusive environments:

this kind of inclusion is a form of enclosure, dangerous in how it domesticates decolonization. It is also a foreclosure, limiting in how it recapitulates dominant theories of social change ... decolonization is not a metaphor. When metaphor invades decolonization, it kills the very possibility of decolonization; it recenters whiteness, it resettles theory, it extends innocence to the settler, it entertains a settler future. (Tuck and Yang 3)

Open access and digitization, when decontextualized and universalized, tend to romanticize the digital by overlooking the coloniality it has inherited and perpetuates from the analogue.

By considering the mere digitization and open access of archives as sufficient for repatriation (virtual or otherwise), BHL runs the risk of engaging in discursive appropriations of decolonization that obscure the underlying colonial dynamics that are the roots of the biodiversity-related knowledge production that it houses. In this regard, discussions about the repatriation of archives and other cultural objects often refer to the power relationship “between the metropole as the recipient of archival materials and the colonial or post-colonial periphery as the source” (Banton 43). Colonial archives tend to narrate from the centre, silencing the voices of the periphery, a practice that “indicates one register of omission from the archive of colonialism” (Risam, ‘Colonial Violence and the Postcolonial Digital Archive’ 48). In most cases, virtual repatriation alone does not counteract colonialism since it is incapable of reparation, that is, it does not reverse the stripping and appropriation of Indigenous cultures and artifacts by the colonizing power, nor the colonial violence exercised against humans and nonhumans alike. Therefore, while virtual repatriation and akin projects can provide open access, they can only do so as “mediated access” to a “surrogate copy” (Espinosa de los Monteros 111). Thus, power relationships between nations and communities are a central aspect to consider when discussing virtual repatriation, a process that cannot only provide access but requires a deep understanding and decolonial critical stance vis-à-vis the digital archive.

A core notion to consider when speaking of the decolonization of archives and the repatriation of artifacts is materiality. One of the main reasons why virtual repatriation can be problematic is because the analogue object itself does not change hands. In this sense, Kate Hennessy defines virtual repatriation as the “[v]isual access by [the originating communities] to their cultural heritage in online museum and ethnographic collections” (5; emphasis mine). In her definition, Hennessy interestingly incorporates *visuality* as one of the essential aspects of virtual repatriation and the digital itself.^{xxi} This relates to a fundamental concern about and objection to virtual repatriation: the so-called *return* of a *digital copy* of the *physical original* object renders material

interaction impossible and replaces it with *visual* interaction, that is, *virtual* interaction. For this reason, some critics advise against the use of the concept of virtual repatriation. For instance, when discussing archives and Indigenous knowledge, Robin Boast and Jim Enoté consider that the compound phrase “virtual repatriation” should not be used to refer to mere “data sharing” (103), especially because sharing alone does not question nor repair the oppressive history behind the artifacts and suffered by its communities of origin. For these authors, the problem with digital *repatriated* objects is not an issue of materiality but of origin and, in that sense, originality: digital artifacts are not immaterial, but they are not the original artifact either, which renders “restitution or repatriation” impossible, especially as it continues to be enacted from the power of institutions (Boast and Enoté 109). Going back to the case of *Biologia Centrali-Americana*, for example, the locus of enunciation, dissemination, curation and storage is still rooted in the epistemic power centred in the Global North. In this regard, Kim TallBear considers that it is not possible to speak of or enact decolonization if there is no *actual* return of stolen artifacts, for decolonization, “in its core, is always something material” (TallBear), a statement that challenges the notion of *Biologia Centrali-Americana* (or any other digitized product) as an example of (virtual) repatriation.

While the value of projects often associated with virtual repatriation—as is the case of BHL—in terms of data sharing and open access is not questionable, it should neither be confused with nor lightly presented as virtual repatriation. In reality, virtual repatriation is a concept that runs the risk of interfering with political action and concealing colonial histories:

In addition to deviating the term *Repatriation* away from the corporeal, material person, thing, or practice—a very dangerous political move that runs counter to the intentions of these projects—the appropriation of *Virtual Repatriation* for projects of data sharing confuses the context of sharing with programs of restitution, thus potentially playing into the hands of those voices which seek to maintain the centralized, universal enlightenment collection.

(Boast and Enote 111)

In this version of virtual repatriation, discursive and epistemic coloniality are enacted in the indiscriminate and interchangeable use of terms such as decolonization, inclusion, reconciliation, and repatriation, which perpetuate and foster colonial violence (TallBear), in this case, in digital environments. In this regard, an important vein in repatriation efforts focuses on how “la restitución de bienes culturales (principalmente, bienes arqueológicos) pone sobre el tapete la legitimidad —o, más bien, ilegitimidad— de las extracciones y las transferencias de bienes que hoy se encuentran en el extranjero, al tiempo que se aboga por su retorno”^{xxxii} (Ochoa Jiménez 119–20). Debates around virtual repatriation thus highlight the historical issues of legitimacy, ownership, coloniality, and power relations—especially between the Global South and North, periphery and metropole, *anthropos* and *humanitas*—that surround natural-cultural heritage. Furthermore, when considering the colonial background and roots of archives, it is necessary to approach these concepts more carefully, especially because “this is not only a repetition of colonial violence within the cultural record; rather, it fosters that violence in the digital cultural record” (Risam, ‘Colonial Violence and the Postcolonial Digital Archive’ 51). While virtual repatriation is often associated with digital access, online sharing, and virtual return, the ideas of *access*, *sharing*, and *return* do not question the *ownership* of the archive. On the contrary, *authority* to grant access, *benevolence* to share, and *willingness* to return—all of which can be implied in the original terms—still consolidate the power of the *giving* party, that is, the centre, the North, the *humanitas*. This assumption can interfere with political and decolonial projects on and offline, especially because an uncritical approach to the *return* of cultural artifacts can further consolidate the power of the Global North over colonized cultures in regions such as Latin America, Africa, and Asia. This, in turn, invigorates colonial practices of cultural oppression, and fuels “cultural property battles” (Frick 118). Thus, *virtual repatriation* risks becoming a vehicle for the same colonial legacies it is supposed to mend by overshadowing political efforts for the *actual* return

of cultural artifacts.

Although the problematic compound *virtual repatriation* engenders “ethical questions about the digitization and circulation of [natural-]cultural heritage” (Hennessy 5) as well as about the value of the *form* of that repatriation, I still believe projects framed within virtual repatriation efforts can offer possibilities towards decoloniality. These possibilities of virtual repatriation include but are not limited to active participation and engagement with digital artifacts, recovery of natural-cultural heritage, renewed relationships with heritage, appreciation of plural natural-cultural heritage, and collaborative and local projects and research (Hennessy 6). In some ways, these possibilities all refer to participation and inclusion but from a truly ethical and decolonial standpoint. Accordingly, most projects pursuing virtual repatriation see collaboration as an essential part of their development. The collaboration between parties “should be seen as an opportunity to better address the problems of post-enlightenment, neocolonial collecting, and representation” (Boast and Enote 111–12), even though framing it as virtual repatriation could “firmly, and uncritically, orient the collaboration within the historical and constitutional space of the universal collection” (112). Virtual repatriation, open access, and digital archives continue to evidence the complicated overlapping of and opposition between the universal and the particular and the local and the global, as well as between the historical and the constitutional, raising questions as to how to untangle these concepts and practices.

Nonetheless, and though not strictly accomplishing repatriation, by highlighting and negotiating these issues, collaborative (digital) projects that deal with a plural understanding of the archive are taking a step forward into the decolonization of (digital) knowledge. Furthermore, such dialogue can encompass both virtual and non-virtual repatriation. For instance, in many digital archival projects and initiatives, virtual repatriation engenders true collaboration between diverse groups, thus enacting virtual repatriation in parallel to physical repatriation (Boserup 169).

Therefore, virtual and physical repatriations do not need to be opposite processes but can be part of a shared decolonial and decolonizing vision, especially if they undertake specific strategies to promote networking, exchange, and dialogue that transcend the centring of (digital) knowledge production and dissemination. As stated in the previous chapter, for example, BHL could promote decolonial collaboration by engendering bio-diverse networks with its global partners that allow them to participate in the curation, content creation, and (social media) representation of their collections, thus ensuring cultural multiplicity in all layers of BHL's bio-diverse storytelling process. Such a stance can open avenues for what I call *virtual epistemic repatriation*.

2.4 Repaired, Returned, Reborn: Bio-Diverse Virtual Epistemic Repatriation

A central aspect of virtual repatriation refers specifically to the repatriation of *knowledge*. It is in this sense that critics such as Boast and Enote distinguish between virtual repatriation and data sharing. Repatriation projects of archives in different countries, such as Iceland's medieval manuscripts, are often seen as part of an academic research accomplishment, for which technology is an exceptional means for access (Boserup 170), an objective that is indeed more in tune with data sharing, especially as it refers specifically to digital surrogates. Therefore, in this and other similar projects, it is hard to determine whether the *object*—in this case, *knowledge*—is being *repatriated*, that is, *given back and restored* to its originating community. The difficulty resides in the fact that, while it is not possible to *materially* interact with the *physical* object, online digital access offers the possibility of *epistemic* interaction, thus allowing for what I call *virtual epistemic repatriation*, that is, the *giving back and restoration* not of objects but of knowledge.

The necessary objection to this train of logic concerns the act of *giving back*. Repatriating efforts might have the community of origin in mind but often seek to provide more *global* access to the materials, which renders the *return* to the originating community, at the very least, questionable.

Additionally, the goal of global access responds to a greater—utopian—goal of the Internet as a *universal* repository. Ivan Boserup goes so far as to argue that “[t]he distant goal is a single manuscript collection, virtual, but integrated, global in its scope, and globally accessible as well-presented digital facsimiles” (173). This problematic assertion, again, runs the risk of falling back into inherited ideals of the Enlightenment and its universalistic scope, as well as applying them to a romanticized ideal of the digital and, specifically, open access—what I have been referring to as Enlightenment 2.0. Such perspective, in turn, can overshadow the colonial systems of power that plague the history of the objects contained in digital repositories and erase the specificities and contexts of the plural humanities that interact with and participate in the creation of knowledge, as explained in the Introduction to this thesis and as exemplified by *Biologia Centrali-Americana*.

How, then, to create an online space for virtual epistemic repatriation that acknowledges the history and continuum of coloniality and makes room for the collaboration between plural humanities? Many critics point to the creation of “collaborative catalogs” (Boast and Enote 108) as an inclusive and decolonizing alternative to traditional archival practices. These catalogues allow for the originating communities not only to interact with the objects but to participate in the curation and systematization of the data and metadata of the archives (*ibid.*), “without centering the epistemologies of the Global North” (Risam, ‘Colonial Violence and the Postcolonial Digital Archive’ 52). In this sense, collaboration can create possibilities for a “multiplicity of needs” (Frick 123) that considers the interests of several communities—plural humanities—and finds a (digital) space in which they can coexist. Furthermore, these practices go beyond the holding group and the originating community, creating space for collaboration across academia, individual scholars, and institutions such as libraries and museums (Boserup 172), ideally creating an archive where plural humanities engage in multiple epistemic practices and are situated across sites of knowledge production. This goal brings us back to the possibility of a CRSEUoB enacted by the *anthropos*. The

decolonial digital archive is a site of dissemination of bio-diverse knowledge where plural humanities, as well as human and nonhuman subjects, can find open digital spaces for the re-telling and co-existence of their (hi)stories, that is, plural (sympoietic) spaces where multiple human and nonhuman narratives can become part of the weave—the web and the Web—of bio-diverse plural knowledges.

In the case of BHL, this ideal is reflected in and could be further developed through the Library's establishment of global nodes, local and centralized practices of metadata creation, and a continuous collaborative approach. If BHL were to open their networks of curation and promote participatory inclusiveness of diverse communities in annotation and dissemination practices, open access could potentially lead to the decolonization of its archive. For instance, while the colonial geopolitical roots, affiliation, and knowledge appropriation of *Biologia Centrali-Americana* cannot be erased, BHL could undertake a contextualizing process that would allow for diverse—hopefully Indigenous—communities and scholars to participate in annotating such materials. These practices would lead, for example, to metadata categories that not only reflect the colonality of knowledge that this work exemplifies but also challenge it by making its silenced (hi)stories of colonization visible.^{xxiii}

While the digital inclusion of *Biologia Centrali-Americana* would still not be a case of repatriation per se, by implementing collaborative and decolonial archival practices, it could be seen as a case of *virtual epistemic repatriation* inasmuch as it decolonizes not the artifact itself but the ways in which the knowledge it contains is presented and contextualized, its status in the networks of bio-diverse knowledge, the agents that participate in its curation, and, potentially, the future knowledge production it engenders. Additionally, from a collaborative and decolonial perspective, the concept of virtual epistemic repatriation aligns with the cyborgian nature of the CRSEUoB model. As explained in the Introduction to this thesis, our relationships with nonhuman species are often

virtual, that is, mediated by technology, which, nevertheless, does not interfere with the *actual* affective intraspecies connections that are engendered from such virtuality. In the case of virtual epistemic repatriation, understanding that virtuality does not impede affect and that epistemic return is not akin to material return but has value in and of its own, can lead to a re-valorization of digitizing projects that simultaneously promote repatriation efforts focused on the necessary material return and reparation of colonial legacies and cultural robbery and appropriation.

Although collaboration is a valuable goal, it also calls for the necessary replacement, specification, or at least redefinition of *virtual repatriation*, especially as to not interfere with nor overlook the political claims of communities that struggle to recover their cultural artifacts that more often than not landed in foreign hands as a result of colonial exploitation. Oppressed and colonized communities did not relinquish these artifacts; they were deprived of them, robbed. In such cases, the material object acquires a political, social, historical, and cultural signification and identity that the digital copy cannot possess nor retribute.

Therefore, for a re-understanding of *virtual repatriation*, it is necessary to reconsider what a digital object is, and the values it holds. While digital objects, especially in digital archives, are thought of only in relation to the *original* object, digital versions carry their own value and open further possibilities for the enacting of knowledge:

Digital surrogates *are not intended to be replacements for, or synonymous with, the physical materials they may represent*. Instead, digital (or digitized) cultural materials provide an *alternative form of and dynamic life for many physical objects*. These newly digitized and repatriated materials may stimulate linguistic or cultural revivals, spur contention and disagreement, prompt new cultural forms or popular products, incite new collaborations, and/or forge new types of performances or artistic creations. (Christen 187; emphases mine)

To understand the value of analogue objects made digital, it is necessary to transcend the binary

between the original and the copy, and between the material and the digital. It is fundamental, then, to acknowledge that a digitized object is not a copy but a new object itself, a “born-again” object (Raynor and Lewis 10), that attests to the claim that “analog-digital hybridity is not a transitional state” but the essence of digitized objects (Prelinger 19). In the case of bio-diverse knowledge, if we refer to the CRSEUoB model, not only are our interactions with-in biodiversity necessarily virtual but their value is represented in stories, in narratives, which are communicated, in the case of BHL and other online archives, through digital and digitized texts. Additionally, the rhizomatic dimension of the model refers to the ramifications and possibilities of (hi)stories and is anchored in the regenerative nature of the rhizome. The rhizome represents new beginnings as much as it represents roots. The rhizome opens possibilities (Deleuze and Guattari, *A Thousand Plateaus: Capitalism and Schizophrenia* 8). As noted by members of BHL’s Secretariat, the materials included in the Library’s catalogue are indeed a door that opens the way for the unfolding of *new* (hi)stories:

additional data made available through digitization and online publication [allow] researchers to use the information contained therein in new and better ways, such as assessing the value and condition of specimens, reconstructing historical ecologies, clarifying specimen and article provenance, and re-discovering species and study localities. (Kalfatovic and Rinaldo 11–12)

Thus, in addition to being careful with and conscious of the limitations and issues that determine the concept of virtual repatriation, and in the context of repatriation of *knowledge* and not *objects*, it might be more productive to think of the digital object as a point of departure to spawn new (hi)stories anchored in and intertwined with previous ones, that is, sympoietic (hi)stories. A renewed reconnection with natural-cultural heritage can originate new epistemic and artistic cycles, forms, meanings (De Largy Healy 151), and, particularly, (hi)stories. These narratives—rooted in the past, embraced in the present, enacted towards the future—highlight what Jessica De Largy Healy,

following Joe Gumbula, calls “the empiric value of *digital knowledge repatriation*” (152; emphasis mine). Such is the goal of several digital repatriation projects. For instance, when the fundamental Maya work, the *Popol Vuh*, was first digitized and made available online, the edition’s main objective was to become a new genesis of plural knowledges rooted in the world vision transmitted by the *Popol Vuh*, outside the constraints of the often Western-centric interpretations of this work (Espinosa de los Monteros 107), thus aiming for the decolonization of epistemologies anchored in the *Popul Vuh*. The first digital edition of this work, then, was fueled by the need to open spaces for plural and multiple (hi)stories and knowledges that arise from connections with previous plural and multiple (hi)stories and knowledges, and head towards the creation of new narratives entrenched, precisely, on plurality and multiplicity.

A similar case can be made for *Biologia Centrali-Americana*. As early as 1887, the value of this work for Latin American biodiversity-related knowledge production was recognized by the Museo Nacional de Costa Rica [National Museum of Costa Rica]. Building upon the nonhuman species described in the *Biologia*, this institution sought to “recopilar en los Anales de este Museo todos aquellos trabajos que han de servir de base para estudios posteriores”^{xxiv} for which they decided to “publicar en este primer tomo la lista de las plantas que hasta ahora han sido dadas a conocer a la ciencia como procedentes de [Costa Rica]”^{xxv} (Alfaro 1). Furthermore, the Museo recognizes that its work is greatly indebted to that of Godman and Salvin (2) while also evidencing “lo limitado de las exploraciones botánicas que hasta ahora se han llevado a cabo en Costa Rica”^{xxvi} (1), including the shortcomings of the *Biologia* itself.

Such endeavours persist today, as current Latin American biodiversity studies continue to rely on the knowledge compiled by Godman and Salvin. To cite just one example, Juan Márquez, Julieta Asiain, and Quiyari J. Santiago-Jiménez, consider the *Biologia* a fundamental work for Mexican entomology (21) and compare their observations of Coleoptera to those of the British authors to

understand the (hi)stories of these species and whether they have been affected by human activities (33–34). Furthermore, BHL itself contributes to the networks of bio-diverse (hi)stories anchored in the *Biologia*. Quoted in several BHL blog posts, this work is constantly engaged in new (digital) knowledge production associated with the Library. In September 2012, the *Biologia* was chosen as Book of the Week in the framework of the Hispanic Heritage Month (Constantino, ‘Biologia Centrali-Americana & Hispanic Heritage Month’). The blog post, written for this occasion by Grace Constantino, also links to the “virtual exhibition dedicated to *Biologia*” that was built by the Smithsonian National Museum of Natural History and several BHL partners (*ibid.*), including CONABIO, the Instituto Nacional de Biodiversidad, Costa Rica (INBio, National Institute of Biodiversity, Costa Rica), and the Museo Entomológico de León, Nicaragua (Entomology Museum of León, Nicaragua) (Smithsonian Institution et al.). This virtual exhibition is presented as a “digital edition” of the *Biologia* that includes all of its volumes (*ibid.*). Additionally, it offers the visitors a list of the nonhuman groups described in the work, each of which links to a separate page where the user can view the digitized pages and the plates/images of the volume.^{xxvii} However, it is important to note, regarding BHL’s work around the *Biologia*, that the blog post written for the Hispanic Heritage Month is still anchored on Latin America as *object* of study, for BHL could have chosen a book produced in the region instead of a work *about* the region. Nevertheless, and although the metadata available in BHL that accompany the *Biologia* participate in the perpetuation of epistemic inequality, the virtual exhibition of this work is an exceptional example of bio-diverse epistemic collaboration between the Global South and North that can potentially aid in the decolonization of the knowledge contained in the *Biologia*.

In this sense, the work of the Museo Nacional de Costa Rica (contemporary to that of Godman and Salvin), the continued reference to the *Biologia* throughout scientific research in Latin America (and elsewhere), and BHL’s knowledge production around this work—particularly the

virtual exhibition curated collaboratively—exemplify the possibilities of bio-diverse epistemologies building upon each other, both in analogue and digital ways, and both focusing on the global and local contexts of the *Biología*, as well as the decolonizing possibilities of this form of virtual epistemic repatriation. The online presence of the *Biología* then promotes engagement with-in Latin American biodiversities, as well as knowledge production from Latin America, which is, precisely, the form of virtual epistemic interaction for which this thesis argues.

Rather than conceiving virtual (epistemic) repatriation only as a mere alternative to physical repatriation, one could understand it in broad terms and consider it as an array of cultural digital processes through which natural-cultural heritage and patrimony can find their (digital) pathway to their places of origin (Ochoa Jiménez 121) to engender new (hi)stories and forms of interaction. This constitutes what María Julia Ochoa Jiménez calls a “reparación postcolonial” [postcolonial reparation] (124). It might not be a *material* reparation, but, taking these steps towards the decolonization of the archive points to the possibility of a *digital* reparation. In this way, virtual *epistemic* repatriation of bio-diverse (hi)stories through BHL might be part of the decolonial framework required by a CRSEUoB, especially if accompanied by decolonial and decolonized curatorial and metadata practices.^{xxviii}

Nonetheless, for virtual epistemic repatriation to be truly decolonial, it must occur in parallel with actual efforts for land claims and decolonization. In this sense, and as mentioned in the Introduction to this thesis, it is fundamental to understand that decolonization is not mere diversification or inclusion. Along with repatriation, decolonization requires reformation, reparation, and restitution. How, then, can virtual epistemic repatriation aid actual efforts to decolonize land and political and social structures? Colonization depends on a forced separation—legal, economic, social, cultural—between Indigenous peoples and their land, which results in the erasure of Indigenous peoples, communities, and (hi)stories (Tuck and Yang 6). In this sense, virtual epistemic

repatriation has the potential to trace the footprints behind such erasures. In the case of BHL, for instance, the incorporation of Indigenous (hi)stories that constitute a parallel and contentious narrative of history, politics, land, society, and biodiversity can decentralize the hegemonic (hi)stories that dominate the Library's catalogue and, in that sense, push for the decolonization of its archival practices.

I argue, then, that decolonizing processes, which must always be anchored in concrete political and social action, begin in the ways through which (hi)stories are told. The (hi)stories contained in BHL are the starting point for studies and research on biodiversity that can later become sources of knowledge for other initiatives and efforts, including policy, civil rights, and social justice. If such (hi)stories are Global-North-centric, then the resulting knowledge and efforts will carry with them such biases and become excuses and justification for the colonizer's supposed "dominion over the earth and its flora and fauna, as the anthropocentric normal," as well as the colonizer's conception of being "more developed, more human, more deserving than other groups or species" (Tuck and Yang 7). In the following chapter, for example, I will explore the case of *Bertholletia excelsa*, the Brazil nut, and the absence of materials in BHL that highlight the strong relationship between this species and Indigenous peoples in the Amazonian area. Indigenous peoples are key actors in the biochemical processes that determine the growth of the Brazil nut. If the (hi)stories of their labour and knowledge around *Bertholletia excelsa* were part of BHL's collection, then BHL's materials could become sources to argue for the return—that is, the decolonization—of the lands where *Bertholletia excelsa* is cultivated and where Indigenous peoples were/are forced to work and relinquish their rights. Moreover, specifically in the context of Brazil and the Amazonian region, such decolonization must occur at the level of the nation, for current land and rights claims in the area stem from the conflict between Indigenous peoples and Brazilian authorities (Raftopoulos and Morley 1625–27). Therefore, I consider BHL and other digital archives as

storytelling machines whose stories have the potential to aid and enact processes of repatriation, restoration, and reparation in the global and local contexts.

The decolonization of online plural knowledges, in its pursuit of multiplicity and plurality, requires that globality intertwines with locality, creating a global community that nonetheless recognizes and emphasizes the value of the local. Multilingualism and global partnerships are valuable first steps that can, and should, be followed by other practices such as adjusting curatorial and annotating practices of both data and metadata, especially to address the often colonial nature of materials, as well as opening spaces for different communities to participate in such practices. A truly decolonial archive is one “that embodies the power of the record while simultaneously disavowing it, that is to say invoking both privilege and antiprivilege” (Prelinger 8). In my estimation, BHL is in the perfect place to become such a decolonial archive, harnessing the power of information and plural epistemologies, and placing it in the hands of silenced bio-diverse narratives. This is a unique opportunity, particularly concerning intra and interspecies relationships, that is, our plural existence, knowledges, and experiences with-in biodiversity. Acknowledging, understanding, addressing, and repairing colonial biases in bio-diverse (hi)stories are fundamental steps towards equitable, sustainable, and fair bio-diverse coexistence and towards a cyborgian rhizomatic sympoietic existential utopia of biodiversities.

Notes for Chapter 2

ⁱ It is worth noting that social media networks also promote user-generated content as an essential characteristic of Web 2.0, which points back to user agency as a central component of citizen science as promoted by BHL as well as CONABIO and its affiliated websites. Additionally, this highlights, as discussed in Chapter 1, the ethical need to question *who* can exercise that agency, that is, *who can be a user*.

ⁱⁱ Social traffic includes the number “of site visits (non unique) from social sources over the selected time period” as well as the “distribution of leading social visits per Social Network” (Similarweb).

ⁱⁱⁱ Social traffic refers to the “[p]ercentage of traffic from social pages which drove traffic to the analyzed site” (Similarweb).

^{iv} I am referring to the six websites introduced and analyzed in section 1.4 Decolonial Access: Towards Plural Audience Engagement in Chapter 1 of this thesis: BHL, CONABIO, Bioteca, NaturaLista, RI-UNAM, and MEXICANA. For a full description of these websites, see Appendix.

^v This social media panorama is constantly changing given the rapid development and fluctuating popularity of social media platforms. It will be interesting to see whether traffic from social media channels to the selected websites changes with new platforms in the horizon, such as TikTok.

^{vi} There seems to be a correspondence between activity and number of followers. As of July 22, 2020, CONABIO’s Facebook page had a total of 207,636 likes and 221,808 followers, while BHL’s Facebook page had 69,847 likes and 72,743 followers. Regarding YouTube, as of July 23, 2020, CONABIO’s channel had 34,800 subscriptions and 11,228,844 viewings, while BHL’s channel had only 246 subscriptions and 10,347 viewings. These numbers are in tune with each channel’s

content: CONABIO has 670 videos while BHL has 56 only. In contrast, as of July 22, 2020, CONABIO had only 28,300 followers on Instagram compared to BHL's 69,900 followers. On this platform, BHL's account is considerably more active, with 2,421 posts, as opposed to CONABIO's 666 posts (these data were collected on July 22, 2020 and BHL's Instagram account announced a hiatus starting July 8, 2020 due to changes at the Library's Secretariat).

^{vii} While BHL's Annual Meeting usually takes place in person, the 2020 meeting was held entirely online (mostly asynchronously) due to the COVID-19 global pandemic. All reports and presentations for this meeting were pre-recorded and made publicly available through BHL's YouTube channel. This gave users, including myself, the advantage of having access to all the data shared by members of BHL's Secretariat and staff during this meeting.

^{viii} Data as of September 2020.

^{ix} I further explore issues of institutional affiliation in my discussions of metadata in Chapter 3 of this thesis.

^x Lena Lowis does not refer to this plant as *pyrostegia venusta* but uses the scientific name *bignonia venusta*, which is attributed to the same species, as noted by the Encyclopedia of Life ('Flamevine. Scientific Names') and by BHL's post itself.

^{xi} As of October 2020, Wikipedia is the only online source of concrete information about Lena Lowis, a fact that is in itself evidence of the need to highlight the work of women in the sciences.

^{xii} First recorded as *bignonia venusta*. See note x above.

^{xiii} BHL's metadata practices are analyzed in more detail in Chapter 3 of this thesis.

^{xiv} This could also aid in the promotion of cross-Global South interaction, which is still minimal, as shown by the analysis of traffic by country in Chapter 1.

^{xv} *Place* and *sense of place* are fundamental concepts in my discussions of metadata in Chapter 3 of this thesis.

^{xvi} In this regard, Mandy Banton highlights that UNESCO's "1970 'convention on the means of prohibiting and preventing the illicit import, export, and transfer of ownership of cultural property' included archives among definitions of 'cultural property' but was not retrospective" (50). This convention "eventually resulted in the *Vienna Convention on Succession of States in respect of State Property, Archives and Debts*, but it did not come into force, being ratified by too few member states" (51). The limitations and lack of success of such initiatives point to the complexity of the nationhood of archives.

^{xvii} Salvin died in 1898, "leaving [Godman] alone to complete the '*Biologia*'" (Godman 10).

^{xviii} I further explore the representation of Indigenous peoples as objects of study in my discussions of metadata in Chapter 3 of this thesis.

^{xix} One of the few exceptions is the work of Mateo Trujillo, who Godman met in Jalapa, Mexico:

I engaged Mateo Trujillo, a half-breed Indian, who accompanied me during the greater part of the time I was in Mexico and proved a very skilful collector. He was a first rate climber, and amongst other things made a considerable collection of the frogs, newts, and insects which inhabit epiphytical Bromelias growing on the trees in the neighbourhood of Jalapa. (Godman 10)

Trujillo is amongst the few Indigenous researchers to whom Godman gives credit: "we employed a considerable number of expert collectors to travel in districts we had not visited, and they continued to send us the results of their labours for some years after we had left. Amongst them must specially be mentioned W. H. Richardson, Mr. H. H. Smith, and Mateo Trujillo" (11).

^{xx} the metropolitan synergy that colonial order promoted.

^{xxi} Visuality is particularly important in terms of the responsive web as it refers to the standardization of web design and layout that seeks “to accommodate users with screens of all sizes” (Carver). See Chapter 1 of this thesis.

^{xxii} the restitution of cultural artifacts (especially archaeological ones) brings to the front the legitimacy—or rather, the illegitimacy—of the extractions and transferences of artifacts that are nowadays abroad, at the same time it argues for their return.

^{xxiii} I further discuss the importance of contextualizing metadata in Chapter 3 of this thesis.

^{xxiv} compile in the Annals of this Museum all works that can aid in future studies.

^{xxv} publish in this first tome the list of plants known so far by science to be native to [Costa Rica].

^{xxvi} The limitations of the botanical expeditions that have been so far carried out in Costa Rica.

^{xxvii} While the electronic *Biologia Centrali-Americana* is still available online (as of May 2021), it is now accompanied by the following legend:

As of 2016, the pages hosting the eBCA are no longer being maintained, though the content will be stable until central support for the platform is unavailable. The entirety of the *Biologia Centrali-Americana* is available through the Biodiversity Heritage Library, including the volumes for Archaeology, with additional services such as taxonomic name finding, easy navigation of the text, and the ability to create custom pdfs of the content. (Smithsonian Institution et al.)

^{xxviii} I further discuss decolonial metadata in Chapter 3 of this thesis.

Chapter 3

Bio-Diverse Curation: The (De)Colonial (Hi)Stories of Metadata

Archives are storytelling mechanisms. The archive is the machine activated by the cogwheels of digital technology, human design, and other practices, and is fueled by the (hi)stories enacted by human and nonhuman beings in sympoietic systems. The (hi)stories that constitute the archive determine the nature of the archive itself, and the broader (hi)story/ies it (re)tells. Stories activate the archive, and the archive, in turn, produces stories. A decolonial digital archive in the Anthropocene is a storytelling mechanism that re-tells the virtual (hi)stories of a multiplicity of human and nonhuman worlds from an ethical standpoint. A decolonial archive considers human and nonhuman kinship as coexisting in a network of sympoietic narratives that are heterogenous, interconnected, and characterized by ramifications, possibilities, and re-generation towards the future, anchored in an equal and affective valorization of nonhuman modes of existence as well as plural humanities. In sum, a decolonial digital archive in the Anthropocene is a cyborgian rhizomatic sympoietic existential utopia of biodiversities (CRSEUoB) enacted by the *anthropos*.

Such is the model I propose for the *Biodiversity Heritage Library* throughout this thesis, aiming at a re-structuring of its storytelling practices at different levels, which include the diversification and pluralization of audiences (as explored in Chapter 1) and the critical approach to ownership and representation (as explored in Chapter 2). To delve deeper into the decolonization of archival storytelling methods, this chapter will look more closely at BHL's (hi)stories and practices of metadata,ⁱ considering the nuances of which (hi)stories of human and nonhuman subjects are collected and how they are annotated and curated in the Library's catalogue. The (hi)stories of the materials housed in archives never stand on their own. Their stories are accompanied by the stories of their production and publication, that is, their metadata, which constitute a fundamental component of their narrative network. The (hi)stories of metadata are thus part of the network of

bio-diverse narratives that constitutes, in the case of decolonial digital archives, a CRSEUoB.

This chapter focuses on the representation of Latin America as both an epistemic actor and object in the narratives and networks of bio-diverse knowledge production as told by BHL. The premise of this chapter is, precisely, that metadata constitutes yet another layer of archival storytelling that reveals the (de)colonization of bio-diverse (hi)stories, especially concerning a multifaceted understanding of *place*. Metadata is a *place* of contention of *places*, rooted in the colonial narratives of bio-diverse epistemologies. The metadata in BHL reveal the multiplicity of meanings communicated through the representation of *place*: *place* as a site of knowledge production, *place* as an epistemic agent and/or owner, *place* as an object of study. This chapter then dissects the different ways in which *place*—with a focus on Latin American *places*—manifests in metadata, as well as the geopolitics that sustains those meanings, all with the goal of proposing a (de)colonial approach to the metadata of *place* in BHL.

3.1 What's in a *Place*? The Metadata of Place and the Place of Metadata

A *place* locates, identifies, maps, creates, belongs. A *place* carries a myriad of meanings tied to a subject's positionality. As explained in the Introduction to this thesis, one of the most important cultural associations of biodiversity resides, precisely, in its *place*-making, its central role in the human creation of a sense of place. This role of biodiversity is rooted in affects, that is, “the subjective and emotional attachment people have to place” (Cresswell 7). It is through places that humans “se[e], kno[w] and understan[d] the world ... a world of places ... worlds of meaning and experience” (11). Moreover, *place* “is space invested with meaning in the context of power” (12). The creation of a *sense of place* through metadata, thus, is an affective process rooted in power relationships. Who, then, can have such a *sense of place*? Who tells the (hi)stories of *place*? Whose are the (hi)stories of biodiversity in *place*? Where is biodiversity located? How does metadata reveal constructed bio-

diverse sense(s) of *place*? These questions in the context of digital archives point, once more, to the inherent coloniality of cataloguing and curating practices. *Place* is discursive and semiotic (Scollon and Wong Scollon 23), in short, narrative. The narratives of *place* as re-told by (digital) archives are then imbued with the power and (de)colonial relationships that determine them.

The *place* of *place* in archives lies in metadata, specifically in the mechanisms through which metadata embed archival materials with a sense of *place*. The geopolitical associations of metadata exist within the multiplicity of places that determine the lifespan—the (hi)stories—of each material included in an archive. The sense of *place* in archival metadata is multifaceted. A *place* can be an object of study, a site of knowledge production, a site of publication, and a site of residence. In the case of the *Biodiversity Heritage Library*, *place* is also a site of biodiversity and interspecies relationships.

Furthermore, the idea of *place* in metadata is, more often than not, tied to the idea of *nation*, given that curatorial standards utilize “categories based entirely on European-defined geographic borders” (Bone and Loughheed 89). In this regard, metadata categories are rooted in hegemonic understandings of regions, countries, and cities, all of which stem from national division. Thus, *nation* is still predominantly the unit of metadata, much like it is a central concept for archives in general, as discussed in the previous chapter. For example, geographical categories such as places of publication and holding institutions are largely dependent on the idea of *nation* as the basis of knowledge production and ownership. My own understanding of Latin America is based on the *nation* as well, as I refer to a region that comprises several nations with independent but related identities and a shared history of coloniality: “nations are historically contextual, shaped by the social and material conditions that surrounded them” (Croucher 101). The (hi)stories of the *nation* thus play a fundamental role in the intertwining of locality and globality and local and global power dynamics: “nationhood remains a central, if not invigorated, source of cultural and political belonging, and ethnicity, race, and religion persist as powerful mechanisms for reinforcing

boundaries between a national ‘Us’ and an alien ‘Them’” (88).

In the case of BHL, the *nation* is also the centre of biodiversity relationships. Biodiversity is located in *nations* and *nations* create a sense of *nation* through biodiversities (National Research Council 62–63), making biodiversity an essential part of a *nation’s heritage*.ⁱⁱ Actors in matters of intraspecies relationships in the Anthropocene are “individuals, collectivities, institutions, and nations” (Chakrabarty, ‘The Seventh History and Theory Lecture. Anthropocene Time’ 6), but, of these actors, it is the *nation*—and the relationships between *nations*—that play a fundamental role in greater bio-diverse processes, such as climate change, and in efforts to counteract negative processes and improve human relationships with-in biodiversity.ⁱⁱⁱ Therefore, if we consider *nation* as the unit of geographically charged metadata and the unit of bio-diverse belonging, the *place of place* in BHL’s metadata is deeply tied to the *representation* of *nations* and *biodiversities* in metadata and, thus, to the binaries, overlaps, power relationships, epistemic dynamics, and shared and contending (hi)stories of the *national*.

In metadata, the storytelling around *places* (and *nations* as a form of *place*)^{iv} determines the archival and epistemic representation of those same *places*. Some *places*—mostly *nations*—are actors, epistemic agents, producers of knowledge; others are objects, matters around which the actors build their knowledge, their subordinated objects of study. Each *place* that appears—or disappears—in the metadata of an archival record is a node of the multiplicity of narratives that constitute the life of said record and reveal the geopolitical dynamics of curatorial practices. In the case of archives as a CRSEUoB, the intertwining of human and nonhuman (hi)stories is simultaneously an intertwining of the different places in and through which such narratives are enacted, and of the places to which human and nonhuman actors pertain and from which they speak or remain silent. In archives, metadata categories related to *place* carry multiple geopolitical meanings that establish networks of knowledge. In the case of BHL, these geopolitical meanings often reflect a dichotomy between

places that act as agents of knowledge production and those that are objectified as subjects of such knowledge.

As has been a constant throughout this dissertation, a critical analysis of BHL's metadata continues to evidence geo-colonial dynamics in which *nations* and *places* in the Global North act not only as producers but as legitimizers of bio-diverse knowledge, while those in the Global South—with their plethora of human and nonhuman (hi)stories—remain but a mere object of biodiversity-related inquiries. The following sections of this chapter unfold the layers of storytelling through which metadata participate in the geopolitics of archives. To understand the geopolitics of metadata and *place* in BHL from the perspective of Latin America, each section delves into the presence and absence as well as the (geo)politics of representation of this region, as a whole, as independent *nations*, as sites of biodiversity belonging, and as peoples.

3.2 Geopolitical Archival (Hi)Stories: Subjects and Objects of Metadata

Given the context of *place* in metadata, and to understand the Latin America-related geopolitics of *place* in BHL, the first step of this analysis was to extract the metadata of BHL records that include Latin American countries and regions as part of their subject lists. If Latin American *places* appear in subject lists, that means that they are, at least in part, the object of study of such materials. The goal of this analysis was then to examine whether Latin American *places* are only functioning as *object* or to what extent they play or can play other roles in the networks of bio-diverse knowledge production. Following a similar methodology to that of Chris Freeland (Freeland, steps 1-3), metadata were extracted utilizing database software^v and BHL's public online datasets^{vi} to build five subject-based subsets related to Latin America, her peoples, and her biodiversity^{vii} (Figure 22). For each record in each subset, the extracted metadata fields were title ID (used as the primary key for identification of each record), full title, author, holding institution, year of publication (including start and end year of

publication for periodicals), publication details, language, title URL, and the subject the record included to be part of the subset.

Subset	Total number of records ^{viii}	Percentage of BHL collection ^{ix}	Number of unique title IDs ^x	Included subjects ^{xi}
Greater Regions (GR)	4465	2.6842%	787	Latin America, Central America, South America, West Indies.
Latin American Countries (LAC)	6801	4.0886%	1982	Argentina, Belize, Bolivia, Brazil, British Guiana, Chile, Colombia, Costa Rica/Costa-Rica, Ecuador, El Salvador, French Guiana, Guatemala, Guiana/Guyana, Honduras, Nicaragua, Panama, Paraguay, Peru, Surinam/e, Uruguay, Venezuela.
Mexico (MEX)	2989	1.7969%	781	Mexico ^{xii}
Indigenous Peoples – General (IP-G)	1052	0.6324%	159	Indians of Central America, Indians of Mexico, Indians of South America, Indians of the West Indies, Aztecs, Incas, ^{xiii}
Indigenous Peoples – Specific (IP-S)	135	0.0811%	46	Carib Indians, Choco Indians, Cuna Indians, Diaquita Indians, Goajiro Indians, Huichol Indians, Kickapoo Indians, Mapuche Indians, Maya(s), Mayoruna Indians, Mojo Indians, Shipibo-Conibo Indians, Taino Indians, Tairona Indians, Tarahumara Indians, Yahgan Indians.

Figure 22 Subject-based subsets generated to analyze the geopolitics of bio-diverse knowledge production in the *Biodiversity Heritage Library*. Data in number of records as of July 1st, 2021.

All subjects selected for this analysis represent a certain form of *place* concerning Latin America, whether they refer to the region as a whole, in subcontinental terms, or through a specific country. Additionally, the subjects in the subset Indigenous Peoples – General (IP-G) are included as a notable example in which the (hi)stories of Indigenous peoples, Latin America, and nonhuman species intersect and conflate in subject lists. Similarly, while the Indigenous Peoples – Specific (IP-S) subset does not include any explicit geographical mention of Latin American countries, it refers to Indigenous peoples that appear in BHL's database and are (roughly) located in this region.^{xiv}

Given the geopolitical focus of the intended analysis, data was cleaned and prepared for geolocation after the extraction process. This was particularly necessary given that BHL's metadata do not have separate categories for place of publication and publisher. On the contrary, these two are included under the category *Publication details*, as per MARC21 standards (Network Development

and MARC Standards Office, Library of Congress; Haynes 9), which often includes the year of publication as well. Therefore, to understand the geopolitical affiliations of the records included in each subset, data required cleaning to have a separate category for place of publication.^{xv} In some cases, this called for the modernization and/or translation of place names, given that BHL's metadata often include publication information in the original language and format of the material. For example, the publication details of a volume of José de Acosta's *Historia natural y moral de las Indias*, included in the Latin American (LAC) subset, read "Impresso en Seuilla :en casa de Iuan de Leon., Año de 1590." This record, then, required the isolation of the place of publication (*Seuilla*), its modernization from 16th-century Spanish to its current form *Sevilla*, and its translation into English, *Seville*, for software readability.^{xvi}

In general terms, a geopolitical analysis of these subsets shows a crucial discrepancy between places established as objects of study (all referring to the biodiversity and peoples of Latin America) and the networks of knowledge production *about* these places. For instance, the most frequent places of publication of materials in the Greater Regions (GR) subset are all located in the United States and Europe. When considering non-unique IDs—meaning that each volume and issue in periodicals counts as an independent record—the most frequent places of publication are London with 1442 records (35.53% of the subset) and Paris with 985 (24.27%). These figures indicate that more than half of non-unique IDs in the GR subset were published in these two cities (Figure 23), a fact that reveals the overwhelming Eurocentrism of these records.

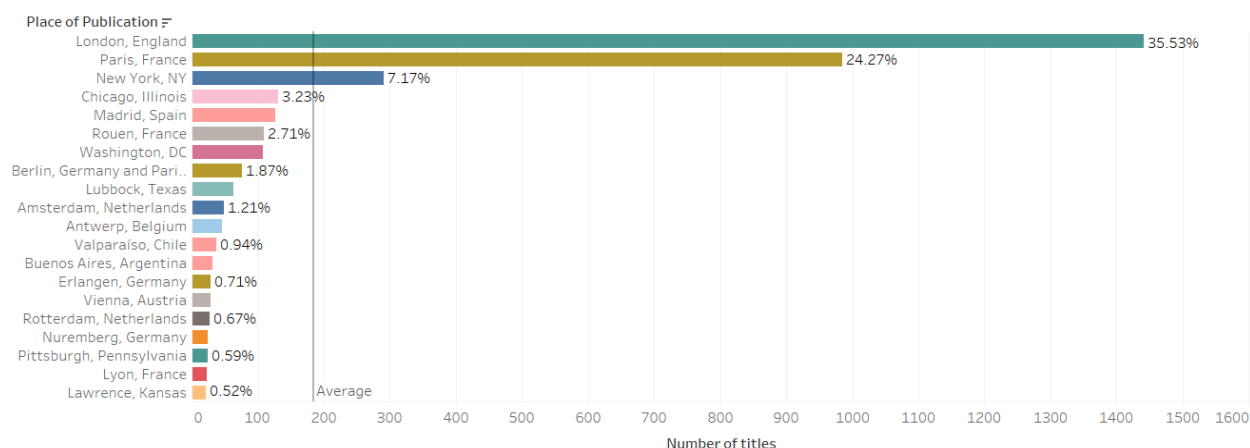


Figure 23 Most frequent places of publication in the GR subset for non-unique IDs. Generated on Tableau in September 2021. Data from <https://www.biodiversitylibrary.org/data> as of July 1st, 2021.

On the contrary, when considering unique IDs only—meaning that all volumes and issues of the same work or periodical are comprised into and counted as a single record—the most frequent place of publication continues to be London with 104 titles out of 787 unique IDs (17.08%) but is followed in this case by New York and Chicago with 92 (15.11%) and 79 (12.97%) records respectively (Figure 24).

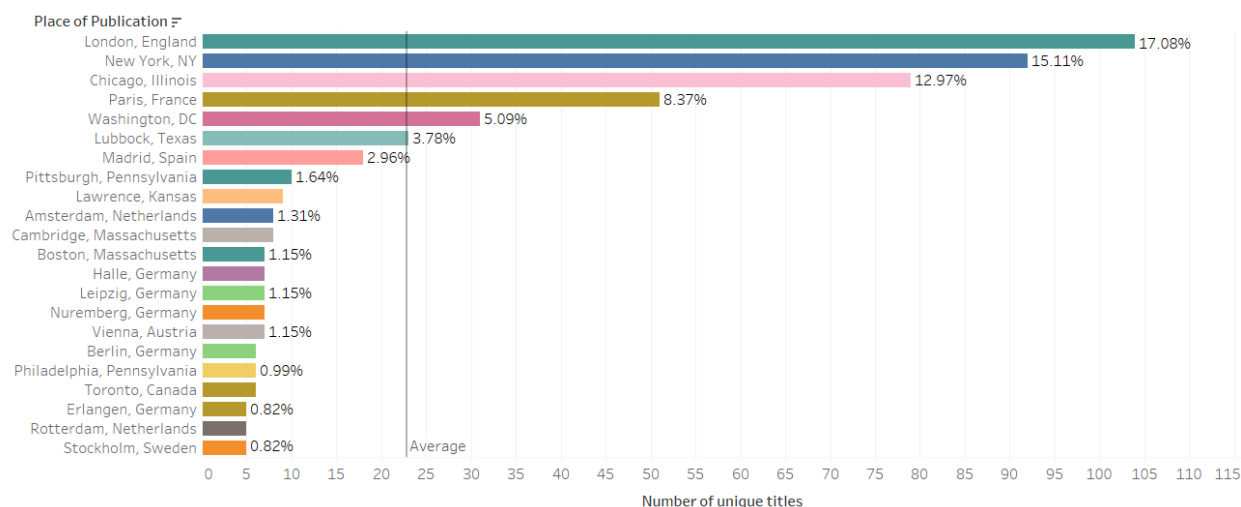


Figure 24 Most frequent places of publication in the GR subset for unique IDs. Generated on Tableau in September 2021. Data from <https://www.biodiversitylibrary.org/data> as of July 1st, 2021.

In these differing data (between unique and non-unique IDs), the case of France is illustrative of the colonial nature of the records in the GR subset. Unlike in data for non-unique IDs, Paris appears only in fourth place amongst the most frequent places of publication, with 51 records (8.37%). This

decrease is most likely due to the multiple massive works related to French expeditions in the Americas that were published in numerous volumes during the 18th and 19th centuries but are compressed into a single record when considering unique IDs. For example, the *Mission scientifique au Mexique et dans l'Amérique Centrale: Ouvrage publié par ordre de S.M. l'Empereur et par les soins du Ministre de l'instruction publique* was published in parts from 1868 to 1902 and makes up 985 records in BHL's metadata but counts as a single record when considering unique IDs only. Like the *Mission scientifique*, many records in this subset that were published in France are encyclopedic compendiums that belong to the 19th century, a period in which natural history in this country was in vogue (Fox and Weisz 194). The work of important naturalists, for instance, such as Georges Cuvier and Henri Milne Edwards (198–99, 206)—whose works in volumes are part of BHL and are included in the GR subset—represent the “strong tradition in natural history that had blossomed long before the Revolution in the work of Buffon and then found a home, from 1793, in the Muséum National d'Histoire Naturelle” (199). Heirs to the colonial interest in natural history that began with the expansion of France in the Caribbean during the 17th century (McCook 784), many of these 19th-century French researchers worked in Latin America and even participated in local projects to promote the study and recording of natural history in the region during this period (Cueto 771–72). However, towards the 20th century, “Great Britain, France, and Holland neglected their economically stagnant Caribbean colonies, preferring to pay more attention to their new colonial possessions in Asia and ... in Africa” (McCook 786), with the knowledge production centred on the region declining as well. Indeed, this change explains the scarcity of 20th-century French publications in BHL (Figure 25). These numbers, thus, reveal another facet of the (hi)stories of coloniality in the records of BHL and the Eurocentrism of the narratives it includes, for, in this case, the interest in Latin American biodiversity seems to be deeply tied to the historical political interests of European nations in the region.

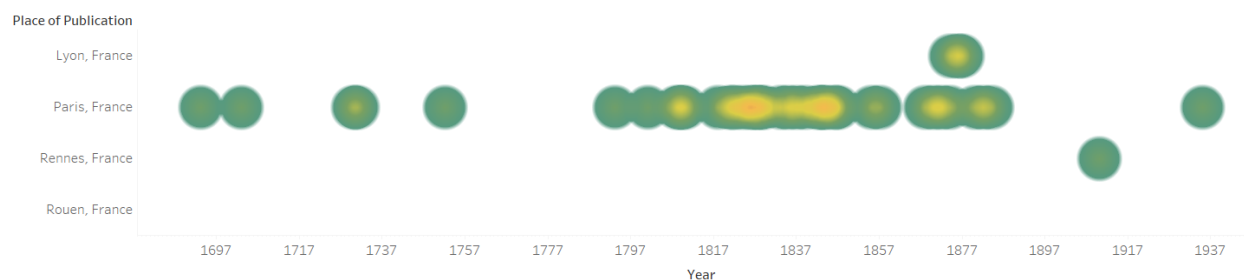


Figure 25 Density of publications per year per place of publication of materials in the GR subset published in France. Generated on Tableau in January 2022. Data from <https://www.biodiversitylibrary.org/data> as of July 1st, 2021.

While there are different patterns of publication between unique and non-unique IDs that highlight the colonial history of France in the Americas, it is also true that, in both cases, at least half of the materials in the GR subset were published in Europe and the United States, and that places of publication outside these regions are all below average. Therefore, these findings hint again at the broader power dynamics between the Global South and North that determine the places of publication and, thus, the knowledge production in these materials.^{xvii}

Such dynamics evidence a dichotomy between the Global South as the object of study and the Global North as the producer of biodiversity-related knowledge, a dichotomy still held by BHL's collection and accompanying metadata. Here, the colonial (hi)stories of the *nation* (France and Latin American countries) are part of a larger/global network of colonial (hi)stories between the Global South and North. Furthermore, on the one hand, these records reveal the strong presence of the (hi)stories of the colonization of Latin America, including her peoples and biodiversity, in BHL's collection. On the other, while it is true that these (hi)stories need to be recorded and remembered, the absence of materials published in Latin America upholds the very dynamics that began with those colonial (hi)stories and seem to be perpetuated, at least in the case of BHL, in current networks of biodiversity-related epistemologies.

Nevertheless, it is important to note that one of the terms included in the GR subset is *West Indies*, mostly associated with expeditions to the Americas before the 20th century. This subject is present in 752 non-unique (16.84%) and 192 unique (24.39%) records, hinting at the historical

nature of between a quarter and a fifth of this subset. These numbers, at least to an extent, can help explain the stark contrast between Europe as the producer of this knowledge and the West Indies—namely former European colonies—as the object of study.

In that same regard, and in contrast to the GR subset, the Latin American Countries (LAC) subset, which includes 6801 non-unique^{xviii} and 1982 unique IDs, seems to be more diversified. At first glance, this subset presents a considerable diversity of places of publication, including several cities throughout Latin America. For instance, Buenos Aires (144 non-unique IDs; 2.12%) and Concepción (234, 3.45%) register numbers of publications above the average for non-unique IDs, while La Plata (104, 1.53%), Lima (83, 1.22%), Rio de Janeiro (205, 1.54%), Santiago (92, 1.35%), São Paulo (49, 0.72%), and Valparaíso (68, 0.99%) appear as other important Latin American places of publication (Figure 26). Similarly, Buenos Aires (51 unique IDs; 2.57%) and Rio de Janeiro (52, 2.62%) are above average for unique IDs, with Santiago (20, 1%), São Paulo (14, 0.7%), and Lima (9, 0.45%) also making the list (Figure 27). Thus, as these numbers show, the multiplicity of places of publication in the LAC subset point to a more diversified collection in comparison to other subsets, such as the GR subset. Likewise, the percentages in terms of publication seem to be less overwhelming than those in the GR subset, hinting, perhaps, at a less robust dominance of the Global North in these materials.

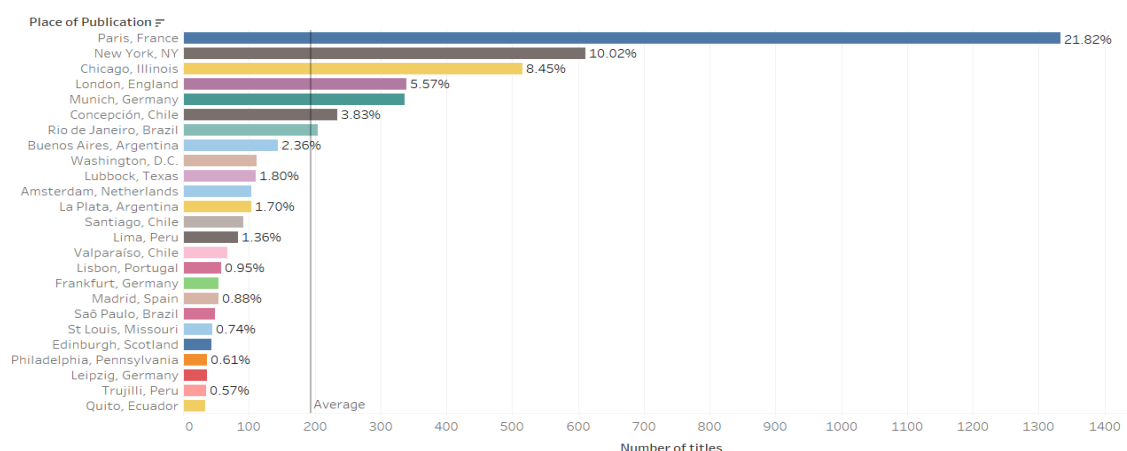


Figure 26 Number of titles per place of publication in the LAC subset for non-unique IDs. Generated on Tableau in September 2021. Data from <https://www.biodiversitylibrary.org/data> as of July 1st, 2021.

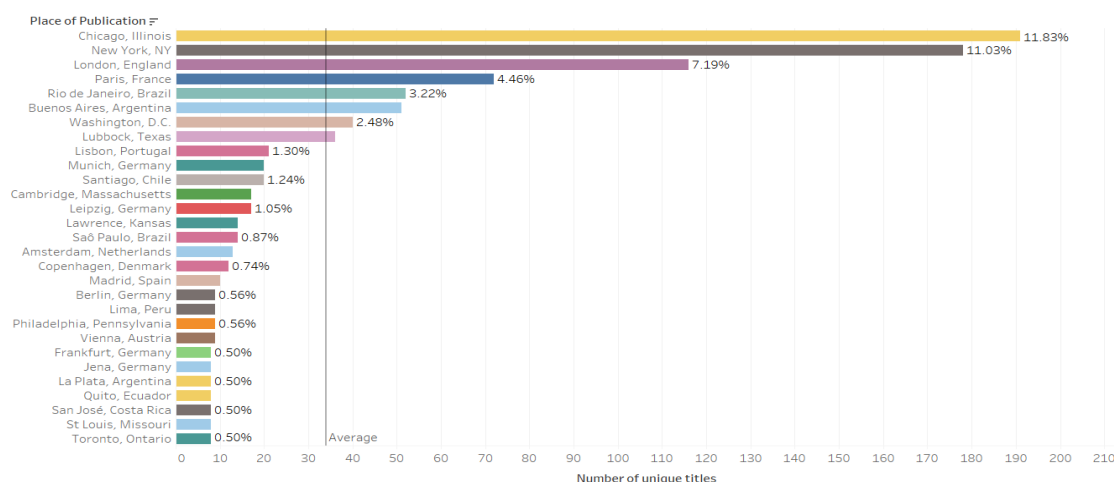


Figure 27 Number of titles per place of publication in the LAC subset for unique IDs. Generated on Tableau in September 2021. Data from <https://www.biodiversitylibrary.org/data> as of July 1st, 2021.

Even though London, Paris, Chicago, and New York continue to lead in their number of publications about Latin American countries, the latter countries themselves appear to be important centers of knowledge production about the region and, therefore, engaging in self-representation. In this sense, almost all materials in the LAC subset that were published in Latin America, also include the country of publication in their subject list, that is, these materials are local productions that focus—in most cases exclusively—on the local biodiversity of each of these countries (Figure 28). Thus, Latin American countries as represented in BHL’s metadata are participating in bio-diverse epistemic networks about their own biodiversity, and the diversification of places of publication can translate into the inclusion of local knowledges.

Country of publication/ included as subject	Number of records published in the country (non-unique IDs)	Records that include the country of publication as subject	Records that include other countries as subject	Total records that include the country as subject	Percentage of records about the country published in the country
Argentina	250	246	4	471	53.07855626%
Belize	2	2	0	68	2.941176471%
Bolivia	2	2	0	317	0.630914826%
Brazil	305	302	3	1734	17.5893887%
British Guyana/ Guyana	19	19	0	188	10.10638298%
Chile	394	394	0	947	41.60506864%

Colombia	9	9	0	291	3.092783505%
Costa Rica	13	13	0	210	6.19047619%
Ecuador	33	33	0	248	13.30645161%
El Salvador	0	0	0	22	0%
French Guiana	0	0	0	34	0%
Guatemala	5	5	0	443	1.128668172%
Honduras	0	0	0	48	0%
Nicaragua	1	1	0	55	1.818181818%
Panama	6	6	0	363	1.652892562%
Paraguay	7	7	0	70	10%
Peru	137	136	1	953	14.37565582%
Uruguay	28	28	0	46	60.86956522%
Venezuela	2	2	0	149	1.342281879%

Figure 28 Number of records related to locally-produced knowledge in the LAC subset. Data in number of records as of July 1st, 2021.

Nevertheless, the diversity of the LAC subset is still insufficient as these materials continue to be dominated by the Global North as an epistemic centre when considering broader statistics. For instance, as seen in the table above, most non-unique records in this subset that were published in the same country they include as subject are below 15% when compared to all records containing that country as a subject in BHL. The only exceptions are Chile (still under the 50% mark), Argentina, and Uruguay. The numbers of these three countries, however, contrast drastically with those of Bolivia, Nicaragua, Panama, and Venezuela—where under 2% of the knowledge production about them takes place in the same countries—and of El Salvador, French Guiana, and Honduras—which are not represented at all as places of publication in BHL.

Furthermore, it is important to note that there is almost no knowledge production about Latin America from other regions in the Global South^{xix} (Figure 29) and that the holding institutions^{xx} of the materials in this subset are almost exclusively located in the Global North (Figure 30). Thus, despite the considerable and important presence of several Latin American cities as places of publication of materials about Latin American countries, the lack of diversity in other metadata fields still points to a privileged position of the Global North not only as the producer but also as the *owner*^{xxi} of this knowledge: while all objects of study are located in Latin America, most of

the records in the LAC subset were published in the Global North, and almost all of them are housed in institutions across the Global North.

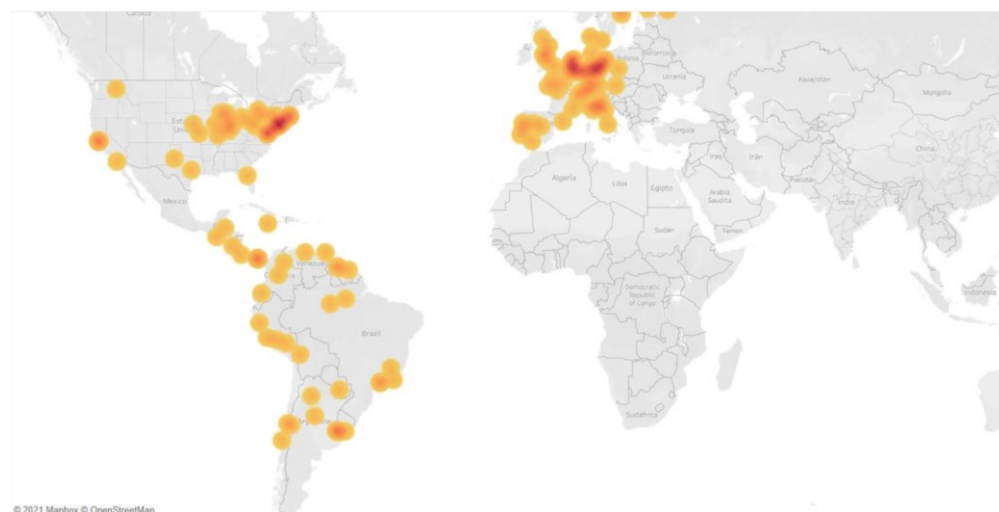


Figure 29 Map showing places of publication (density per number of records) in the LAC subset. Generated on *Tableau* in August 2021. Data from <https://www.biodiversitylibrary.org/data> as of July 1st, 2021.

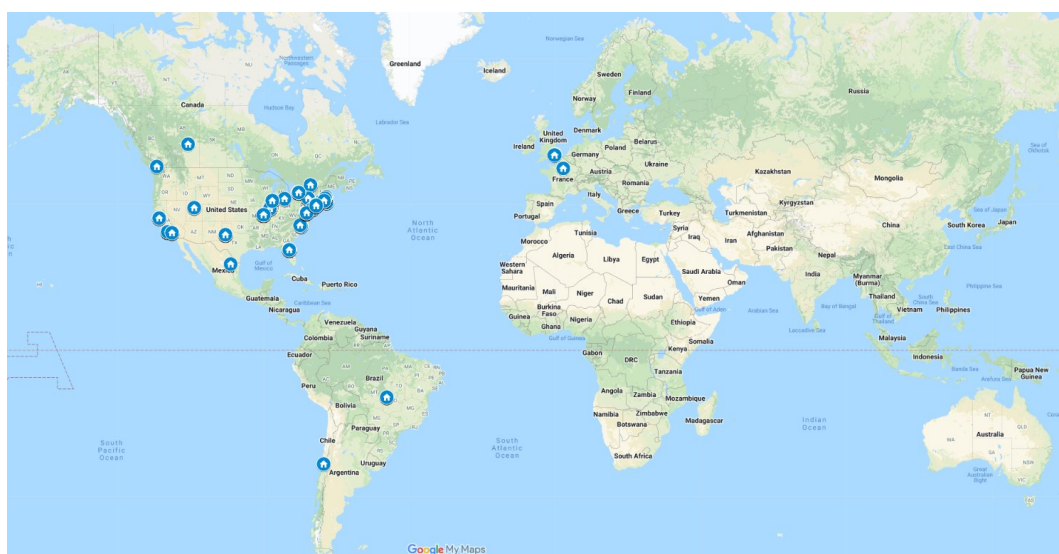


Figure 30 Map showing blue markers for holding institutions in the LAC subset. Custom map created on Google maps by the author in the summer of 2021. A live version of the map is available at https://www.google.com/maps/d/edit?mid=1u6WEhgSrXmJC6DR2c_rhpwnxTevMBeYs&usp=sharing

The Global North acts as an epistemic agent in terms of production, publication, and legitimization. The present analysis suggests that, in most cases, only after the knowledge production about Latin America has been collected by an institution in the Global North can it find its way to BHL's collection and, therefore, to so-called *global open access*. The centralized epistemic role of the US and

Europe reminds us that the global is not “nebuloso y abstracto” but always located and localized, defined by “subjetividades y localidades específicas” and determined by its “carácter asimétrico,”^{xxii} that is, unequal (Castro-Gómez and Mendieta 5). These epistemic power relationships bring to light the biased nature of open access (Albornoz et al. 31) and the need for openness to be “commit[ted] to difference ... [and to] the expression of such difference,” making room for “other ways of learning and knowing” (Lorenzo et al. 88). The goal, in line with a CRSEUoB, is then “to include a more diverse range of actors, to give greater agency to those who have lacked it, and to gain from perspectives that are frequently excluded” (Neylon 125), as I have argued throughout this thesis.

Regarding ownership and epistemic power, it is notable that there are only three works in the LAC subset—out of 1982 unique IDs—that are held in institutions outside of Europe and Anglo North America: Jean Baptiste Boussingalt and Francois Desire Raulin’s *Viajes científicos a los Andes Ecuatoriales ó Colección de memorias sobre física, química e historia natural de la Nueva Granada, Ecuador y Venezuela* (1849) translated^{xxiii} by Joaquín Acosta and held in the Universidad Autónoma de Nuevo León in Mexico; the *Anales del Museo de Historia Natural de Valparaíso*, authored and held by the Museo de Historia Natural de Valparaíso in Chile; and Evangelina Schwindt, Nicolás Battini, Clara Giachetti, Karen Castro, and Alejandro Bortolus’s *Especies exóticas marino-costeras: Argentina* (2018), edited and contributed to BHL by authors Schwindt and Bortolus.

The first one of these works, Boussingalt and Raulin’s book, and, especially, Acosta’s translation of it, is, in fact, a considerable example of historical efforts to decentralize biodiversity-related knowledge. Acosta himself, in his prologue, highlights the goal of his translation as being that of the sharing of the knowledge produced by Boussingalt and Raulin in French, especially so that it can be accessed by “Granadinos, Venezolanos y Ecuatorianos” (Acosta 10) that is, the people from the places established as the object of study of this work, Colombia, Venezuela, and Ecuador. As the translator mentions, the general public in these countries had, during that time, little to no access to

these volumes due to their limited distribution and high costs. Furthermore, Acosta emphasizes that his translation is the product of a strong collaboration between him and the authors and that the edition was sponsored by a French editor (10–11). Thus, already in 1844, Acosta's translation of this work was an example of efforts to create collaborative knowledge production across regions and between the Global South and North in biodiversity-related matters. Moreover, his goals echo in the access provided to these volumes by BHL, even more so given that they are contributed by a Mexican institution, meaning that a fundamental part of the collaborative network of bio-diverse knowledge production of this text, from the 19th century to today, is notably located across the Global South.

In turn, both the volumes of the *Anales* of the Museo de Historia Natural de Valparaíso in Chile and Schwindt et al's book are powerful examples of local biodiversity-related knowledge production. Additionally, the latter is a more recent example of global collaboration and the role of BHL in promoting it, as it exemplifies the fruitful outcomes of a truly diverse and trans-geopolitical network of bio-diverse knowledge production. The result of an extensive local project to understand marine species in Argentina, *Especies exóticas marino-costeras* is also bilingual (English and Spanish) and includes the voices of researchers in different parts of the world. It incorporates, for instance, three prologues by researchers from the US, South Africa, and Argentina respectively. Similarly, this book includes a remarkably diverse list of acknowledgements, with individuals from Canada, Argentina, Uruguay, Brazil, France, Sweden, South Africa, the US, the UK, Spain, the Netherlands, Colombia, and Chile, who the authors thank for “provid[ing] valuable assistance and help during the entire creative process ... by supplying administrative assistance, photographs and specimens, as well as commenting and improving the text” (Schwindt et al. 15–16). Finally, this work was featured in a BHL's blog post published in October 2020 and written by former Outreach and Communication Manager, Grace Constantino (Constantino, ‘Empowering Research on Marine Bioinvasions to

Support Conservation of Native Species and Ecosystems’). At the moment of publication, the blog post was shared on the Library’s accounts on Twitter and Facebook as well (Figure 31), thus promoting this bio-diverse trans-geopolitical collaborative work through other important online avenues, a decolonial and truly global representation of Latin America.^{xxiv}



Figure 31 BHL's tweet promoting the work of Evangelina Schwindt and the book *Especies exóticas marino-costeras*. Tweet originally published on October 8, 2020. Screenshot taken on September 2021.

Notwithstanding the richness and diverse geopolitical affiliations of these materials, their small numbers blur their presence and continue to evidence an overwhelming predominance of the Global North as the housing site of biodiversity-related knowledge production, thus positing it as a legitimizing epistemic centre for such production. Although local and collaborative knowledge production is present in its catalogue, BHL still has a long way ahead to achieve a more equitable and diversified collection. The collaborative approach of Schwindt et al.'s work, for instance, might serve as an inspiration for the Library to adopt a more participatory approach. Involving a greater diversity of institutions, communities, and researchers to build, annotate, and promote their catalogue might be a successful strategy for BHL to emphasize collaboration in the creation of

biodiversity collections. In this sense, what the GR and LAC subsets show is a colonial object-subject relationship between the Global South and North that requires a profound diversification of the networks of knowledge production that constitute BHL's catalogue that carefully considers all layers of metadata (hi)stories.

The (hi)stories told by metadata point to the interconnectedness of all layers of storytelling in digital archives. While the holding institution category in BHL's catalogue reveals the strong dominance of the Global North as keeper of biodiversity-related epistemologies, this is not exclusive to metadata but appears in other layers of BHL—as explained in previous chapters of this thesis—such as web analytics, virtual ownership and repatriation, multilingualism, and social media.^{xxv} For example, and to add yet another layer to epistemic power in networks of bio-diverse knowledge, the role of the Global North and BHL as centres of legitimization manifests in traffic trends to BHL's website. Between April and June 2020, data on traffic from Similarweb shows that BHL received almost the same number of visits through a direct channel (41.93%) than through organic search (42.09%) (Figure 32). Although direct traffic is difficult to measure, often influenced by the shortcomings of the data provider and the website itself, and can also include all traffic without an identifiable source (Kemmis; Bennet; Saeed), visits through the direct channel are still considered to be from “some of the website's most loyal and engaged users” (Similarweb). In the case of BHL, these figures suggest that almost half of the users of BHL are “loyal and engaged,” as they are visiting the Library's website by directly typing its URL, using a browser bookmark, or clicking on a link outside a web browser, i.e., in an offline document or application^{xxvi} (*ibid.*). Additionally, these users are almost the same in number as those arriving at the Library via organic search, that is, through a query in a search engine. Moreover, in both April and May 2020, BHL's direct visits surpassed organic search visits (90,038 versus 88,095 in April, and 91,342 versus 85,151 in May).

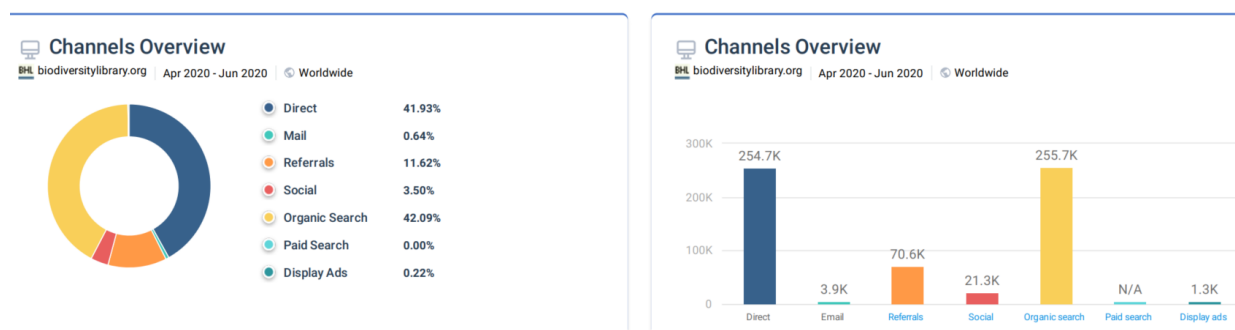


Figure 32 Overview of traffic by channel to BHL's main website (April-June 2020). Data and graphs from Similarweb.

Overall, these figures indicate that BHL has consolidated as a strong and well-known resource, that is, an authority site. The authority of a website is usually tied to visibility, which is, in turn, related to the website's number of active inbound links, its place in search engine queries, how often it is referenced in discussions of related topics, and its number of direct visits as opposed to visits through other channels (Dimenstein 8–9). Thus, it can be argued that BHL has acquired the status of authority website, especially in terms of the number of direct visits it receives and its numerous referrals, which are particularly important for online libraries. In this regard, a considerable percentage of traffic to BHL (11.62%) comes from referrals, meaning that the Library is an important source of information for other websites. As of July 2020, BHL had a Domain Rating^{xxvii} of 80 on Ahrefs and 71 on Moz, both of which point, once more, to a significant standing of BHL as an authoritative website (Figure 33).^{xxviii}

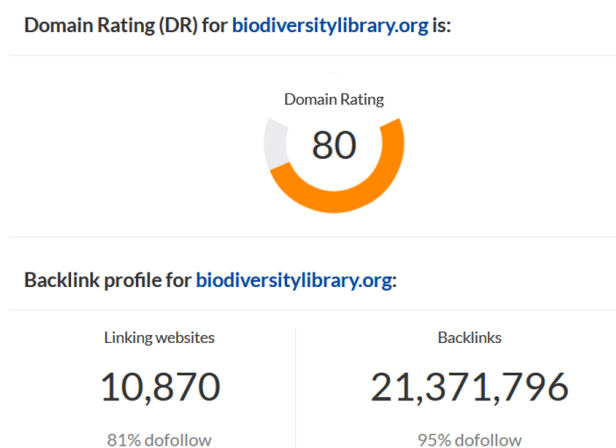


Figure 33 DR of BHL's website on Ahref. Screenshot taken on July 22, 2020.

Nevertheless, the authority of BHL's website does not necessarily lead to or indicate diversification or plural representation. For instance, when comparing linking domains to BHL's and CONABIO's websites,^{xxix} several of the most important sites are related to Wikipedia. While this in itself might not be surprising, it is noteworthy that BHL's linking domains include Wikipedia in English and Spanish, while CONABIO's include Wikipedia in English, Spanish, Portuguese, and French (Figure 34). This compelling multilingual panorama could imply, once more, that BHL's authority does not translate necessarily into multilingualism or diversified global access. Such contradiction suggests that having an authority website does not equate to digital inclusion, which is often more than meets the eye. Here, again, utilizing a mixed methodology aids in identifying the gaps in the archive, revealing multiple layers of inclusion and exclusion in multiple factors, and, especially, highlighting BHL's responsibility as an authoritative resource.

Linking Domains for	biodiversitylibrary.org		
Scope	pld		
Sorted by	source_domain_authority		
Filters:	external+not_deleted		
Root Domain	Domain Authority	Linking Domains	Spam Score
youtube.com	100	17739918	1%
microsoft.com	99	4419955	1%
en.wikipedia.org	98	5497338	10%
plus.google.com	98	12053629	1%
adobe.com	98	2885649	5%
sites.google.com	97	1681946	--%
europa.eu	97	1681769	1%
es.wikipedia.org	96	778892	12%
github.com	96	2003453	1%
bbc.co.uk	96	1429503	1%

Linking Domains for	biodiversidad.gob.mx		
Scope	pld		
Sorted by	source_domain_authority		
Filters:	external+not_deleted		
Root Domain	Domain Authority	Linking Domains	Spam Score
youtube.com	100	17739918	1%
en.wikipedia.org	98	5497338	10%
plus.google.com	98	12053629	1%
vimeo.com	97	3146759	21%
es.wikipedia.org	96	778892	12%
pt.wikipedia.org	95	359464	16%
fr.wikipedia.org	95	538507	17%
wikimedia.org	95	1372485	1%
nytimes.com	95	1697080	1%
bbc.com	95	675676	4%

Figure 34 Linking domains to BHL's website (left) and CONABIO's website (right). Data from Moz as of July 2020.

The standing of BHL as an authority site in biodiversity-related matters as well as the predominance of the Global North as producer and holder of materials in the Library contradicts the principles of openness, globality, and democratization so often associated with digital repositories and, in particular, those of BHL. In this regard, it is important to mention that BHL has adopted various

strategies in its path toward the decolonization of the Library's collection. In fact, in September 2021, BHL's Collections Committee released an Acknowledgement of harmful content,^{xxx} which was also announced in a post on BHL's blog, highlighting that such content "goes against the values of the Biodiversity Heritage Library" (Biodiversity Heritage Library, *Acknowledgment of Harmful Content – About BHL*) and their commitment to building "a global 'biodiversity community'" (Biodiversity Heritage Library, *About the Biodiversity Heritage Library*). This Acknowledgement is, without doubt, a fundamental step into building a more equitable and inclusive bio-diverse library. Nevertheless, for BHL to continue advancing on this front, it is imperative to find and address the gaps in its catalogue and overall digital practices, as I intend to do throughout this dissertation. As María Dorta-Duque and Dominique Babini, following Ricardo Casate, mention, one of the key aspects of open access is that it "[h]elps eliminate barriers to the flow of knowledge between the South and North, East and West, South-South and vice versa" (39). While BHL has taken important measures on this front and it pursues the goal of global open access to the Web, the different layers of the analyses I present here reveal that the Library continues to be located within a niche of still very strong colonial dynamics. Echoing a common objection against openness and globality, BHL is still "dominated and driven by hegemonic (Northern) countries, while non-hegemonic countries tend to take on secondary roles" (Chan 14), a dichotomy that is well represented in the GR and LAC subsets previously discussed.

As seen so far in this chapter, metadata categories and their connotations constitute an essential layer of storytelling in BHL that highlights the shortcomings of the Library in terms of open access and globality, and in the representation of the Global South and North as epistemic actors—agents—versus (passive) objects. It is not possible to speak of global openness inasmuch as it depends on its circumstances and actors, all "subjected to negotiation according to local contexts and historical contingencies" (Chan 17). As explained in the Introduction to this thesis, the idea of

universality denies not only the diversity of actors behind, in this case, open access (18) but also perpetuates its colonial roots (Mignolo 186) and consolidates the epistemic power of the Global North (Chan 18), in this case, in the many layers of the storytelling of digital archives and BHL. Therefore, to honour its mission of “making biodiversity literature openly available to the world as part of a global biodiversity community” (Biodiversity Heritage Library, *BHL Bylaws*), BHL must begin by questioning what exactly “a global biodiversity community” means, what positionalities play into it, who the actors and objects are, what “openly available to the world” entails, and for what *world* it is available. In sum, BHL must “think critically about the role and use of particular technologies in terms of their potential to democratize knowledge-creation processes and expand the agency and decision-making capacity of users” (Albornoz et al. 39). It is precisely in this need that the importance of a critical approach to metadata lies, for the (hi)stories told and silenced by metadata are a key entryway to identify the *places* where *places* need to be decolonized so that *places* in the Global South can become *subjects* and makers of a *sense of place*, that is, actors imbued with agency within the paradigm of a cyborgian rhizomatic sympoietic existential utopia of biodiversities.

3.3 The (Hi)Stories of What? Subject Patterns and Representation of Topics

As argued throughout this thesis, a network of bio-diverse plural knowledges anchored in sympoietic intra and interspecies relationships must transcend the barriers of epistemic colonization and the binary between the South as a passive object of knowledge and the North as agent and producer of that same knowledge. This non-binarism is a key component of the CRSEUoB model proposed thus far, especially in the heterogeneity and interconnection implied by the rhizomatic component of the model as well as the kinship and coexistence required by sympoiesis. Thus, and building upon the arguments presented in Chapter 2, one of the main goals of this chapter is to distinguish between representation as presence and representation as decolonization or decolonial

representation. The latter is an essential requirement of each component of the CRSEUoB model and refers to the ongoing questioning of the globality and openness of technology (cyborgian), the (re)generation of interconnected narrative ramifications (rhizomatic), the intertwined worlding processes of human and nonhuman critters (sympoietic), and the just inclusion of a multiplicity of human and nonhuman worlds (existential utopia). On the contrary, representation as presence disguises colonial dynamics behind a façade of inclusion, that is, proposes that the presence, for example, of Latin America as an object of study, is enough to achieve so-called inclusion. In this regard, it is fundamental to remember that “the inclusion of diverse actors and diverse epistemologies is not merely a goal to be attained, but a process of constant negotiation and reflection, of understanding power relations and group dynamics, and intentionally reconfiguring research methodologies and practices” (Albornoz et al. 34). Such a reconfiguration is, precisely, the goal of the CRSEUoB model proposed in this thesis, with an emphasis on the promotion and representation of bio-diverse Latin American (hi)stories and plural humanities. Nevertheless, the narratives about Latin American biodiversities in BHL continue to tell their (hi)stories from the perspective of the colonizer, in which the colonized is denied self-determination and epistemic agency. As seen in the previous section of this chapter, the Global North remains the producer and owner of biodiversity-related knowledge in BHL. Not only does this promote representation as presence but contributes, on the one hand, to the erasure of local(ized) (hi)stories and, on the other, to biased accounts of biodiversities from the Global South.

Given this panorama, identifying geopolitical semantic patterns in subject lists highlights the diversification—and lack thereof—in (hi)stories about Latin American biodiversity contained in BHL. The presence of certain topics and the places where knowledge about said topics is located determine the (hi)stories that are told and those that are silenced, drawing a landscape of Latin America that cannot be considered bio-diverse. Thus, to distinguish between representation as

presence and decolonial representation in BHL, and to further delve into the power and epistemic dynamics between the Global South and North, it is essential to consider not only the presence and frequency of Latin America-related subjects but also patterns of occurrence and publication.

A lack of diversification in terms of knowledge production results in unequal representations and valorization of topics pertaining to the Global South and North that perpetuate colonial dynamics in biodiversity-related knowledge production. To test this thesis, and to understand the narratives of Latin American biodiversities told by the subject lists in BHL's metadata, the Great Regions (GR) and Latin American Countries (LAC) subsets as described in the previous section of this chapter were divided into more specific subsets, as shown in the table below (Figure 35). Furthermore, I generated frequency lists, co-occurrence networks, and hierarchical clusters^{xxxii} on KH Coder 3 for each of these sub-subsets. By taking a closer look at the patterns of subject lists revealed by these text analyses, it becomes clearer how a colonial niche of biodiversity-related publications can lead to biased and colonial representations of biodiversity and communities from the Global South.

Subset	Number of unique title IDs^{xxxii}	Included subjects
West Indies (WI)	228	West Indies
Central-Latin-South America (CLS)	710	Central America, Latin America, South America
Central American Countries (CAC)	485	Belize, Guatemala, Honduras, Nicaragua, Costa Rica, Panama, El Salvador
South American Countries (except Brazil) (SAC)	1221	Argentina, Bolivia, Colombia, Chile, Ecuador, Guyana, (French) Guiana, Paraguay, Peru, Surinam/Suriname, Uruguay, Venezuela
Brazil (BR) ^{xxxiii}	543	Brazil

Figure 35 Secondary subsets of subject lists generated to analyze the geopolitics of bio-diverse knowledge production in BHL. Data in number of records as of July 1st, 2021.

Such is the case, for instance, of materials in BHL that focus on the biodiversity of Central America and, specifically, Panama.^{xxxiv} Further specifying these subsets allows for a careful revision of subject patterns that reveal the consequences of centralized publication and housing practices.

Like knowledge production, the subject representation of Latin America in BHL continues to be subsumed by the Global North. For example, in the Central American Countries (CAC) subset, *Panama* is by far the most frequent subject with 240 occurrences, followed by the compounds^{xxxv} *field note* with 188 and *Costa Rica* with 99 (Figure 36). Additionally, when looking at the subject lists in which *Panama* appears, it is possible to note that this subject is often associated with *Canal Zone* and *United States*, terms that are significantly frequent in this subset as well (Figure 37).

Words	Frequency
Panama	240
field note	188
Costa Rica	99
Ornithology	94
Guatemala	91
Botany	78
United States	67
Barro Colorado	61
plant	50
Animal behavior	49
Ethology	48
Panama Canal / Canal Zone	44
Nicaragua	44
National	42
Mexico	41
Museum	41
Belize	37
Honduras	37
Isla	32

Figure 36 The 10 most frequent terms^{xxxvi} in the CAC subset. Generated on KH Coder 3 in September 2021. Data from <https://www.biodiversitylibrary.org/data> as of July 1st, 2021.

Description and travel ; Nicaragua ; Natural history ◇ Mollusks ; **Panama** ◇ France ; San Francisco, Calif. -RRB- ; History ; Panama-Pacific International Classification ◇ Guatemala ; Catalogs and collections ; Birds ◇ **Panama** ; Fishes ◇ Guatemala ; Fishes ; Zoology ◇ Costa Rica ; Botany ; Plants ; Classification ◇ Classification ; Plants ; Botany ; Costa Rica ◇ Parasites ; **Panama** ; Arthropodvectors ◇ Costa Rica ; Botany ; Classification ◇ Classification ; Botany ; Costa Rica ; Orchids ◇ Belize ; Anchovies ; Fishes ◇ Fishes ; **Panama** ◇ Belize ; Fishes ; *Eupomacentrus dieneae* ◇ Haiti ; Mammals ; Belize ; *Mus dieneae* ◇ Haiti ; Mammals ; Belize ; Mexico ; Jamaica ◇ **Panama** ; Fishes ◇ Fishes ; Honduras ; Labrisomidae ; Belize ; Blenniidae ; Tripterygiidae ; Chaenopsidae ◇ Diptera ; Guatemala ; Joblingia ◇ **Panama** ; Frogs ; *Dendrobates* ◇ *Emblemaria hyltoni* ; Classification ; Honduras ; Roatán ; Aridae ; Costa Rica ◇ Belize ; Amphibians ; Reptiles ◇ Fishes ; **Panama** ◇ Guatemala ; Honduras ; Mammals ◇ Amphibians ; Reptiles ; Guatemala ◇ Roatán ; Indians of Central America ; Mayas ◇ Fishes ; Nicaragua ◇ **Panama** ; *Bolitoglossa schizodactyla* ; Amphibians ◇ Orchids ; Guatemala ; Belize ◇ Costa Rica ; Amphibians ; Reptiles ◇ Honduras ; Shrews ; Fossil ◇ Fishes ; **Panama** ◇ Costa Rica ; Fishes ◇ Fishes ; Costa Rica ◇ Guatemala ; Ferns ; Pteridophytes ; Costa Rica ◇ Guatemala ; Ferns ; Pteridophyta ◇ Fishes ; **Panama** ◇ Zoology ; Barro Colorado island ; **Panama** ◇ Canal -LRB- Panama -RRB- ◇ *Arcturus* -LRB- Ship -RRB- ; Cocos Island -LRB- Panama ◇ Zoology ; Barro Colorado island ; Panama Canal -LRB- **Panama** -RRB- ◇ *Arcturus* -LRB- Ship -RRB- ; Cocos Island -LRB- Costa Rica -RRB- ; South America -LRB- Panama -RRB- ; **Panama** ; Bivalvia ◇ Panama ; Birds ◇ Panama ; Portobelo ; 1799-1845 ; Billberg , Johan Emanuel ; Pacific Coast -LRB- South America -RRB- ; Panama ; Bivalvia ◇ **Panama** ; Birds ◇ Panama ; Portobelo ; 1799-1845 ; Billberg , Johan Emanuel ; Plants ◇ South America -RRB- ; Panama ; Bivalvia ◇ Panama ; Birds ◇ **Panama** ; Portobelo ; 1799-1845 ; Billberg , Johan Emanuel ; Plants ◇ Plants ; Plant na

Figure 37 Sample of subject lists that include the word Panama. Generated on KH Coder 3 in September 2021. Data from <https://www.biodiversitylibrary.org/data> as of July 1st, 2021.

These numbers and associations suggest not only that Panama is the most studied Central American country in BHL's materials but also that these records are strongly tied to US-related matters. The word frequencies and associations in the CAC subset thus lead to the hypothesis that the frequency of *Panama* in this subset is due to the biological (Smithsonian Tropical Research Institute, 'Why Is the Smithsonian in Panama?') but also economic importance of the country and the Central American region in US politics. This hypothesis is further held by the co-occurrence network and hierarchical clustering of the CAC subset, where the strong relationship between Panama and the United States continues to unfold. For instance, the most intricate subgraph in the co-occurrence network for the CAC subset is built around *Panama* and includes nonhuman species and biodiversity-related topics (*mammalogy*, *ethology*, *Animal behavior*, *Ornithology*) alongside US-related subjects and institutions (*United States*, *National Museum*), as well as the compound *Canal Zone* (Figure 38, subgraphs 01 and 06). Given these observations and the complex historical relationship between the US and Panama, and considering the hypothesis established for this part of the analysis, these findings called for an additional subset created specifically for this country, the Panama (PAN) subset, that comprises all materials in BHL that include *Panama* in their subject lists.

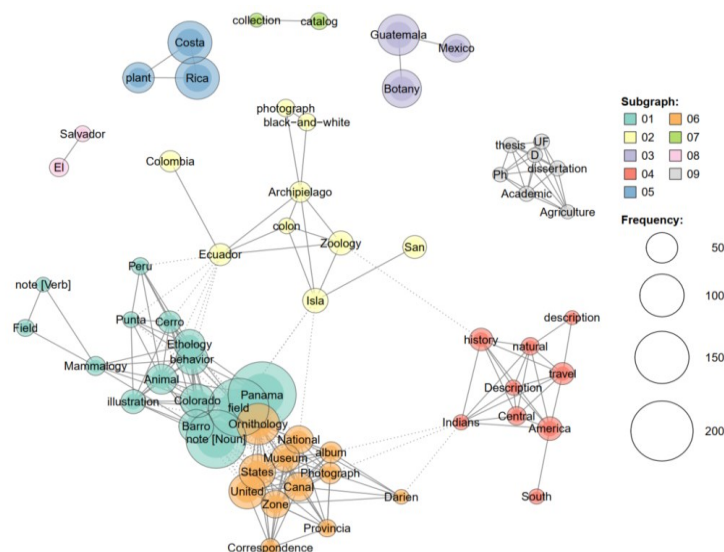


Figure 38 Co-occurrence network of the CAC subset. The overlapping of subgraphs 01 and 06 shows the strong association between Panama and the United States. Generated on KH Coder 3 in September 2021. Data from <https://www.biodiversitylibrary.org/data> as of July 1st, 2021.

The PAN subset confirms that US-centric interests around Panama manifest in the metadata of records containing the subject *Panama* and determine the epistemologies and (hi)stories about this country and her biodiversity as told by BHL. The creation of the PAN subset revealed that 70% of the materials in BHL about Panama (125 out of 185 title IDs) have no identified place of publication, almost all of which are handwritten field notes,^{xxxvii} thus explaining the important presence of the subject *field notes* in the CAC subset. While the place of publication of these notes cannot be identified because these materials are not publications per se, keeping the US-Panama relationship in mind, I manually identified the institutional affiliations of the fieldwork and expeditions that originated these materials to help more clearly illuminate the geopolitics of biodiversity-related knowledge production about Panama in BHL. For instance, out of the 125 materials in the PAN subset with no identified place of publication, 76 (60.8%) are field notes resulting from US-based expeditions to Central America,^{xxxviii} meaning that such expeditions constitute the predominant point of origin of materials in the PAN subset (Figure 39).

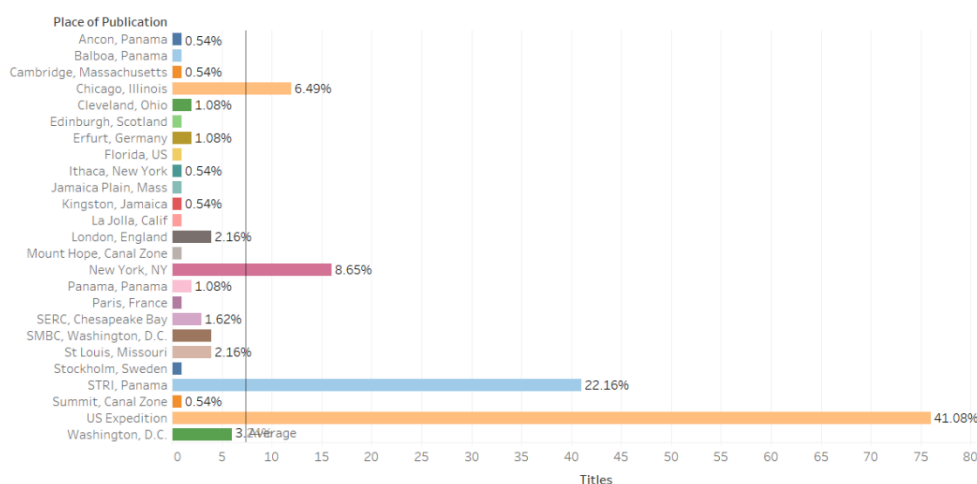


Figure 39 Titles per place of publication in the PAN subset (with cleaned data for missing fields). Generated on Tableau in September 2021. Data from <https://www.biodiversitylibrary.org/data> as of July 1st, 2021.

Considering these details for each of the records with no identified place of publication is particularly important as the hierarchical clustering for the CAC subset—similar to the co-occurrence network of that same subset—also shows a strong connection between the subjects

Panama and *field note(s)* (Figure 40, cluster 8/magenta). Since most field notes with no identified place of publication in the metadata are the product of US-based expeditions to Central America, this connection further emphasizes the determining role that US interests play in the presence and representation of Panama in BHL's collection. The ambiguities of the metadata of these records evidence the (neo)imperial nature of the archive, in that it conceals the power dynamics that occur in the production of these materials. Labelling these records as having no place of publication blurs the dominance of the US in representing—or inventing (Rabasa 7–8)—Panama, demonstrating, at the same time, the gaps, shortcomings, and inherent biases of metadata fields.

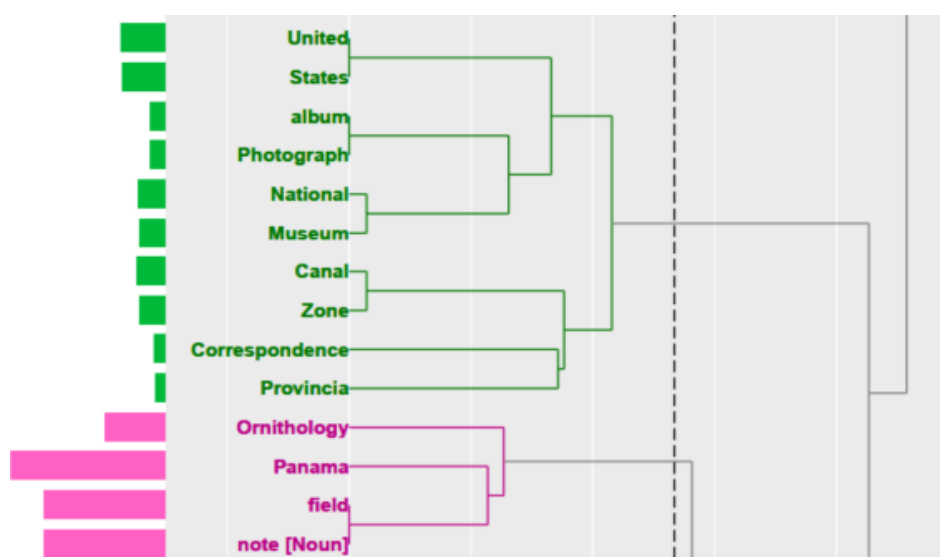


Figure 40 Hierarchical Clusters 7 (green, above) and 8 (magenta, below) for the CAC subset. Generated on KH Coder 3 in September 2021. Data from <https://www.biodiversitylibrary.org/data> as of July 1st, 2021.

Thus, the majority of the (hi)stories of Panama included in BHL are the result of US knowledge production, which hints at a highly (neo)colonial and (neo)imperial representation of Panamanian biodiversity in the Library, as also suggested by the rest of the materials and metadata in the CAC and PAN subsets. For example, of the remaining materials with no identified place of publication in the PAN subset, seven (5.6%) are affiliated with the Smithsonian Environmental Research Center (with its headquarters in Chesapeake Bay) and the Smithsonian Migratory Bird Center (in Washington, D.C.). The latter is particularly interesting, as it could contribute, at least in part, to the

importance of the subject *ornithology* in connecting the subject *Panama* with the subgraph built around the term *United States* in the CAC subset (Figure 38 above, subgraph 06). In this case, the nonhuman subjects encompassed by the term *ornithology* as well as the subject *Panama* are subordinated to the epistemologies produced by the United States, thus pointing to the conflation of human and nonhuman subjects from the Global South under the epistemological as well as political and economic dominance of the Global North.

This dominance manifests even in materials in the PAN subset that have a direct connection with Panama. The remaining 41 materials with no identified place of publication in this subset are affiliated with the Smithsonian Tropical Research Institute (STRI). What is particularly notable about the STRI is that it is located in Ancón, Panama (Smithsonian Tropical Research Institute, ‘Why Is the Smithsonian in Panama?’). This means that even if the STRI is affiliated with the Smithsonian and, therefore, the United States, the knowledge production about Panama sponsored by the Institute could be seen as an epistemic collaboration between researchers from Panama, the US, and beyond (Smithsonian Tropical Research Institute, *Biological and Cultural Diversity of the Tropics* 4).

Nevertheless, even when considering the place of publication of STRI-affiliated documents as being located in Ancón, the knowledge production about Panama and her biodiversity as housed in BHL continues to be greatly dominated by the United States (Figure 41). Thus, the preponderance of field notes affiliated with US institutions as sources of knowledge about Panama in the US, as well as the role of the latter as hegemonic centre of publication in the PAN subset, reveals, once more, an active subject-passive object epistemic relationship between Panama and the US. Such a relationship then points to the determining role of the shared colonial and (neo)imperialistic history between the two countries in the (hi)stories told by BHL.

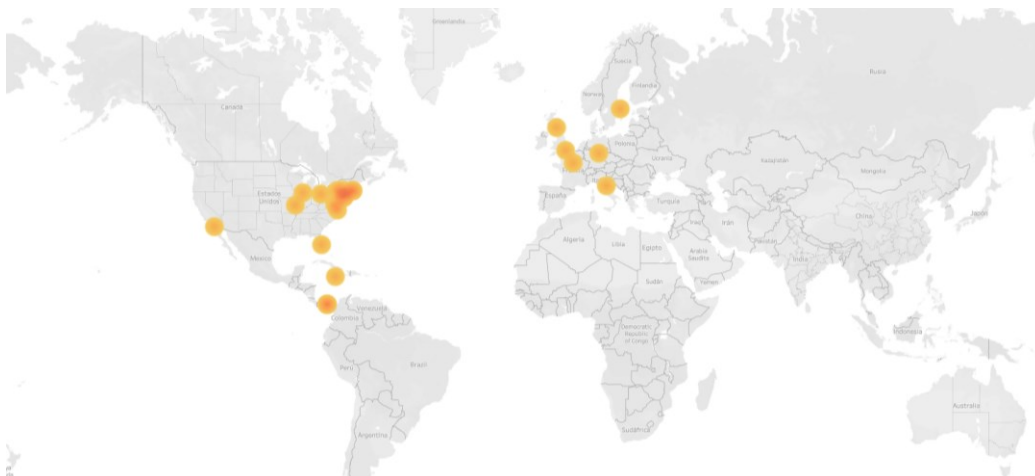


Figure 41 Map showing places of publication (density per number of records) in the PAN subset (with cleaned data for missing fields). Generated on Tableau in September 2021. Data from <https://www.biodiversitylibrary.org/data> as of July 1st, 2021.

The year of publication in the PAN subset is yet another layer that evidences the impact of US politics and interests in the production of these materials, especially given the history of the US construction and administration of the Panama Canal throughout the 20th century. After its beginnings as a French project in the late 19th century, the construction of the Panama Canal was initiated by the United States in 1904 and concluded in 1914 (Autoridad del Canal de Panamá). The concession of this region was a result of US participation in “the separatist movement in Colombia [after which] the separatists achieved in breaking the province of Panama from Colombia [and] the United States was *awarded* with what was to become the Panama Canal Zone” (‘Panama Canal Zone in World War II,’ emphasis mine). The US control of the Canal continued until 1979 when it was transferred to “the Panama Canal Commission, a joint agency of the United States and the Republic of Panama” (Padelford), and it was not until 1999 that the Canal’s administration was left exclusively in the hands of Panama (Autoridad del Canal de Panamá).

Mirroring this historical context, 161 out of the 185 records in the PAN subset (87%) were published between the years 1903 and 1996, that is, during the US administration of the Panama Canal, with the peak occurring in the late fifties (Figure 42). Furthermore, 74 of the 76 materials^{xxxix} that are the product of US-based expeditions (as previously explained) were published between 1910

and 1983, meaning that 97.4% of these expeditions occurred during US control of the Panama Canal (Figure 43).

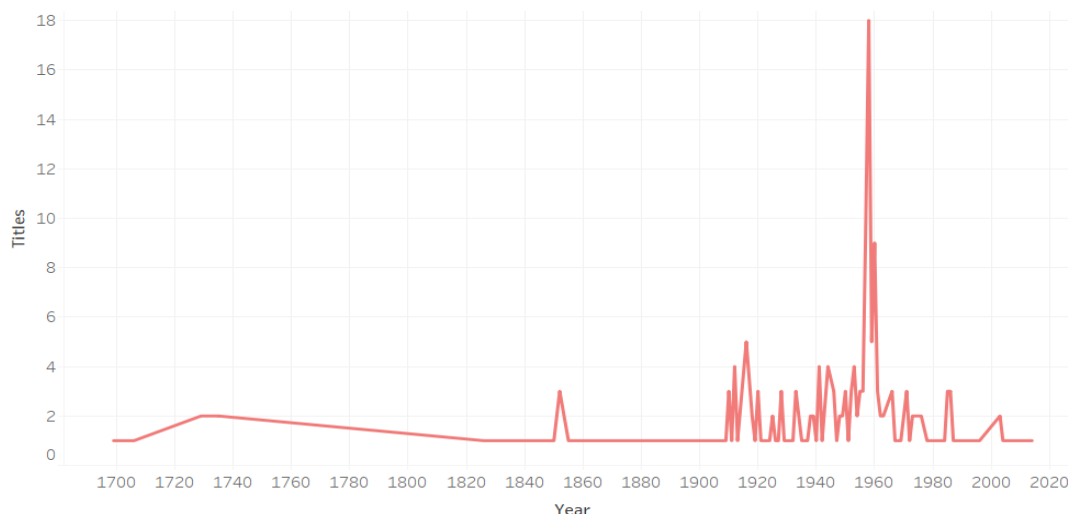


Figure 42 Distribution per year of publication of titles in the PAN subset (with cleaned data for missing fields). Generated on Tableau in September 2021. Data from <https://www.biodiversitylibrary.org/data> as of July 1st, 2021.

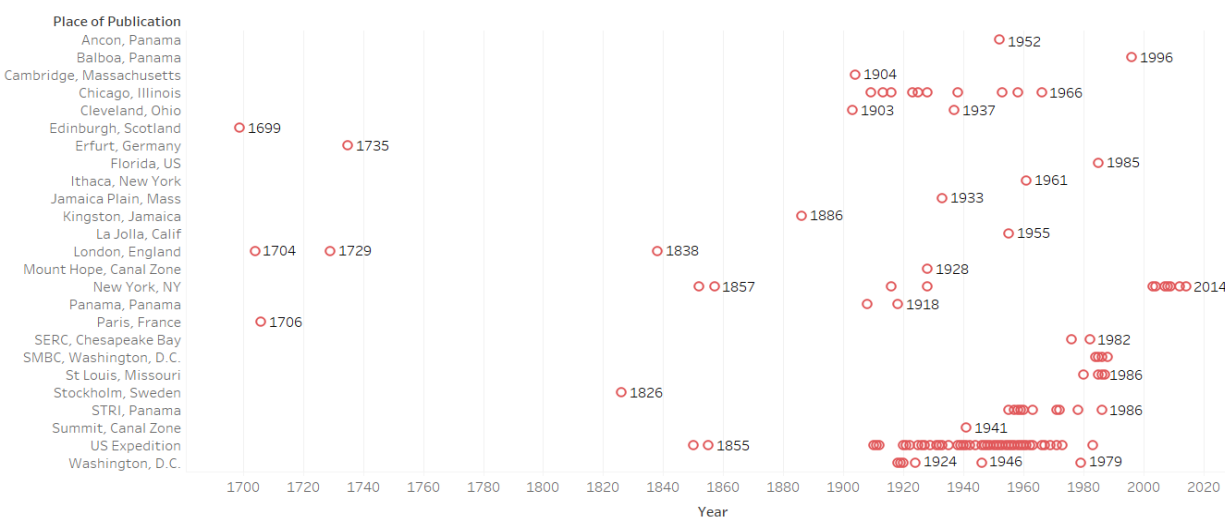


Figure 43 Chronological distribution per place of publication of titles in the PAN subset (with cleaned data for missing fields). Generated on Tableau in September 2021. Data from <https://www.biodiversitylibrary.org/data> as of July 1st, 2021.

Even the STRI itself, despite its global collaboration outlook, is “closely tied to the construction of the Panama Canal” as it resulted from “Smithsonian scientists and naturalists across the United States urg[ing] U.S. President Theodore Roosevelt to support a biological expedition to take an inventory of the future Canal Zone’s flora and fauna” (Smithsonian Tropical Research Institute, ‘Why Is the Smithsonian in Panama?’). The STRI’s last publication in BHL dates from 1996 to

1999,^{xl} showing that even the knowledge production of the STRI itself fits perfectly within the timeframe of US control of the Canal and questioning whether biodiversity is truly the main motivation of this and other publications, or yet another asset in US relationships with Panama. While it could be argued that these are only the materials incorporated into BHL and do not necessarily represent the work of the STRI—which continues its research endeavours in Panama to date—what cannot be ignored is that these are the (hi)stories of Panama, the US, and the STRI that BHL’s collection tells, the undeniable colonial panorama that those narratives paint.

Given these patterns of publication across time—alongside the importance of US expeditions and the STRI in the production of the knowledge contained in BHL and the semantic associations and word frequencies of subject lists in the PAN subset—it is possible to conclude that biodiversity-related epistemologies *about* Panama in BHL are greatly subordinated to US history, politics, and economic interests. While the mission of BHL is to provide access to global knowledge about biodiversity, the narratives it perpetuates through its collection and its metadata are still deeply rooted in geopolitical and colonial dynamics. Metadata “acts as a representation or surrogate for one or more documents or data sets,” (Brody 35) meaning that the narratives and (hi)stories told by metadata are inevitably part of how we understand and approach the materials contained in the Library. The (hi)stories of the biodiversity of Panama that BHL tells are not those of Panama but those of Panama *through* the (neo)imperial epistemic lenses of the United States. The (hi)stories *about* Panama as told by BHL’s storytelling are not the (hi)stories *of* Panama; they are not sympoietic but colonial; they do not form a rhizome but a pyramid.

Moreover, while the storytelling of metadata should imply a new beginning, a new (hi)story (Ernst 54), its perpetual connections to past and present coloniality, as in the case of BHL’s materials about Panama, hinder such *newness* and pulls it back to the long-known imperialism of archives. If digital archives signify a transformation of “[c]ollective memory [as] a reference to a

remembered past [into] a way of analyzing the present as a collection of big (meta-)data in real-time for future prediction” (55), the shadow of coloniality that impedes a renewed storytelling not only represents a past characterized by the oppression of humans and nonhumans but perpetuates it in the present and prolongs it into the future. BHL does not narrate the biodiversity of Panama—and Panama herself—from a neutral standpoint but from a Global-North-centric, US-centric, and—adding the category of language—Anglocentric stance.

As I argued in the first chapter of this thesis, a fundamental category in terms of the diversification not only of representation but also of access and audiences, is, precisely, language. In this regard, out of the 185 records in the PAN subset, only seven (3.78%) are in languages other than English,^{xli} of which only three (1.62%) are in Spanish, the official language of Panama (Zajícová 185)(Figure 44). Considering the ratio of the dominance of English in all BHL collections (as explained in Chapter 1 of this thesis), these numbers are not surprising but still notable concerning the US-centrism of materials *about* Panama in BHL.

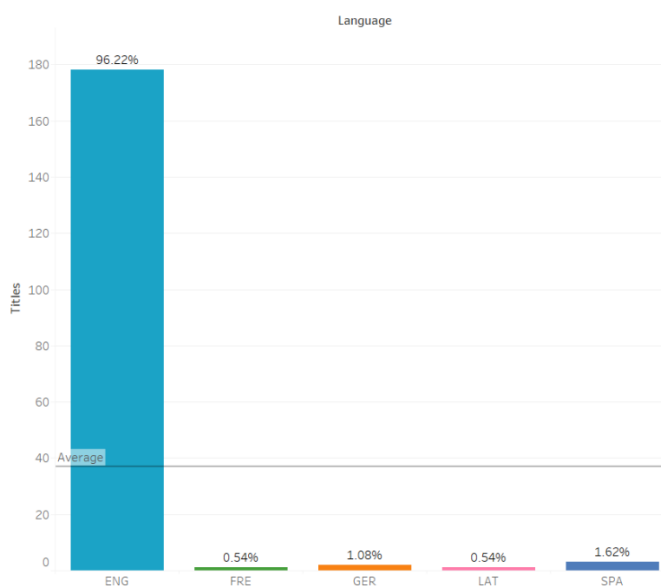


Figure 44 Percentage of titles per language in the PAN subset (with cleaned data for missing fields). Generated on Tableau in September 2021. Data from <https://www.biodiversitylibrary.org/data> as of July 1st, 2021.

The three materials in the PAN subset that are written in Spanish are James Zetek’s *Los moluscos de la República de Panamá* (1918), the Smithsonian Tropical Research Institute’s *Panamá, puente biológico: Las*

Charles Smithsonian del Mes (2001),^{xlii} and Rafael Tobías Marquís Oropeza's *Algunas palmeras industriales de la flora istmeña* (1908). The first two, despite being published in Panama, are affiliated with the US through their authors and holding institutions. These two materials are held by the Smithsonian Libraries, with the STRI being the author of the second one. Likewise, James Zetek (1886-1959), a US entomologist who worked for the US Department of Agriculture, was in charge of research expeditions and international relations with Central America, especially the Canal Zone in Panama, during both world wars (Snyder et al. 1230–31). This record, thus, further evidences the importance of the history of the Canal and US interests in materials in the PAN subset.

On the contrary, the third record is a unique example that counteracts US-centric tendencies in BHL. Marquís Oropeza was a Venezuelan scientific philosopher and agronomist who acted as the first Director of the Museo Nacional de Panamá [National Museum of Panama] (Moreno 169–70). Therefore, and even though this work is held in the New York Botanical Garden (thus positing the US as a site of legitimization, as previously explained), Marquís Oropeza's book is the only record in the PAN subset (out of 185) that is written in Spanish and where the knowledge production took place in Panama and independently from the US and Europe. Moreover, this work highlights biodiversity-related collaboration within the Global South (Venezuela and Panama), further acting as an example of counter-colonial epistemic agency in non-hegemonic spaces.

Nevertheless, the evident shortcoming of the work of Marquís Oropeza is the rareness of its case, which, given the observations made through the analysis of the CAC and PAN subsets explained so far, turns it into a one-case exception. The goal of the diversification of BHL's collection should then be to make these cases the rule and not the anomaly, an objective that could be achieved through more thorough incorporation of non-hegemonic materials and the establishment of more BHL nodes across the Global South. In this sense, the findings explained throughout this section reveal the important need for BHL to strengthen bonds with institutions in

the Global South not only to achieve a truly global repository but to diversify representation and promote self-representation, a particularly pressing matter in topics related to colonial and (neo)imperial issues, such as in the case of Panama. The overwhelming predominance of US-centric narratives and perspectives in the knowledge production about Panama and her biodiversity in BHL's catalogue reveals the urge to diversify, decentralize, and decolonize bio-diverse epistemologies, especially in the path to establishing a CRSEUoB in the Anthropocene.

3.4 Re-Thinking Intraspecies Relationships: The (De)Colonial (Hi)Stories of the Brazil Nut

The coloniality of knowledge engrained in BHL's collections not only affects the representation of *place*—as is the case of Panama—but also of nonhuman subjects, especially in their sympoietic (hi)stories with plural humanities. By perpetuating epistemic coloniality, BHL hinders intraspecies relationships inasmuch as it makes room exclusively for meaningful relationships between *humanitas* (the Global North) and nonhumans but not so much between the *anthropos* (the Global South) and nonhumans. In this regard, while the relationship between *humanitas* and nonhuman subjects as communicated by BHL's metadata is multifaceted, the *anthropos* is limited to a categorization, along with nonhuman subjects, as *objects* of the *humanitas*, without the possibility of enacting and re-telling her (the *anthropos*'s) own (hi)stories with-in biodiversity.

To better understand this complex panorama, let us turn to the case of *Bertholletia excelsa*, commonly known as Brazil nut, and the (hi)stories of this species as re-told by BHL. The species known as *Bertholletia excelsa* received this name when identified by Aimé Bonpland and Alexander von Humboldt during their trip to the Americas between 1799 and 1804 (Jones 212; Humboldt and Bonpland 124–27). Nevertheless, Brazil nuts—endemic to the Orinoco River region, especially Brazil, Bolivia, and Peru—had been exported since the early 17th century by the Dutch (Schultes 23), who continued to prolifically send seeds to Europe during the 18th and early 19th centuries

(Mori and Prance 134). In the late 19th century, after the opening of “Brazilian ports ... to free trade” in 1866 (*ibid.*), the British Crown sought to cultivate the Brazil nut in their colonies. As a result, in 1881, *Bertholletia excelsa* was imported by the Botanical Department of Jamaica (Royal Botanic Gardens, Kew 11). In the following years, the species was also introduced into the British “Eastern and Australian Colonies,” particularly Queensland and Singapore, a project that, in 1887, the Royal Botanic Gardens at Kew saw as “in every way ... desirable,” especially as this dependency considered itself to be “a ‘half-way house’ between the two tropics” (12). Thus, seeds of the Brazil nut were taken to London from the Americas and then sent to the “Eastern Colonies” for cultivation and commercialization (*ibid.*). Similarly, Brazil nuts had been imported into several other European countries since the beginning of European colonial expansion in the Americas. Bonpland and Humboldt themselves explain that the species had already been introduced to Portugal, France, and Spain by the time they identified it and given different names in each country’s language (Humboldt and Bonpland 124–25). In this regard, the (hi)stories of *Bertholletia excelsa* are the (hi)stories of colonization, still coded in the very roots (literal and metaphorical) of this species.

As in the case of *pyrostegia venusta* explained in Chapter 2 of this thesis, the (hi)stories of *Bertholletia excelsa* tell the (hi)stories of the colonization of the Global South, which transfers to the collections of BHL. For instance, an analysis of the metadata of all materials in BHL that include the scientific name *Bertholletia excelsa*^{xliii} reveals these (hi)stories of colonization and their permanence in the (colonial) biodiversity-related record of digital archives. Unsurprisingly, once again, the places of publication of these 680 materials (unique IDs) are mostly located in Europe and the United States (Figure 45), with London being at the top (153 titles, 23.53%), followed by New York (57 titles, 8.77%) and Paris (42 titles, 6.46%) (Figure 46).

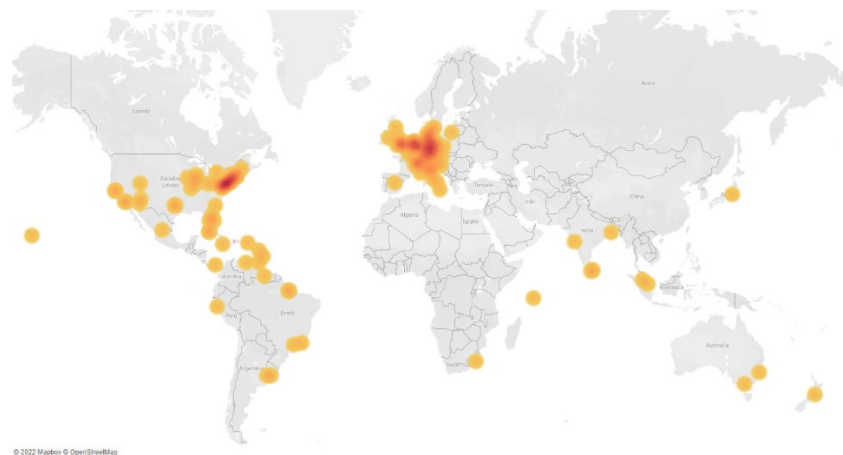


Figure 45 Density map of places of publication of materials in BHL containing the scientific name *Bertholletia excelsa*. Generated on Tableau in January 2022. Data from <https://www.biodiversitylibrary.org/> through a scientific name search conducted in January 2022.

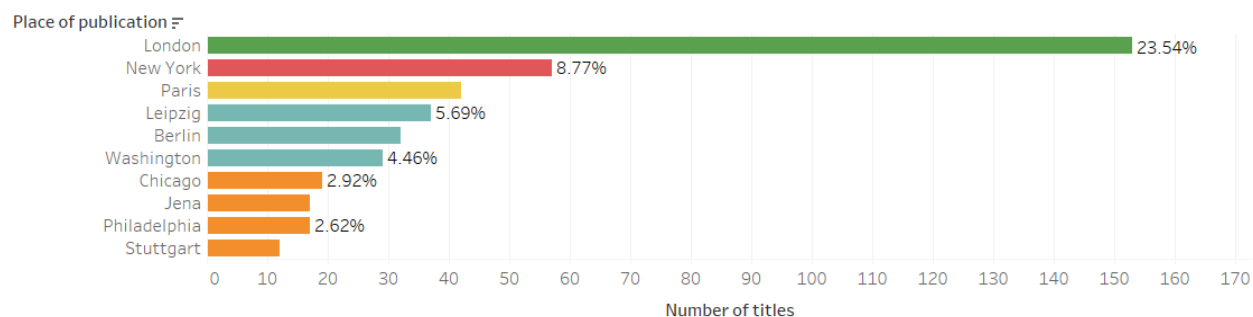


Figure 46 Top 10 places of publication of materials in BHL containing the scientific name *Bertholletia excelsa*. Generated on Tableau in January 2022. Data from <https://www.biodiversitylibrary.org/> through a scientific name search conducted in January 2022.

Interestingly, however, the data also show the presence of several locations in the Global South as places of publication of these materials. For instance, there are numerous titles published in Latin America (Figure 47), Brazil being the most important Latin American place of publication with 16 titles (2.35%) published in Pará/Belém (7 titles, 1.08%), Rio de Janeiro (7 titles, 1.08%), and São Paulo (2 titles, 0.31%). Additionally, two of these 16 materials were published in the late 19th century (1873 and 1897^{xliv}) and the remainder 14 were published during the 20th century (between 1906 and 1988)^{xlv}, that is, all 16 records were published well after the independence of Brazil in the early 19th century. Thus, even if the presence of knowledge production about *Bertholletia excelsa* from Brazil in BHL is still significantly lower than production from the Global North, the importance of Brazil as a post-colonial epistemic agent in matters related to this species is notable.

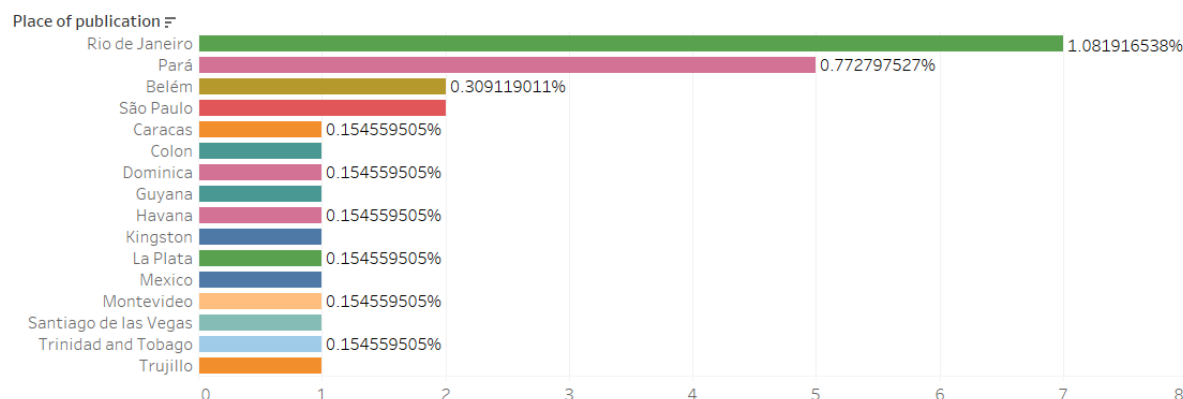


Figure 47 Number of titles per place of publication in Latin America of materials in BHL containing the scientific name *Bertholletia excelsa*. Generated on Tableau in January 2022. Data from <https://www.biodiversitylibrary.org/> through a scientific name search conducted in January 2022.

Nonetheless, this is not the case for places of publication of materials about *Bertholletia excelsa* in the Global South *outside* of Latin America, which, on the contrary, continue to reveal the colonial nature of these records. In this regard, it is noteworthy that most of these locations were British colonies at the time of publication of the records included in BHL (Figure 48): Calcutta and Mumbai in India, Peradeniya and Colombo in Sri Lanka, Kuala Lumpur in Malaysia, Jamaica and Trinidad and Tobago in the Caribbean, Durban and Seychelles (Victoria) in Africa, and Singapore, as well as Melbourne in Australia and Wellington in New Zealand.

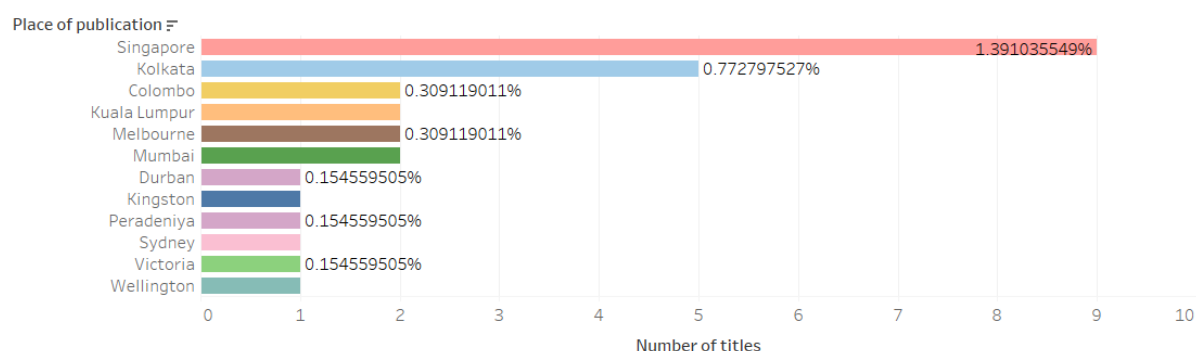


Figure 48 Places of publication of materials in BHL containing the scientific name *Bertholletia excelsa* that were British colonies at the time of publication of the records. Generated on Tableau in January 2022. Data from <https://www.biodiversitylibrary.org/> through a scientific name search conducted in January 2022.

Unlike Brazil, given not only the place of publication of these records but the specific context of their production, these *places* cannot be considered post-colonial epistemic agents but sites of production of knowledge affiliated with the Global North and, therefore, with coloniality. While

these places are “represented” in the metadata, the temporality of these records re-colonizes their presence in BHL by stigmatizing them as colonies. In this sense, the metadata of records about *Bertholletia excelsa* in BHL show precisely the intertwining of the colonial (hi)stories of *place* and nonhuman subjects, as both the Brazil nut and these locations included as places of publication are, in the context of the production of this knowledge, victims of past and present, analogue and virtual, epistemic coloniality.

In addition to their place of publication, the language of publication of materials about *Bertholletia excelsa* adds another layer to their coloniality (Figure 49). For instance, and as has happened in other instances explored throughout this thesis, English continues to be, by far, the most frequent language of publication, with 394 records (61.66%), followed by German with 139 (21.75%) and French with 55 (8.61%). Together, these three languages account for 92.02% of the records about *Bertholletia excelsa* in BHL, largely dominating the knowledge production about the Brazil nut, especially during the 19th century and more clearly prior to 1880, with English almost exclusively dominating the 20th and 21st centuries (Figure 50).

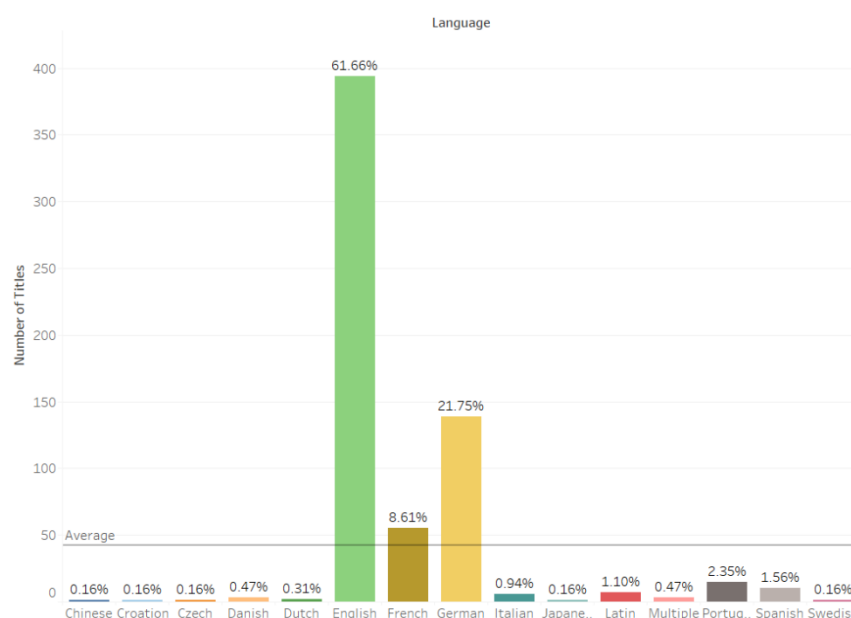


Figure 49 Language of publication of materials in BHL containing the scientific name *Bertholletia excelsa*. Generated on Tableau in January 2022. Data from <https://www.biodiversitylibrary.org/> through a scientific name search conducted in January 2022.

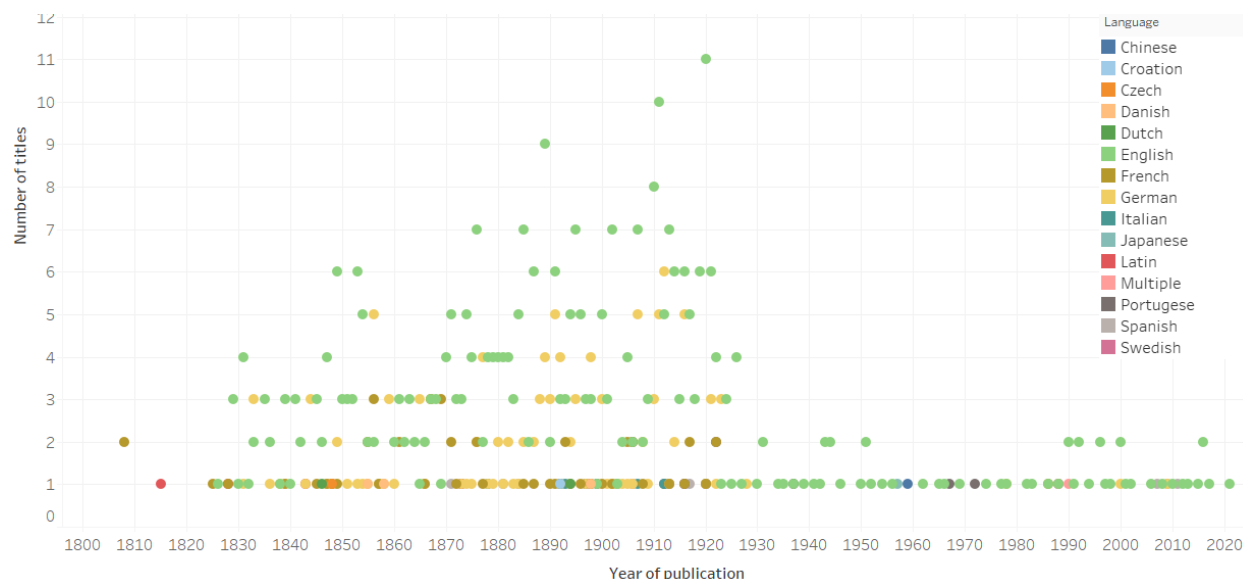


Figure 50 Number of materials in BHL containing the scientific name *Bertholletia excelsa* published per year in each included language. Generated on Tableau in January 2022. Data from <https://www.biodiversitylibrary.org/> through a scientific name search conducted in January 2022.

The 20th and 21st centuries are also characterized by a considerable decrease in the number of publications about *Bertholletia excelsa*, perhaps hinting at the reduced interest in this species in the post-colonial Global North, similar to the case of Panama explained in the previous section. In this regard, it is notable that, after Brazil's independence from Portugal in 1822, "Britain enjoyed a truly strong position in the country," which lasted until around 1900, when "the British position in Brazil [was] challenged mostly by the growing influence of Germany" (Vargas Garcia 4), with British economic interests and influence lasting until "after the world economic depression of 1929-33" (18). Considering that London is the most frequent place of publication of materials about *Bertholletia excelsa*, especially between 1830 and 1930, and that many other places of publication were British colonies at the time of publication, it is possible to conclude that the knowledge production about *Bertholletia excelsa* present in BHL is overwhelmingly Euro- and Anglocentric; in sum, colonial.

The metadata of materials in BHL that include the scientific name *Bertholletia excelsa* demonstrate that the (hi)stories of this species are told through the lens of the Global North, specifically Europe, perpetuating the epistemic coloniality of this species and the human groups that

relate to it. The travel (hi)stories of the Brazil nut as told by BHL are, in reality and once more, the colonial (hi)stories of the Global North as the producer of knowledge and the Global South as the object of study and subject to coloniality. The absence, for example, of materials developed in the post-colonial Global South and of non-hegemonic languages (which parallel the findings explained in Chapter 1) contributes to the overshadowing of peripheral epistemologies.

The absence of non-hegemonic languages in these records also reveals the erasure of the (hi)stories of Indigenous peoples with *Bertholletia excelsa*. In this regard, it is important to note that the extraction of nuts of this species in the Americas was and continues to be mostly undertaken by Indigenous peoples (Royal Botanic Gardens, Kew 11; Humboldt and Bonpland 126–27; Shepard and Ramirez 45). Additionally, Indigenous communities have played a fundamental role in the historical and present distribution and reproduction of the species through “localized disturbance and fertilizing the soil with ash” (Shepard and Ramirez 48). This means that the “cultural practices” of diverse Indigenous groups in the Amazonian area have greatly contributed to “the expansion of Brazil nut populations from ancient through recent times,” a fact that not only impacts our understanding of this nonhuman species but also of Indigenous peoples, as it “challeng[es] the longstanding view of pre-Colombian Amazonian peoples as small, low-impact nomadic populations” and “reveal[s] ... the significant legacy of ancient indigenous peoples in shaping modern Amazonian landscapes” (56). Thus, the coloniality revealed by the metadata of BHL denies the shared (hi)stories of the *anthropos* and the nonhuman by removing Indigenous knowledges from archival collections, the metadata landscape, and networks of biodiversity-related knowledge production. This colonial stance adds to existing oppressive understandings of Indigenous peoples and persists in obscuring their contribution to bio-diverse knowledges and their sympoietic (hi)stories with nonhumans.

Similarly, the coloniality of the (hi)stories of *Bertholletia excelsa* in BHL prevents a network of

Global South epistemologies. For instance, the four most important producers of Brazil nuts in the world are Brazil, Bolivia, Peru, and, perhaps unexpectedly, Côte d'Ivoire (Dufoo-Hurtado et al. 304), with other West African countries showing notable production of this species (Cardoso et al. 10). However, there is almost no presence of African countries in the metadata extracted from BHL, except for two *colonial* records: the Seychelles Department of Agriculture's *Annual Report, Agriculture and Crown Lands* for the years 1911 and 1914, and the Durban Botanic Society's *Report on Natal Botanic Gardens and Colonial Herbarium for the Year 1903-1904*, by John Medley Wood, a British botanist who was, as stated in the cover of the *Report*, a "Corresponding Member of the Pharmaceutical Society of Great Britain" and director of the Durban Natal Garden and Herbarium ('Dr. J. Medley Wood' 174–75). Therefore, the (hi)stories of the Brazil nut in BHL not only exclude the Global South (especially beyond Latin America) as a producer of knowledge of *Bertholletia excelsa* but also hinder cross-Global South epistemic networks by suspending these countries in their colonial past and in exclusive relation to their colonizer (Bhambra 92).

The *place of places* in the Global South within metadata continues to be a *place of* subordination and little agency, self-determination, or cross-Global South collaboration. While the presence of Seychelles (Victoria) and Durban as places of publication of these materials link them to knowledge production, the actual context of these records—as explained before—reveals the colonial nature and origins of these epistemologies. Moreover, these findings echo those explained in Chapter 1 concerning traffic by country to BHL's website, in which web analytic data revealed the nonexistence of cross-Global South collaboration. These lacks demonstrate, once again, the colonality of biodiversity-related knowledge production and the different layers of storytelling but, particularly, of silencing that take place in digital archives. All in all, by promoting a colonial, Global-North-centric approach to biodiversity collections, BHL and other similar archives and libraries continue to conceal the role of Indigenous peoples and the Global South in human-nonhuman

(human-plant in the case of *Bertholletia excelsa*) relationships, both in environmental and epistemic terms, a central obstacle in achieving a truly decolonial network of bio-diverse knowledges anchored in the establishment of a CRSEUoB in the Anthropocene.

3.5 Whose Colonization? Or the (Im)Possibility of Being a Storyteller

As revealed by many of the examples explained thus far—including the case of *Bertholletia excelsa* explored in the previous section—and given the colonial nature of many materials in BHL, an imperative component of the questioning of archival coloniality lies in the decolonization of subjects and matters related to Indigenous peoples and knowledges. At first glance, perhaps the most evident issue in BHL’s metadata concerning these topics appears with the use of subjects that include the word *Indians*, a problem that has been identified and criticized by several researchers and groups working on the decolonization of annotating practices (Bone and Loughheed 86). Decolonizing efforts for libraries and archives have recognized that the widely used Library of Congress Classification Scheme relies on “problematic terms to describe Indigenous peoples, specifically the word ‘Indian’ (i.e. ‘Indians of North America’)” (Edwards). BHL is not the exception and includes, amongst others, the subjects *Indians of Central America*, *Indians of Mexico*, *Indians of South America*, and *Indians of the West Indies*. As suggested by the Association for Manitoba Archives in their implementation of the Manitoba Information Network, the term *Indian* in standardized library practices must be revisited and replaced by more accurate terminology, oftentimes the term *Indigenous peoples* (87), which is preferred “where the headings are applied by many different people, in multiple locations, with varying levels of training” (89), as is the case of BHL and its partners.^{xlvi}

Additionally, I argue that, in the case of Latin America, the use of the term *Indigenous peoples* to replace *Indians* is even more crucial as it converges more clearly with the terminology used in Spanish. In this regard, several Latin American countries suggest the terms *pueblos indígenas* and/or

pueblos originarios, as is the case, for example, of the governments of Chile and Argentina (Ministerio de las Culturas, las Artes y el Patrimonio. Gobierno de Chile; Ministerio de Cultura Argentina). Likewise, the Inter-American Development Bank’s *Guía de conceptos clave para el trabajo con pueblos indígenas* encourages the use of these two terms and the avoidance of the colonial term *indio* (Albertos and Martín 8). Similarly, the Mexican government recognizes the derogatory connotations of the word *indio* in Mexico and other Latin American countries (Navarrete Linares 7–8). Moreover, even though the proper terms need to be scrutinized in the specific context of different regions and peoples in the world, the use of the term *Indigenous peoples* might make sense for BHL as it mostly appears in its catalogue in relation to the Americas. For instance, when extracting metadata from the Library for records that include the phrase *Indians of* in their subject list,^{xlvii} the most frequent word in said lists is *America* (even above the word *Indians* itself), which commonly appears in the subjects *Indians of North America* and *Indians of South America*, with the words *South* and *North* also being amongst the most frequent in this subset (Figure 51). Although revising standard terms—as occurs with subjects including the word *Indians*—requires “choos[ing] between official, legal, and socially and politically meaningful categories; and efficient access to resources” (Bone and Loughheed 89), it is fundamental to question the colonial connotations of certain terms and opt for more appropriate vocabularies that can lead to a more equitable representation of human and nonhuman subjects.

Words	Frequency
America	521
Indians	519
North	305
history	219
travel	180
natural	163
South	159
Description	142
Mexico	88
River	63
antiquity	60
Peru	57
Valley	52

Early	51
language	50
Brazil	48
Imprint	47
work	47
Northwest	45
States	41
exploration	41
Canada	39
New	39
Discovery	36
West	33
Carolina	30
Latin	29
Canadian	26
account	26
Amazon	25

Figure 51 The 30 most frequent words in subject lists of materials in BHL that include a subject that begins with the phrase *Indians of*. Generated on KH Coder 3 in November 2021. Data from <https://www.biodiversitylibrary.org/data> as of July 1st, 2021.

In BHL's collections, topics that include the term *Indian* carry colonial connotations not only in the terminology itself but also in matters pertaining to Indigenous peoples alongside which the word appears. For example, a co-occurrence network of the subject lists of materials in BHL that include the phrase *Indians of*^{slviii} shows a strong association between this phrase (especially in the subjects *Indians of North America* and *Indians of South America*) and the subjects *Description and travel* and *natural history* (Figure 52, subgraph 02). Additionally, through the word *South*, the same subgraph branches into two clusters, one of which associates these subjects with others such as *Latin America*, *Mexico*, *Peru*, *Brazil*, *Discovery and exploration*, and *Early account*, all of which suggest that many of these materials refer, at least in part, to the colonization of the Americas. These subjects, thus, point to the colonial nature of materials in BHL that include the phrase *Indians of* in their subjects and, therefore, to the colonial nature of the phrase itself, whose use in the metadata of these records perpetuates that same colonality and fosters it in digital environments and archives.

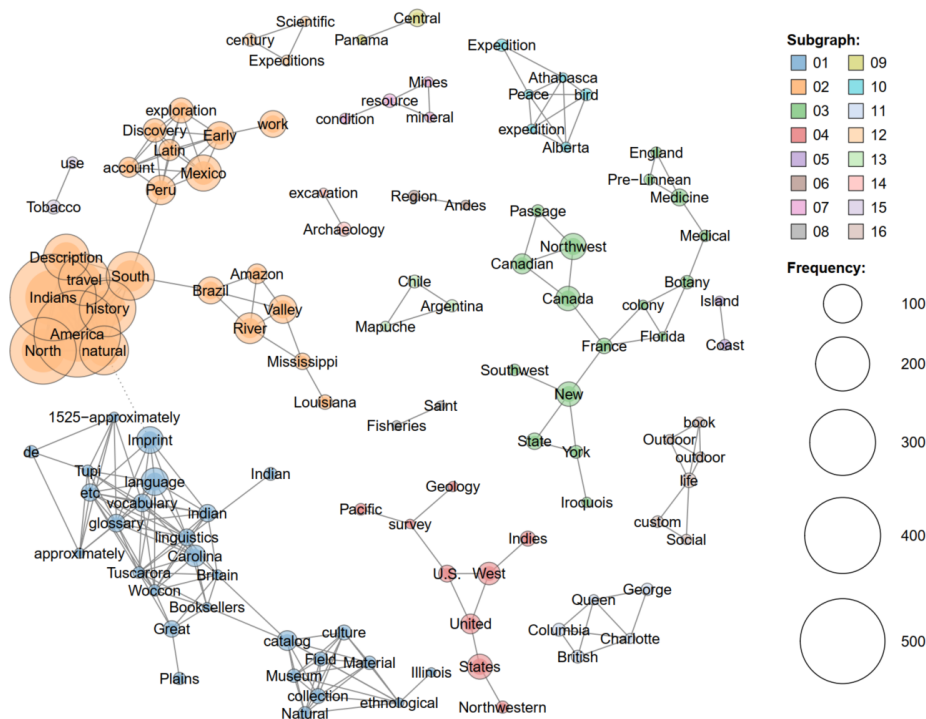


Figure 52 Co-occurrence network of all materials in BHL that include the phrase *Indians of* in their subject lists. Generated on KH Coder 3 in September 2021. Data from <https://www.biodiversitylibrary.org/data> as of July 1st, 2021.

Interestingly, this co-occurrence network also reveals that the word *Indians* is used predominantly to refer to Indigenous peoples in the Americas. Despite the presence of subjects referring to geographical regions in this continent, there are almost no geographical terms that relate to other regions in the world (except for *England*, *France*, and *Britain*), and certainly, no terms referring to regions in the Global South other than Latin America. To contrast this tendency, I extracted yet another subset of records, those that include the term *Indigenous* in their subject lists. After cleaning the data,^{xlix} 17 records remained that include the term *Indigenous* to refer to topics concerning Indigenous peoples. In addition to the significantly small sample of these materials—0.01% of the Library’s collection (of a total of 166,339 records^l)—in the co-occurrence network for this subset, it is notable that most of these materials refer to Indigenous peoples in Africa, the third most frequent word in the subset, only after *Indigenous*^{li} and *people(s)* (Figure 53). Furthermore, the only occurrence of the word *Indians* in this subset appears in the subject *Indians of North America* and refers to Indigenous peoples in Canada. Thus, this subset reiterates that the word *Indian* carries a geographical

meaning, as it is used mostly in the context of Indigenous peoples in the Americas.

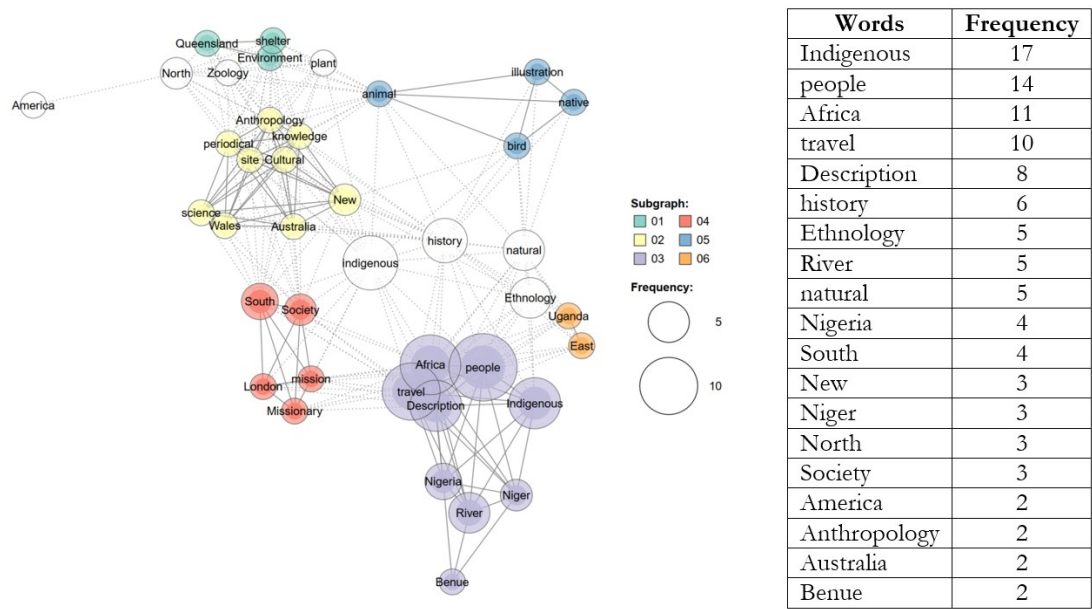


Figure 53 Co-occurrence network (left) and top-20 most frequent words (right) in all materials in BHL that include the word *Indigenous* to refer to topics related to Indigenous peoples in their subject lists. Generated on KH Coder 3 in December 2021. Data from <https://www.biodiversitylibrary.org/data> as of July 1, 2021.

In this sense, removing the word *Indian* and opting for the more widely used *Indigenous peoples* in BHL’s metadata would, first, eliminate the negative connotations and colonial roots that the word *Indian* carries, especially when it refers to Indigenous peoples in Latin America, and second, allow for a stronger correlation between topics related to Indigenous peoples in different parts of the world. This move could perhaps more clearly reveal the colonial discourses that are still present in the Library and the several human and nonhuman groups whose (hi)stories are affected by them. Additionally, the suggested change would help promote cross-Global South (hi)stories, a key component of a CRSEUoB and one of the main shortcomings of BHL in all layers of storytelling, as has been continuously discussed throughout this thesis.

Worth noting in the subset built around the word *Indigenous* is the presence of two records that include the subject *indigenous knowledge*. As of December 2021, these two records are the only ones in BHL that include this subject in their subject lists, and they both concern Indigenous peoples of Australia and belong to the BHL Australia collection. The first of these texts is the *Journal*

and proceedings of the Royal Society of New South Wales, of which volumes 10 (1876) to 153 (2020) are available on BHL. This periodical, especially in its early years, has strong ties to the colonization of Australia. The origins of the Royal Society can be traced back to 1776, when Britain's need for "a new location for its surplus criminals," following the independence of the US, led to the establishment of a colony, "a penal settlement," in Sydney (Tyler 30). In 1821, the Philosophical Society of Australasia—the ancestor of the Royal Society of New South Wales—was founded (31) by a group of gentlemen, that is, men "with private means ... an income from landed estates, who did not have to earn a living ... In the colony of New South Wales ... the distinction [of gentleman] was based on whether or not a person earned his living from physical labour" (32). Thus, this journal is a prime example of the colonality of natural historical knowledge, in this case, in Australia, and the multiple axes of difference, such as gender and class, that intertwine with such colonality.

Nevertheless, these colonial roots are partially counteracted by the labelling of the journal as *indigenous knowledge*. At least to an extent, the apparently simple addition of such a subject in the metadata of this record counteracts—at least in terms of the catalogue—the appropriation of Indigenous knowledge and land that took place throughout the history of Australia and acknowledges the contributions of the Royal Society to such oppression. This acknowledgement is perhaps more clear in the second text that includes this subject, *The North Queensland Naturalist: The Journal and Magazine of the North Queensland Naturalist Club*, published by the NQN Club between 1932 and 2002. The metadata for volumes 1 to 45 (issues 1 to 193, 1932-1992) of this work in the BHL catalogue incorporate a *notes* section that states that the journal includes "a range of articles describing Aboriginal habitation sites from field excursion etc. discoveries; rock painting, rock engraving, artefacts, etc." (Biodiversity Heritage Library and North Queensland Naturalists' Club). However, the metadata for the rest of the volumes of this journal in BHL do not include these *notes* or the subject *indigenous knowledge*. Interestingly, this switch coincides with the *Queensland Anti-*

Discrimination Act 1991, which “came into force on 30 June 1992” (Anti-Discrimination Commission Queensland), as well as with the Mabo Decision, also declared in 1992, that marked the first time the High Court of Australia recognised that a group of Torres Strait Islanders, led by Eddie Mabo, held ownership of Mer (Murray Island) [and that] native title existed for all Indigenous people. The decision led to the passing of the *Native Title Act 1993*, providing the framework for all Australian Indigenous people to make claims of native title. (National Museum of Australia)

While this parallel timeframe could be thought a coincidence, the incorporation of these *notes* and the subject *indigenous knowledge* as part of *The North Queensland Naturalist*’s metadata might also reflect how the *Anti-Discrimination Act* and the *Native Title Act* changed the production of knowledge in Australia. In this regard, it could be the case that the journal changed its production practices alongside the advancement of Indigenous rights in Australia while acknowledging that their previous endeavours contributed to the oppression of Indigenous peoples and that the epistemic production during this period is the result of such complicity as well as epistemic appropriation, and, thus, must be labelled *indigenous knowledge*.^{lii} While this case exceeds the scope of the present analysis and would require further scrutiny to verify this hypothesis, the metadata of these volumes of the *Naturalist* highlight how curatorial decisions around these materials can potentially counteract their colonial origins and history and make room for the (re)telling of other(ed) (hi)stories, such as those of Indigenous peoples.

Despite such possibilities, and as has happened with other such instances analyzed throughout this thesis, the most striking—or perhaps now familiar—issue with these records is their shockingly low numbers. In this case, the presence of only two materials (out of 170 210 records,^{liii} i.e. 0.001175% of BHL’s collection) labelled as *indigenous knowledge* in the Library continues to evidence the striking absence of Indigenous voices (as well as decolonial annotating practices), as is

also the case of Indigenous languages, as explained in Chapter 1 and in previous sections of this chapter.

Moreover, this tendency points to yet another layer of coloniality in BHL's materials, that of authorship and knowledge appropriation. A plural approach to metadata standards requires a critical take on seemingly transparent and innocuous categories, such as that of *author*, which can be particularly problematic in colonial materials. In this regard, colonial texts about the Americas often acknowledge the European chronicler/conqueror as the *author* of the knowledge they contain. However, as explained in Chapter 2 through the example of *Biologia Centrali-Americana*, most of these authors relied on the knowledge of Indigenous peoples of their land and the nonhuman species with which they coexisted. At the same time, Indigenous cultural artifacts that carried no evident economic value for the European foreigners were often disregarded and destroyed. For instance, during the early times of the colonization of the Americas, "Spanish *conquistadores* and their accompanying Catholic clergy set fire to and suppressed the majority of Mayan textual works in existence throughout Mexico and Central America" (Espinosa de los Monteros 109). Nevertheless, following their appropriation of the knowledge of Indigenous peoples, it was also conquerors and clergy who became *mediators* for that knowledge, translated into their languages, intertwined with their own epistemic discourses, and filtrated through their Western paradigms. Such are the accounts that made their way to Europe and into the libraries that hold them today, including BHL:

[w]hat we know about the lost Mayan pre-Columbian collections comes primarily from sixteenth-century colonial accounts written by Spanish explorers and priests who examined these works, often prior to destroying them ... libraries and archives actively preserve, value, and make accessible these historical accounts in both digital and analog formats. The presence of indigenous knowledge works, languages, and self-determined accounts, in contrast, are frequently missing in libraries, archives, or on the internet. (Espinosa de los

Monteros 110)

Thus, the *mediation* of conquerors between (oral and written) Indigenous knowledge and (print) European knowledge; epistemic misinterpretation, misrepresentation, and appropriation of Indigenous knowledge production; the institutionalized unequal valorization of these knowledges; and the problematic concepts of authorship, authority, and publication, bring us back to the questioning of the centre, the metropole, the Global North, as the privileged and hegemonic—that is to say, colonial—site of knowledge production.

These are precisely the colonial contexts that must be considered when developing, modifying, and adapting metadata standards. With this goal in mind, instead of following “inflexible (not neutral) international metadata standards” (Christen 208), decolonial metadata must “confront the colonial mechanisms of knowledge circulation that are a direct product of history, social position, and geolocation” (Espinosa de los Monteros 111). As in the case of the Australian texts labelled *indigenous knowledge*, the use of additional categories (for example, *notes*) and the restructuring of pre-existing ones (such as *subjects*) can aid in the acknowledgement and counteraction of the “colonial mechanisms” that are still at the basis of metadata practices. In terms of authorship, the *author* attribute is not only a problematic concept in archives, particularly colonial ones, but the very notion of an *author* can be anachronic and oppressive in the case of many—especially early—works. Thus, decolonial metadata should include attributes for context specificities, beginning with the problematization of who the author or origin of a text or piece of knowledge is and the questioning of its multiple geographical affiliations, regardless of its place of publication, which challenges the subject-object binary and affects the authority of and over the text, including the location of sites of knowledge production.

Given this colonality of texts and archives, adjusting metadata to account for these historical and present colonial circumstances is a necessary step if BHL wants to acknowledge, make visible,

and contend with the colonial oppression of multiple biodiversities and plural humanities from the perspective of the origins, contents, and history of the texts themselves and in the context of metadata creation and decolonial archival practices. In this sense, following the example of other decolonial projects in the implementation of more inclusive and alternative curational and archival practices will pave the way for BHL to address “histories of exclusion and oppression” as well as to open spaces for “alternative worldviews” (Christen 194). The final goal should then be “to establish a set of standards that allows for multiple voices, layered context, diverse forms of metadata, and the expansion of the archival record” (198). Decolonial archives must be an effort to reconnect with plural epistemologies but also to overcome supposedly “universal” and “true” paradigms that continue to sustain epistemic oppression and unequal power relations. Therefore, decolonial archival systems must develop and implement practices that highlight the artificiality, flexibility, and negotiations of metadata (Christen 201). In sum, a truly decolonial archive goes beyond artifacts and collections and encompasses “[c]ontent and context, epistemology and social practice” (Lee 176). In the case of BHL, promoting self-representation amongst marginalized communities can open spaces for diversified storytelling of human (hi)stories with nonhumans, allowing for a plurality of interspecies relationships. This is a move towards the eco-decolonization of (online) plural knowledges consistent with the pursuit of a CRSEUoB and its multiplicity of bio-diverse (hi)stories, including plural humanities.

Moreover, self-contextualization is essential to the inclusion of plural humanities. Ideally, each community should develop its own specific CRSEUoB and, with it, its own network of (hi)stories, its own contexts and contextualization, its own archives. For instance, a Latin American CRSEUoB would need to incorporate—to connect—the human and nonhuman (hi)stories of the colonial past and present of the region—(neo)colonialism, (neo)imperialism, neoliberalism, extractivism, foreign occupation, exploitation, racism, patriarchy, and so on: “If colonial and

capitalist expansion has both accentuated social inequalities and signalled a precipitous fall in ecological wisdom, an alternative ecology must rest on an alternative society and polity as well” (Guha 418). The *anthropos* must be in connection with others but in line with her own multiple identities; the *anthropos* are bio-diverse and plural:

Making kin must be done with respect for historically situated, diverse kinships that should not be either generalised or appropriated in the interest of a too-quick common humanity, multispecies collective, or similar category ... Making alliances requires recognizing specificities, priorities, and urgencies. (Haraway 207n12)

A Latin American CRSEUoB is a connection—an alliance—with other bio-diverse communities, a call for justice—like all existential utopias—and a decolonial option vis-à-vis the systemic coloniality that has affected and continues to affect the lives—and the narratives—of all human and nonhuman subjects in the continent. Decolonial metadata in the Anthropocene should open spaces for such narratives. Archives such as BHL must acknowledge and respect the continuous unfolding of plural (hi)stories and offer spaces for the enactment of plurality from the margins, both in terms of contents and in terms of curatorial practices. Decolonial archives, thus, “operate through linguistic and cultural perseverance rather than the imperialist agenda of preservation of cultural tradition as hermetically sealed, contained, and unchanging (Cushman, ‘Wampum, Sequoyan, and Story: Decolonizing the Digital Archive.’ 116–17). Decolonial curatorial practices “allow [narratives] to play freely” (Prelinger 28) and avoid “privileging specific narratives” (30). Therefore, truly decolonizing initiatives for legitimate eco-decolonial digital archives should respond to the necessary reparation of the colonial and imperial legacies, origins, and practices of institutions such as museums that linger in current archival practices including “collecting, categorizing, and managing materials of [natural-]cultural heritage” (Cushman, ‘Supporting Manuscript Translation in Library and Archival Collections: Toward Decolonial Translation Methods’ 53).

The reformation of metadata towards a CRSEUoB is fundamental for BHL to counteract the coloniality of Indigenous knowledges that still permeates its collections. In line with this goal, for example, several projects that seek to provide online access to Indigenous cultural artifacts have modified their archival practices and standards towards more plural understandings of the archive, a key change being the restructuring of metadata categories.^{liv} As explained in my discussions of virtual repatriation in Chapter 2, the ideas of mere return and representation as presence are insufficient for decolonization. A truly decolonial biodiversity library would require deeper decolonization of all relationships entailing intra and interspecies coloniality; only then can “reconciliation processes [be] truly authentic” (Farnel et al. 9). Inclusion of oppressed and marginalized communities should go beyond their presence as represented in the materials of the archive and aim, as also discussed in Chapter 2, for a participatory approach that “work[s] with, and not just for, [those] communities” (14).

In this sense, for example, while materials in Indigenous languages are non-existent in BHL, several such languages appear in *subject lists*, meaning that these languages are not considered in the production of knowledge but as *objects* of said production, fueling the schism between the epistemic colonizer and the objectified Other. For instance, metadata extracted from BHL’s collections indicate a significant interest in Indigenous languages as objects of study alongside biodiversity-related topics. Taking as a point of departure the subset Indigenous Peoples – General (IP-G) introduced in section 2 of this chapter, I created a sub-subset (IP-G2) that comprises metadata of records in BHL that include at least one of the following subjects: *Indians of Central America*, *Indians of Mexico*, *Indians of South America*, and/or *Indians of the West Indies*.^{lv} The co-occurrence network of the resulting 158 records shows a considerable presence of topics related to Indigenous languages (Figure 54). Subgraph 08, for instance, includes the words *language*, *linguistics*, *glossary*, and *vocabulary* in a significant relationship with terms such as *indian*,^{lvi} *Tupi*, and *Mapuche*, the latter two referring to

two Indigenous groups of the region we call Latin America. Similarly, the term *language(s)* appears 22 times in this subset, always preceded by an adjective referring to an Indigenous language, such as *Carib*, *Maya*, *Nahuatl*, *Tupi*, *Mapuche*, *Chiquito*, *Mayoruna*, amongst others (Figure 55).

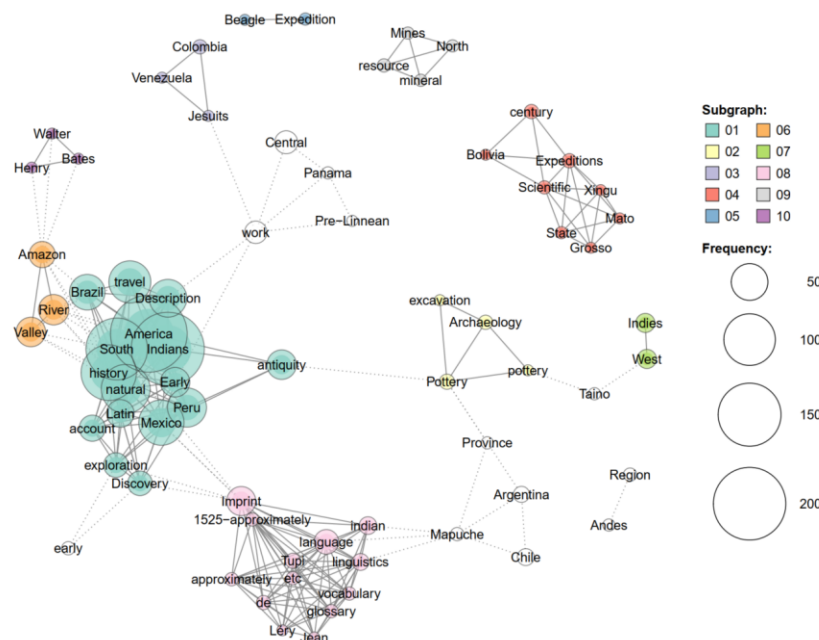


Figure 54 Co-occurrence network for the IP-G2 subset. Generated on KH Coder 3 in December 2021. Data from <https://www.biodiversitylibrary.org/data> as of July 1, 2021.

ans of South America ; Paruro -LRB- Peru - Province -RRB- ; Paruro -LRB- Province -RRB- > Religion and mythology ; Maya	language	Belize ; Ethnology ; Indians of Central America ; Mayas > Chichen Itza -LRB- Mexico -RRB- ; Indians of Mexico ;
Travel ; Early works to 1800 ; 1660 ? -1705 ? -Pre-Linnean works ; Indians of Central America > Nahatl	language	Natural history ; Imprint 1830 ; Imprint 1829 ; Nahua calendar ; Indian linguistics ; Aztecs ; Indians of Mexico ; CSAP ;
America ; Imprint 1596 > History ; West Indies ; French ; Natural history ; West Indies ; Indian linguistics ; Cana	language	Indians of the West Indies > Indians of South America ; 19th century ; History ; Lithographs ; Sources ; Bolivia
Mexico > Imprint 1648 ; Indians of South America ; Natural history ; Brazil ; Pre-Linnean works ; Indian linguistics ; Mapuche	language	Chile > Imprint 1648 ; Chiloé -LRB- Chile -RRB- ; Patagonia -LRB- Argentina and Chile -RRB- ; Indians of South America ; Catalogs
T 1648 ; Indians of South America ; Natural history ; Brazil ; Pre-Linnean works ; Indian linguistics ; Mapuche language ; Tupi	language	Topo -LRB- Chile -RRB- ; Patagonia -LRB- Argentina and Chile -RRB- ; Indians of South America ; Catalogs ; Booksellers ;
Bookellers ; Great Britain ; Imprint 1809 ; Indian linguistics ; Natural history ; Chile ; Mapuche Indians ; History ; Mapuche	language	1809 ; To 1810 > Patagonia -LRB- Argentina and Chile -RRB- ; Mapuche language ; Chile ; Mapuche Indians ; Indian
Mapuche Indians ; History ; Mapuche language ; 1809 ; To 1810 > Patagonia -LRB- Argentina and Chile -RRB- ; Mapuche	language	Chile ; Mapuche Indians ; Indian linguistics ; Natural history ; Description and travel ; Indians of South America > Peru
Description and travel > Early works to 1800 ; Panama ; Description and travel ; Indians of Central America > Cak	language	Early works to 1800 ; Glossaries ; vocabularies , etc ; Description and travel ; Natural history ; Panama ; Indians of Central
Voyages and travels ; Early works to 1800 ; Peru > Description and travel ; Indians of South America ; Bakani	language	Gá languages ; Xingu River , Brazil ; Scientific Expeditions ; Xingu River -LRB- Brazil -RRB- > Description and travel ;
travels , Early works to 1800 ; Peru > Description and travel ; Indians of South America ; Bakani language ; Gá	languages	Xingu River , Brazil ; Scientific Expeditions ; Xingu River -LRB- Brazil -RRB- > Description and travel ; Brazil ; Indians
Imprint 1648 ; Medicine ; Indians of South America ; Natural history ; Pre-Linnean works ; Brazil > Imprint 1593 ; Tupi	language	1534-1611 ; Glossaries ; vocabularies , etc ; Indian linguistics ; approximately 1525-approximately 1576 ; 1549-1762 ; Brazil ;
history ; D > 1510-1571 ? ; 1549-1762 ; Glossaries ; vocabularies , etc ; Indian linguistics ; Natural history ; Tupi	language	1548-1580 ; approximately 1525-approximately 1576 ; History ; Indians of South America ; 1534-1611 ; Description and travel
Natural history ; approximately 1525-approximately 1576 ; Imprint 1592 ; Villegaignon , Nicolas Durand de , History ; Tupi	language	Glossaries ; vocabularies , etc ; Indian linguistics ; 1549-1762 ; Description and travel ; Stad > Le Staden , Hans
Stad > Le Staden , Hans , ; 1510-1571 ? ; approximately 1525-approximately 1576 ; Indians of South America ; Tupi	language	1534-1611 ; Imprint 1606 ; Imprint 1612 ; Léry , Jean de , ; 1548-1580 ; 1549-1762 ; Glossaries ; vocabularies
de , ; 1510-1571 ? ; Natural history ; 1548-1580 ; 1534-1611 ; History ; Imprint 1605 ; Indians of South America ; Tupi	language	Brazil ; Imprint 1597 ; Léry , Jean de , > Glossaries ; vocabularies , etc ; 1548-1580 ; Tupi
de , ; Brazil ; Imprint 1597 ; Léry , Jean de , > Glossaries ; vocabularies , etc ; 1548-1580 ; Tupi	language	Imprint 1597 ; Indians of South America ; 1510-1571 ? ; Léry , Jean de , ; approximately 1525-approximately 1576 ; Brazil ;
and Bolivia -RRB- ; Description and travel ; Brazil ; Amazon River ; Mojo Indians ; Indians of South America > Mapuche	language	South America ; Natural history ; Chiquito language ; Guaraní language ; Imprint 1847 ; Indians of South America ; Orbigy , A
Amazon River ; Mojo Indians ; Indians of South America > Mapuche language ; South America ; Natural history ; Chiquito	language	Guaraní language ; Imprint 1847 ; Indians of South America ; Orbigy , Alcide Deshaydes de , ; 1802-1857 ; Imprint 1835 ;
Mojo Indians ; Indians of South America > Mapuche language ; South America ; Natural history ; Chiquito language ; Guaraní	language	Imprint 1847 ; Indians of South America ; Orbigy , Alcide Deshaydes de , ; 1802-1857 ; Imprint 1835 ; Moro language -LRB-
Mojo language ; Imprint 1847 ; Indians of South America ; Orbigy , Alcide Deshaydes de , ; 1802-1857 ; Imprint 1835 ; Moro	language	-LRB- South America -RRB- ; Indian linguistics ; Texts ; > Indians of South America ; Latin America ; Peru ; America
language ; Imprint 1847 ; Indians of South America ; Orbigy , Alcide Deshaydes de , ; 1802-1857 ; Imprint 1835 ; Moro	language	Brazil ; Description and travel ; French colony ; 1555-1567 > Indians of South America ; Description and travel ; Natural
history ; Imprint 1847 ; Indians of South America ; Orbigy , Alcide Deshaydes de , ; 1802-1857 ; Imprint 1835 ; Moro	language	Classification ; Onomastics ; Unalut River Region ; Peru ; Mammals ; Amazon River Region ; Ethnobotany ; Mammals
ca ; Mammals ; Amazon River Region ; Ethnobotany ; Mammals ; Amazon River Region ; Ethnobotany ; Mammals	language	Classification ; Onomastics ; Unalut River Region ; Peru ; Mammals ; Amazon River Region ; Ethnobotany ; Mammals

Figure 55 Sample of contexts of the word *language* in the IP-G2 subset. Generated on KH Code 3 in December 2021. Data from <https://www.biodiversitylibrary.org/data> as of July 1, 2021.

Moreover, in addition to subject lists, the geographical and linguistic patterns of publication of this subset highlight, once more, the power of the Global North as an epistemic centre. For instance, the most frequent places of publication in the IP-G2 subset are London (36 records, 25.35%), Paris (22 records, 15.49%), and Chicago (18 records, 12.68%), with only six records published outside of

Europe and the US, one in Bogotá, four in Mexico and one in Rio de Janeiro.^{lvii} Nevertheless, despite them being published in Latin America and written in Spanish, it is worth highlighting that these six titles also have colonial origins. Furthermore, this subset (as most subsets discussed in this chapter) is predominantly Anglocentric, with almost half of the records being in English (69 records, 48.25%) (Figure 56). Thus, the IP-G2 subset continues to demonstrate the need to tackle metadata from different standpoints to achieve true diversification, as in the case of materials about Panama and *Bertholletia excelsa*, explained in previous sections.

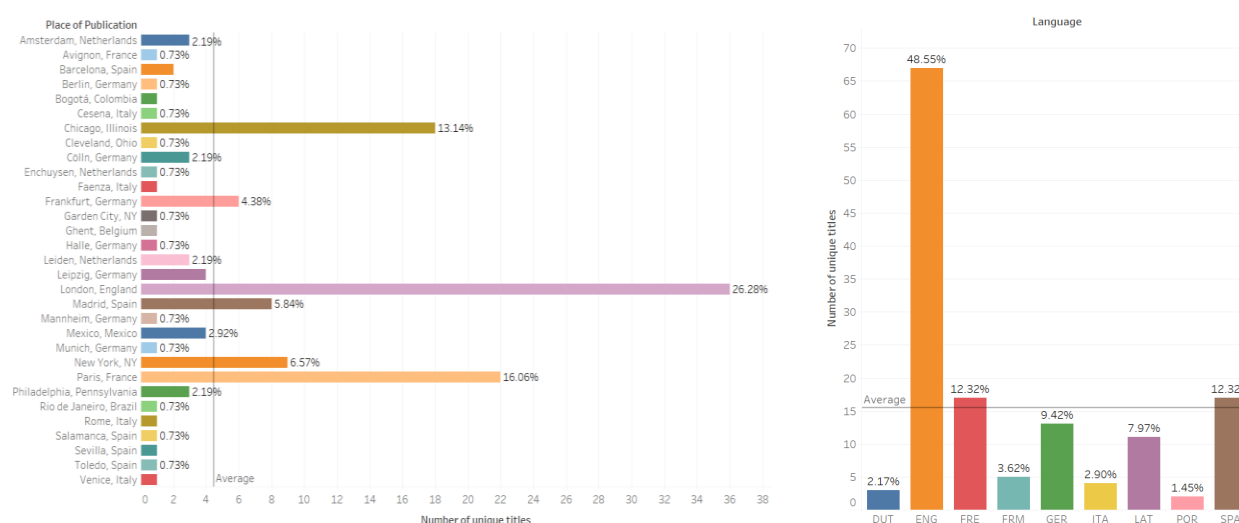


Figure 56 Places of publication (left) and language distribution (right) for unique ID titles in the IP-G2 subset. Graphs generated on Tableau in January 2022. Data from <https://www.biodiversitylibrary.org/data> as of July 1st, 2021.

Although some of these trends could be explained by the homogenizing nature of the terms included in the IP-G2 subset, these findings resonate with those obtained when considering more specific subjects. When working with the subject lists of the Indigenous Peoples – Specific (IP-S) subset introduced in the second section of this chapter and which includes the names of specific Indigenous groups, the interest in Indigenous languages resurfaces. The word *language* appears 22 times, always accompanied by the same adjective that qualifies the subject referring to the Indigenous group included in the subset. For example, subject lists that include the topic *Carib language* always include the topic *Carib Indians*. Arguably, this characteristic of subject lists is in itself indicative of the coloniality of metadata, as it shows that the interest in Indigenous peoples is not

exclusively linguistic, as the topic *Carib language* should be sufficient to indicate the linguistic nature of a record but, on the contrary, never appears on its own.^{lviii} Furthermore, the most intricate subgraph (Figure 57, subgraph 01) in the co-occurrence network for the IP-S subset is one where language-related words such as *vocabulary*, *glossary*, *language*, and *linguistics* co-occur alongside topics such as *Description and travel* and *natural history*, as was the case of the IP-G2 subset, which often refer to colonial expeditions and knowledge production.

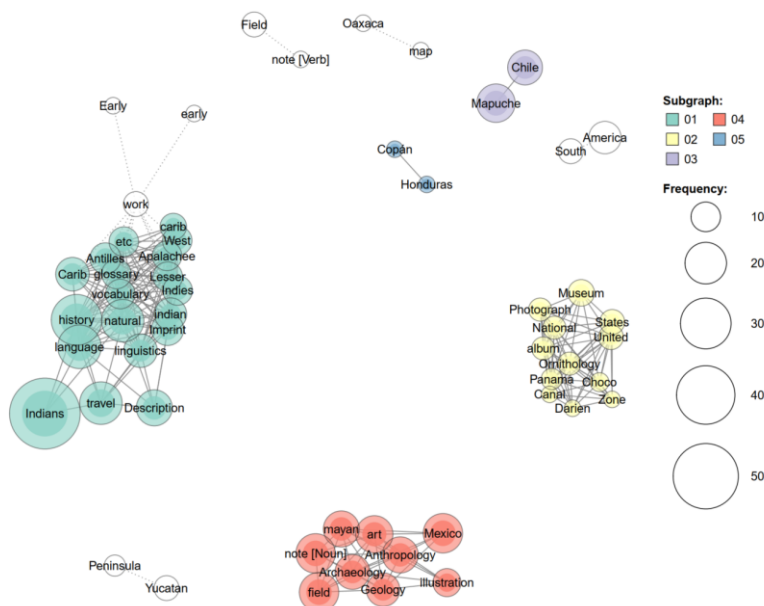


Figure 57 Co-occurrence network for the IP-S subset. Generated on KH Coder 3 in January 2022. Data from <https://www.biodiversitylibrary.org/data> as of July 1, 2021.

What is perhaps most surprising in both the IP-G2 and IP-S subsets is the absence of biodiversity-related topics, especially referring to nonhuman species. While other subsets analyzed in this chapter include topics pertaining to biodiversity studies, the IP-G2 and IP-S subsets include very few references to nonhuman species (Figure 58). In the IP-G2 subset, the most frequent topic referring to nonhuman subjects is *Plants*, which is in the range of places 78 to 99^{lix} with only 3 occurrences; similarly, in the IP-S subset, the most frequent one is *Ornithology*, in place 43 with 6 occurrences. Thus, these numbers suggest that, in subsets concerning the Indigenous peoples of what we call Latin America, the focus of attention is not necessarily nonhuman biodiversity but Indigenous

peoples themselves, who, to a certain extent, “substitute” nonhuman species as *objects* of study.

Furthermore, the mere incorporation of Indigenous groups in subject lists—while we would never find, for example, a material labelled being about *Europeans*—is in itself a colonial move that emphasizes the alterity of Indigenous peoples and the epistemic colonization of human and nonhuman subjects.

Words	Frequency	Words	Frequency
America	225	Indians	59
Indians	204	history	30
South	144	language	22
history	116	natural	21
natural	90	travel	21
Mexico	77	Mexico	18
travel	66	field	18
Peru	57	note	18
Description	53	Mapuche	17
Brazil	47	art	16
River	34	Anthropology	15
Early	32	Description	15
Valley	32	mayan	15
antiquity	32	Archaeology	14
Imprint	31	Chile	14
Latin	28	Carib	13
Amazon	25	Geology	13
account	25	linguistics	13
Discovery	22	America	12
exploration	22	Imprint	12
language	22	indian	12
Central	19	Antilles	11
work	18	Apalachee	10
Indies	13	Indies	10
West	13	Lesser	10
indian	11	West	10
Chile	10	antiquity	10
linguistics	10	etc	10
Argentina	9	glossary	10
Pottery	8	vocabulary	10

Figure 58 The 30 most frequent terms in the subject lists in subsets IP-G2 (left) and IP-S (right). Generated on KH Coder 3 in December 2021 and January 2022 respectively. Data from <https://www.biodiversitylibrary.org/data> as of July 1, 2021.

In addition to subject trends and co-occurrence, it is worth noting that the IP-S subset is the most dominated by the Global North in terms of knowledge production and by English in terms of language of publication amongst all subsets discussed in this dissertation. All 129 non-unique title

IDs in the IP-S subset were published in Europe and the US, and more than half of the subset (75 records, 58.14%) is in English (Figure 59). Therefore, despite the apparent specificity of the subjects included in it (versus the homogenizing nature of the terms in the IP-G and IP-G2 subsets), the IP-S subset is the only one analyzed in this chapter with no materials in Spanish and where the knowledge production occurs *exclusively* in the Global North.

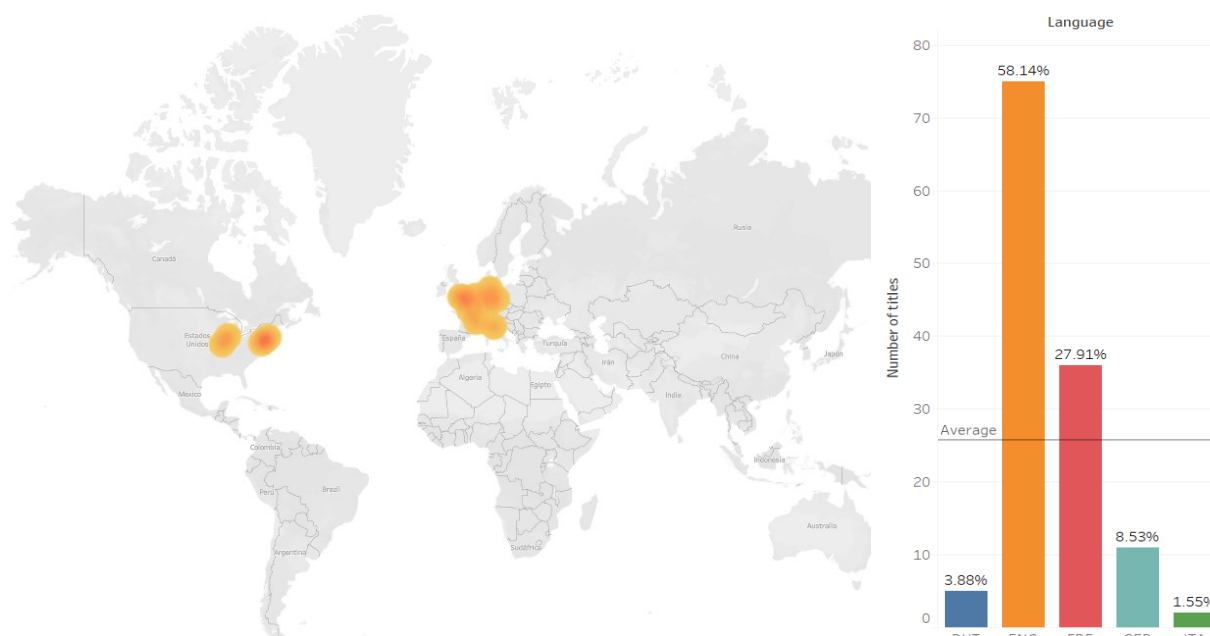


Figure 59 Map showing places of publication (density per number of records) (left) and graph showing language frequency (right) in the IP-S subset. Generated on Tableau in January 2022. Data from <https://www.biodiversitylibrary.org/data> as of July 1st, 2021.

Although the use of subjects that specify certain Indigenous groups could potentially mean a move against colonial homogenization of Indigenous peoples, a closer look at the metadata and the presence of these terms, as well as patterns of publication, brings us back to the, by now, very familiar dominance of the Global North as centre of epistemic production and the Global South and Indigenous peoples as objects of study in BHL's collections. Additionally, these findings suggest that Indigenous peoples are considered an object of study alongside nonhuman species, further highlighting the intertwined (hi)stories of colonial oppression of the Indigenous and nonhuman Others, which continues to be fostered and communicated through BHL's catalogue.

Archival curation, especially when working with metadata protocols for international use,

requires following clear standards that make information comprehensible for different communities and systems; nevertheless, as shown by this chapter's findings, standardization of information, knowledge, and metadata can lead to decontextualization and the loss of specificity. While standards are necessary, they need to be framed in a plural light. Institutions have the responsibility to reassess and expand previously established standards toward cultural and epistemic plurality. This responsibility does not mean the suppression of standards but the reframing of practices, the flexibility of curatorial and archival principles, and the establishment of bio-diverse categories and models (Christen 193). What is essential, then, is not only to acknowledge and address the colonial legacies of archival collections—as BHL itself does in their *Acknowledgement of harmful content*—but also of archival practices, to go beyond colonization as occupation and think of colonization as a “displacement” of Othered “epistemologies and ontologies” (Risam, ‘Decolonizing the Digital Humanities in Theory and Practice’ 79). It is fundamental to understand and recognize that “archives have long been imperial projects” (Cushman, ‘Wampum, Sequoyan, and Story: Decolonizing the Digital Archive.’ 118), and that, therefore, the very categories, classifications, and curation protocols they follow are rooted in historical imperial colonial practices, beginning with fundamental categories such as that of *author*. Digital archives, even those aiming for decolonization, still carry “the instrumental, historical, and cultural meanings” behind their collections (Cushman, ‘Wampum, Sequoyan, and Story: Decolonizing the Digital Archive.’ 116). In this sense, for example, even if the category of *author* is standard and cannot be eliminated without consequences for interoperability, access, and usage, its often-colonial ties can be at least partially counteracted by the inclusion of new or less standard categories, such as *notes*, and the critical rethinking and annotation of other equally standard categories, such as *subjects*, as has been argued throughout the examples in this section. Moreover, BHL requires diversification of its collections and, especially, of its partners, to ensure the active participation of otherwise marginalized communities, such as Indigenous

peoples. Including them in the process of collection and curation can lead to a more diversified representation of human and nonhuman groups, thus counteracting the current colonial biases of the Library's catalogue. Because of the colonial background of many artifacts, archives need to recontextualize their materials from a plural perspective, a vital practice in the path towards the decolonization of archives, especially concerning the inclusion of colonized, oppressed, and silenced (hi)stories, so that the decolonial digital archive can be truly sympoietic and bio-diverse.

3.6 Diversifying Collections: The (De)Colonial Metadata (Hi)Stories of BHL México

The metadata extracted thus far from BHL's catalogue, unfortunately, prove that the (hi)stories of Latin America told by the Library's collection reproduce a colonial narrative that spreads throughout all layers of archival storytelling. Nonetheless, as I have argued in previous chapters, metadata can also prove that global partnerships are a strong strategy to transcend the subject-object binary between the Global South and North, and to achieve decolonial diversification, both in terms of the collections and access to materials. Such is the case of materials about Mexico in BHL.

A significant portion of the materials about Mexico in BHL is contributed to its collection through the BHL México project, and, as a result, the metadata of records that include the subject *Mexico* in their subject lists (Mexico subset – MEX)^k show significant diversification in comparison to the other subsets analyzed thus far, especially regarding places of publication and language distribution. In terms of knowledge production, in the MEX subset, Mexico City is, by far, the most frequent place of publication, with 872 out of 2989^{li} non-unique title IDs, that is, 39.65% of the subset (Figure 60). This means that the MEX subset is the only one included in this chapter where the most frequent place of publication is not in Europe or the US and is located in the same country that is included as subject.

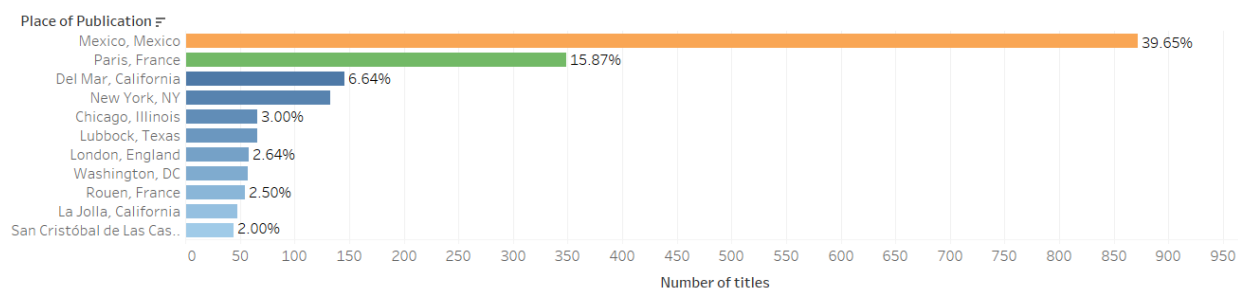


Figure 60 Places of publication (non-unique IDs) in the MEX subset with more than 33.32 records (subset average). Generated on Tableau in January 2022. Data from <https://www.biodiversitylibrary.org/data> as of July 1st, 2021.

Such an important presence of Mexico in the geographical affiliations of these texts posits the country not only as an object of study but, especially, as an agent of knowledge production, particularly of local knowledge production, meaning that Mexico is no longer “tak[ing] on secondary roles” (Chan 14). Moreover, this subset includes several cities in Mexico: Jalapa, Morelia, Puebla, and San Cristóbal de las Casas. Even though these places of publication have very few records published, their appearance in this subset hints at the diversification of the *local*, especially where Mexico is the main place of publication in this subset.^{lxii} Thus far, and as previously explained, I have been referring to locality greatly in terms of *nation*, mainly because this is also the unit of metadata categorizations. Nevertheless, it is fundamental to consider the issues and nuances of *locality*.^{lxiii} Going back to the example of Panama explained previously in this chapter, while places of publication in Panama include locations such as Ancón, Balboa, and Panama City,^{lxiv} the country continues to be greatly reduced to the Panama Canal, thus constraining and limiting local diversity. In the case of materials about Mexico in BHL, however, the shortcomings and colonization of the concept of *nation* are in part transcended by the pluralization of the *local* alongside the importance of the country as a producer of knowledge, that is, by promoting and representing knowledge production beyond the center of the *nation* and with a focus on locally marginalized regions and communities. Thus, the decentralization of the *global* (i.e., the epistemic agency of the Global South) can also lead to the decentralization of the *local* (i.e., the epistemic agency of diverse communities inside the *nation*), conducting, in turn, to the decolonization of the representation of *place* as a whole.

While I have been considering place of publication as a fundamental category to measure the role of *nations* in networks of knowledge production, at this point, it is essential to avoid romanticizing global partnerships and look beyond those places of publication. For instance, while the MEX subset includes somewhat unexpected places of publication that diversify the local, the holding institutions of these materials tell a different story. In this subset, the Global North continues to dominate the *ownership* of knowledge (as explained in Chapter 2 of this thesis), as seen when considering the holding institutions of these records (Figure 61). For instance, the materials published in Jalapa and Puebla are, in contrast, held and contributed to BHL by Harvard University Botany Libraries, while the three materials published in Morelia are held and contributed by the Francis A. Countway Library of Medicine, the McGill University Library, and the Smithsonian Libraries respectively. Therefore, the metadata of the MEX subset reveal that almost all materials published in Mexico and held and contributed by Mexican institutions were published in Mexico City, while those published in other parts of the country are held by US and Canadian institutions, thus debunking the apparent decentralization of the *local* highlighted before and even questioning the status of Mexico as an epistemic agent, as it seems to still be subordinated, at least in part, to the legitimization of institutions in the Global North.



Figure 61 Places of publication and holding institutions of materials in the MEX subset published in Mexico. Generated on Tableau in January 2022. Data from <https://www.biodiversitylibrary.org/data> as of July 1st, 2021.

The one exception is the journal *Ecofronteras*, published in San Cristóbal de las Casas, Chiapas, and held and contributed to BHL by El Colegio de la Frontera Sur (ECOSUR) in Mexico.^{lxv}

Interestingly, ECOSUR has facilities in Campeche, Chetumal, San Cristóbal, Tapachula, and Villahermosa, all located in southeastern Mexico. These cities are simultaneously characterized by the highest rates of poverty (Consejo Nacional de Evaluación de la Política de Desarrollo Social) and the largest concentrations of Indigenous communities in the country (Comisión Nacional para el Desarrollo de los Pueblos Indígenas and Programa de las Naciones Unidas para el Desarrollo)^{lxvi} as well as an outstanding cultural and biological diversity (ECOSUR). Thus, with this geographical focus, ECOSUR is a case of decentralization of the local in its promotion of knowledge production in and from one of the most marginalized regions in Mexico, also connected to Indigenous cultures. Furthermore, because El Colegio de la Frontera Sur is part of the group of institutions led by CONABIO and participating in BHL México, this local decentralization intertwines with global decentralization. In this sense, ECOSUR and the inclusion of *Ecofronteras* in BHL are remarkable examples of how diversified representation on both the local and global levels can be part of the Library's collections and influence one another.

Nevertheless, and despite the value of this case, the contributions of ECOSUR are again blurred behind the overwhelming dominance of the Global North as a centre of epistemic legitimization. As has been argued before, the local knowledge production from the Global South—in this case, Mexico—is overshadowed by the establishment of the Global North—in this case, the US and Canada—as a necessary middle point between said production and the *global* digital scene. In BHL, while Mexico could be considered an epistemic agent regarding the knowledge production it contributes to the Library's catalogue, its role continues to be subordinated to that of the Global North, preventing Mexico from being the *holder* and *owner* of the epistemic production about her own biodiversity, particularly from a decentralized local perspective.

The epistemic power of the Global North and the centre is also present in the MEX subset in its language distribution. As is the case of all subsets analyzed here, the MEX subset is dominated by English, with 1131 non-unique records (43.14%) in this language (Figure 62). However, although English continues to be the most frequent language of publication, the MEX subset also shows a significantly higher number of materials in Spanish (941 non-unique IDs, 35.89%), with the difference between the two languages being considerably smaller than in other subsets (Figure 63). Therefore, at least to a certain extent, the meaningful presence of Spanish in materials about Mexico—which are part of both the BHL México project and the collection *Publicaciones en español*—counteracts the English dominance found throughout BHL’s collections (as discussed in Chapter 1 of this thesis) and evidences some of the benefits of diversified global partnerships.

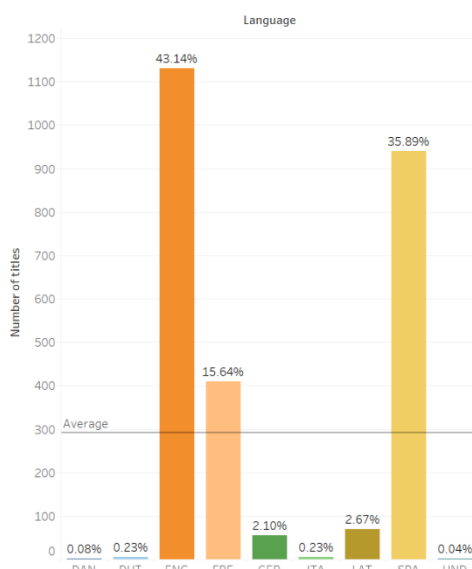


Figure 62 Language frequency of materials (non-unique IDs) in the MEX subset. Generated on Tableau in August 2021. Data from <https://www.biodiversitylibrary.org/data> as of July 1st, 2021.

Subset	Total number of records (non-unique)	Records in English	Records in Spanish	% in English	% in Spanish
Great Regions (GR)	4465	1316	247	29.47%	5.53%
Latin American Countries (LAC)	6801	2613	1087	38.42%	15.98%
Indigenous Peoples – General (IP-G)	1052	273	66	25.95%	6.27%
Indigenous Peoples – Specific (IP-S)	135	75	0	55.56%	0.00% ^{lxvii}
Mexico (MEX)	2989	1131	941	43.14%	35.89%

Figure 63 Frequency of English and Spanish in the GR, LAC, IP-G, IP-S, and MEX subsets. Data from <https://www.biodiversitylibrary.org/data> as of July 1st, 2021.

Moreover, it is important to note that the substantial presence of Spanish as a fundamental language of publication in the MEX subset is only true for non-unique IDs. On the contrary, when considering unique IDs only in this subset, the gap between English and Spanish increases dramatically, showing an overwhelming predominance of the former at 66.97%, well above the 9.78% of the latter (Figure 64). Given that many of the materials contributed through BHL México and CONABIO are periodicals—CONABIO’s journal *Biodiversitas* and the previously mentioned *Ecofronteras* being amongst the most numerous publications—the difference in language distribution when considering unique and non-unique IDs further strengthens the hypothesis that linguistic diversification in the MEX subset is strongly related to the BHL-CONABIO partnership. This argument is equally sustained by the fact that almost all materials published in Mexico are also written in Spanish and none of them are in English.^{lxviii} Thus, the diversification of BHL’s collection proves to be deeply related to the diversification of its global partnerships, the BHL México project being a case in point.

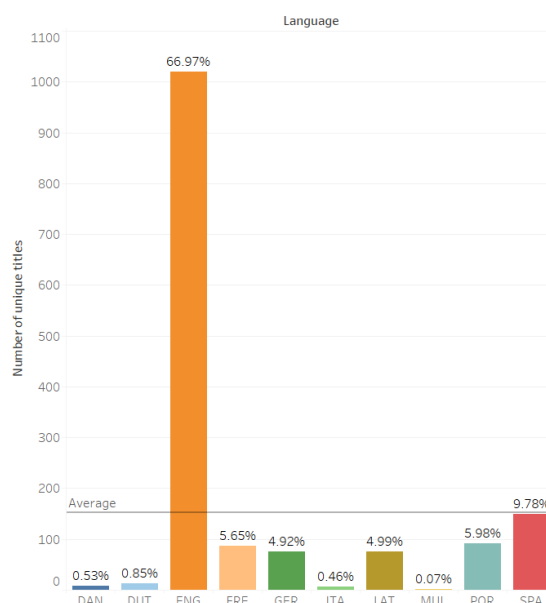


Figure 64 Language frequency of materials (unique IDs) in the MEX subset. Generated on Tableau in August 2021. Data from <https://www.biodiversitylibrary.org/data> as of July 1st, 2021.

As mentioned at the beginning of this section, all layers of metadata intertwine to tell the (hi)stories

of *place* present in BHL and, in the case of materials about Mexico, also provide clear evidence of the worth of BHL México in the decolonization of the representation of the country. This is particularly true for the category of year of publication. As mentioned in my discussions about *Bertholletia excelsa*, the representation of the Global South in BHL and other digital and non-digital archives freezes former colonies in their colonial past, preventing them from participating in *present* networks of bio-diverse knowledge production: “the ‘other’ is excluded from participation in the construction of a world in common by being rendered part of a past in the process of being overcome by mechanisms of modernity initiated independently of that participation” (Bhambra 55). On the contrary, BHL México has allowed for the decolonization of these discourses by making room for past but also present local bio-diverse (hi)stories as a result of the participation of Mexican institutions. For instance, the yearly distribution of materials in the MEX subset shows important peaks of publications since the 19th century and especially towards the 21st century. Similarly, the yearly distribution of languages shows an almost parallel development of knowledge in English and Spanish from the 1990s onward (Figure 65).

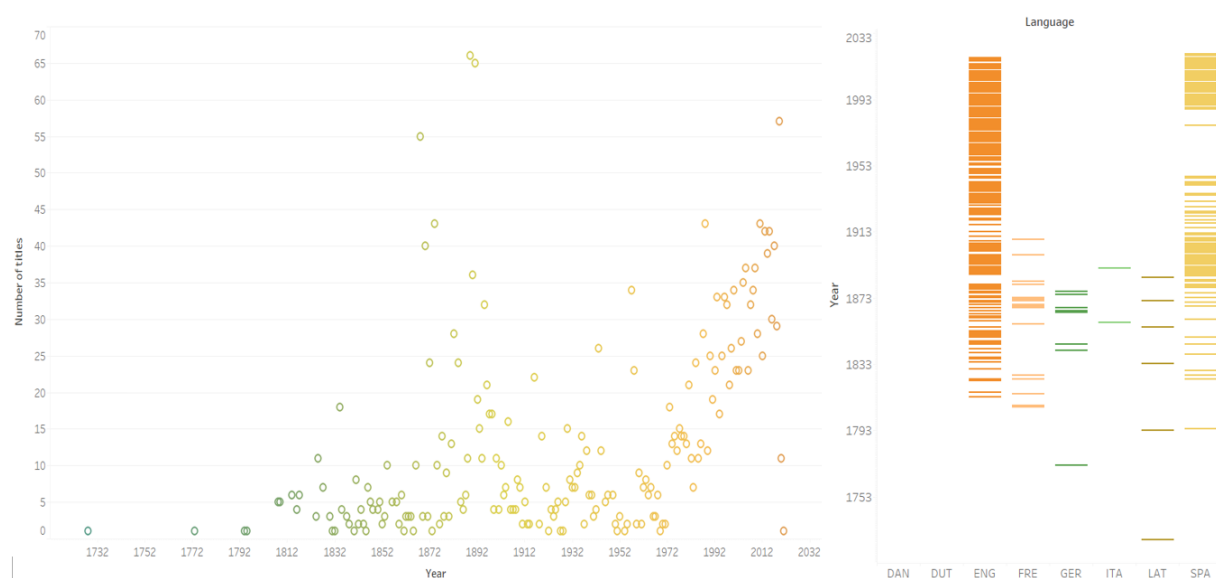


Figure 65 Yearly distribution (left) and publications per language per year (right) of records in the MEX subset. Generated on Tableau in January 2022. Data from <https://www.biodiversitylibrary.org/data> as of July 1st, 2021.

Finally, records published in Mexico and San Cristóbal de las Casas are precisely those that more abundantly appear in the 21st century, meaning that these are the publications generating a strong *present* representation of Mexico in bio-diverse knowledge production (Figure 66). The important presence of such publications contrasts with cases such as that of Panama, as previously explained, where the representation of *place* is constrained by geographical, temporal, and political (neo)imperialism. Unlike records about Panama in BHL, materials published in Mexico City seem to be more accurately telling the (hi)stories of the country, since they arguably present the steadiest publication pattern, from the 1820s—the period of independence and nation-building in Mexico—until today.

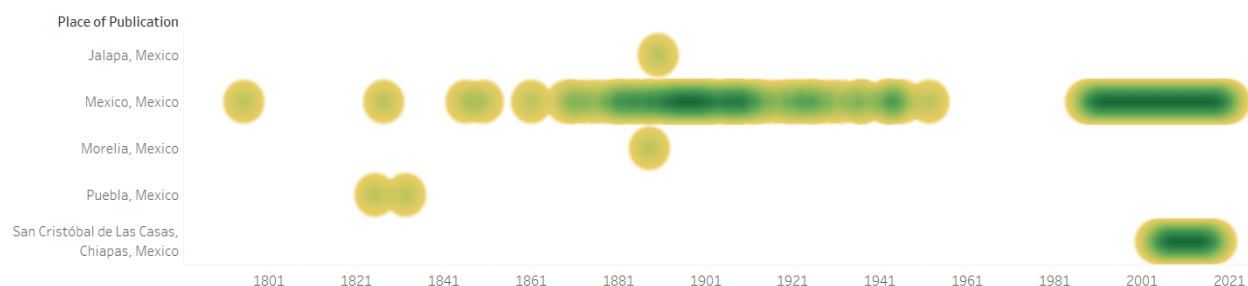


Figure 66 Density of publications per year per place of publication of materials in the MEX subset published in Mexico. Generated on Tableau in January 2022. Data from <https://www.biodiversitylibrary.org/data> as of July 1st, 2021.

Additionally, records published in Mexico from 1988 to the present are *all* published, held, and contributed to BHL by three BHL México partners, UNAM's Instituto de Ecología (INECOL), CONABIO, and ECOSUR. Moreover, most of these publications are issues of INECOL's annual publication *Flora del Bajío y de Regiones Adyacentes* and journal *Acta Botánica Mexicana* as well as CONABIO's *Biodiversitas* and ECOSUR's *Ecofronteras*. In this sense, the representation of Mexico as a current site of knowledge production about Mexican biodiversity seems to be strongly related to the meaningful incorporation of periodicals associated with BHL México.

Despite the invaluable presence of these journals in BHL and the MEX subset, they also reveal a certain constraint in terms of local knowledge production. For instance, there is a clear gap in publications in the MEX subset published in Mexico between the 1950s and the 1980s. Given

that the most recent publications in the subset all belong to the four mentioned journals, knowledge production from Mexico in the MEX subset in the late 20th and early 21st century is restricted to INECOL, CONABIO, and ECOSUR. In this regard, while the MEX subset highlights the benefits of BHL's global partnerships, it reminds us of the importance of *local decentralization*, as was the case of the Archivo Histórico Casa de Morelos [Historical Archive House of Morelos] explained in Chapter 1 of this thesis.^{lxix} As in this case, perhaps the participation of more local institutions in the BHL México project would benefit the (hi)stories of Mexico (re)told in BHL and fill in gaps such as the one found in the MEX subset in the mid-20th century.

Its shortcomings notwithstanding, the important presence of Mexico in *current* bio-diverse knowledge production in BHL is the result of the production and contributions of BHL México partners. Their participation in building the Library's collection counteracts colonial temporality, emphasizes the importance of local diversity, and challenges global epistemic power relationships. Given all the layers of (hi)stories revealed by the metadata of the MEX subset, it is possible to conclude that BHL México, despite its shortcomings, has greatly contributed to the diversification and decolonization of the representation of Mexico in the Library's collections, from the country's position as an epistemic centre to her avenues for local and global decentralization to her role as the storyteller of her own past and present narratives.

As has been argued throughout this dissertation, every layer in the storytelling machine that are digital archives matters^{lxx} for the diversification and decolonization of human and nonhuman (hi)stories and the establishment of the archive as a CRSEUoB in the Anthropocene. In the case of the MEX subset, epistemic diversification and decentralization, as well as the significance of Mexico as a site of knowledge production, drive a sympoietic network of intraspecies relationships by bringing about diversification of topics and human and nonhuman subjects. For example, when comparing the co-occurrence network of the Mexico (MEX) subset to that of other subsets, such as

the Central American Countries (CAC) subset analyzed before, it is possible to note that the former presents an arguably more diversified network of subjects (Figure 67). The MEX subset shows a wider variety of geographical regions and of nonhuman species and groups: the words *Ornithology*, *plant*, *Botany*, *bird*, *Reptiles*, *Herpetology*, and *Mammalogy* are among the most frequent terms in materials about Mexico, all of them with frequencies between 49 and 118, a trend that greatly contrasts with the patterns found in other subsets, particularly those concerning Indigenous peoples (IP-G, IP-G2, IP-S).

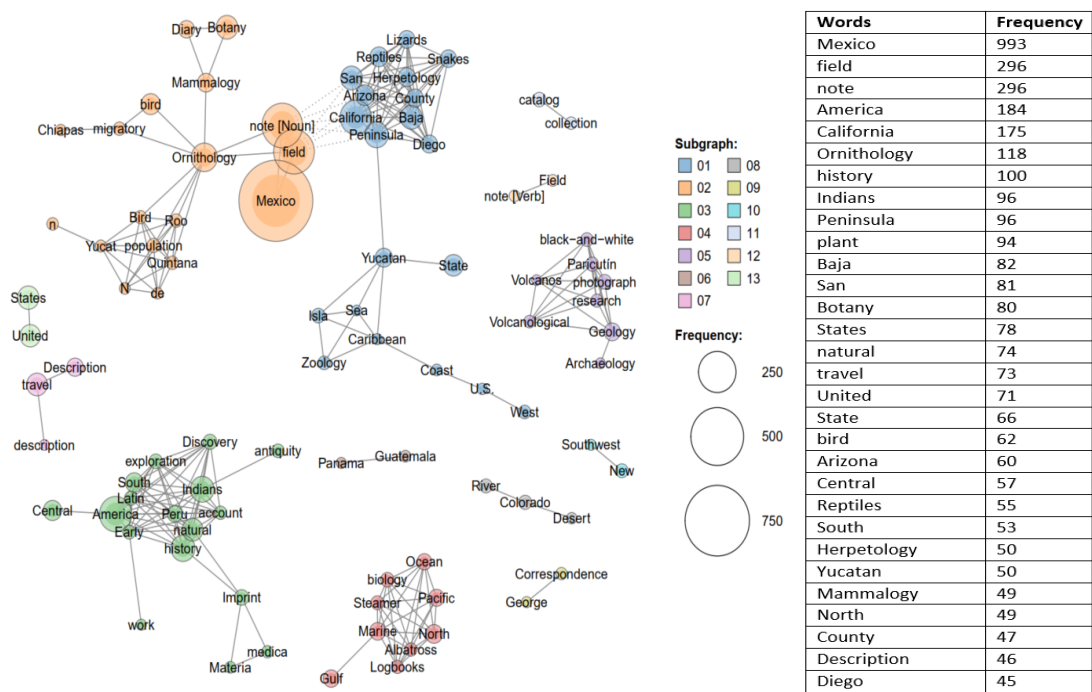


Figure 67 Co-occurrence network (left) and 30 most frequent words (right) in the MEX subset. Generated on KH Coder 3 in September 2021. Data from <https://www.biodiversitylibrary.org/data> as of July 1st, 2021.

It is important to note, however, that the subjects in this network are still deeply engrained in colonization. Perhaps the most obvious example is subgraph 03, which evidences the colonial nature of many materials in the MEX subset as it includes subjects related to Indigenous peoples and colonization. Likewise, the word *Indians* still appears in the top-10 most frequent words in this subset, with 96 occurrences, often as part of the subjects *Indians of Mexico*, *Indians of South America*, *Indians of North America*, and *Indians of Central America*, thus carrying the problematic understandings

of Indigenous peoples explained in the previous section of this chapter. Nevertheless, the significant variety of nonhuman subjects that appear in the MEX subset hint, perhaps, to a more diversified understanding of Mexican biodiversity and more intertwining intraspecies (hi)stories unfolding in BHL's catalogue, a pattern completely absent in subsets focusing on Indigenous peoples.

In addition to nonhuman variety, the co-occurrence network of materials about Mexico suggests a break, at least partial, from (neo)imperial representation. For instance, while subjects and locations related to the United States are still present (subgraphs 01, 03, and 08), their connection to the subject *Mexico* itself is less strong than in the case of the CAC subset and the subject *Panama* (Figure 38 in section 3.3) and seems to be more related to a variety of nonhuman subjects and biodiversity-related disciplines. Moreover, the term *United States* itself constitutes an independent subgraph (subgraph 13) that does not overlap with the others, pointing to a less robust presence of the US in materials about Mexico in BHL. Thus, I continue to argue that a more solid, profound, meaningful, and critical strategy for the establishment of BHL partnerships throughout the Global South can lead to the decentralization of the representation of *place* and to a truly global, open, decolonial, and bio-diverse BHL, that is, to a collection that follows the CRSEUoB model, deeply in line with the Library's goals and mission.

I acknowledge it is not an easy task to diversify archival collections and re-understand and restructure metadata; however, these are fundamental moves in epistemic decolonization. Such a decolonial stance must begin with the realization that metadata can be “both static and dynamic” (Brody 35) and “require[s] an increased awareness of the complexity of creating knowledge and object surrogates” (36), especially when the goal is to create an archive rooted in a CRSEUoB. Metadata patterns remind us that digitality and technology are not neutral and the “ethical concerns” around metadata practices “are socio-technical in nature” (37). Questioning, restructuring, and, in sum, decolonizing collections, subject categories, and other metadata practices “are social justice

issues” (Farnel et al. 13), as also advanced by the existential utopia this thesis proposes. Digital and other libraries and archives “define what can be electronically expressed and digitally articulated” (Ernst 42) and the technology they employ “enable[s] a different logic of remembrance, one that transforms the classical notion of memory from within” (43). The creation and housing of memories in archives, therefore, determine “subsequent affordances and possibilities of use and interaction” (Sutton 44), meaning that the biases of the archive translate into biased memories. For instance, the memory of *place* revealed through the metadata of BHL shows that, as told by this archive, the memory of Panama is the memory of (neo)imperial practices and the overwhelming economic, political, and epistemic power of the United States in Latin America and the memory of *Bertholletia excelsa* is the memory of British colonization across the Global South. In contrast, the same metadata communicate a memory of Mexico that engenders hope for a storytelling machine that makes room for diverse (hi)stories of *place*: global and local, central and peripheral, multilingual, (de)colonial, human and nonhuman; in sum, a cyborgian, rhizomatic, and sympoietic storytelling machine for the (hi)stories of the *anthropos* in the Anthropocene.

Notes for Chapter 3

ⁱ All data for the analyses in this chapter are as of July 1st, 2021, except where otherwise indicated.

ⁱⁱ For more explanations about the national meanings of biodiversity, see the Introduction to this thesis. For more explanations about biodiversity as heritage and its relevance for BHL, see Chapter 1 of this thesis.

ⁱⁱⁱ For more explanations about the relationship between *nation* and climate change and other phenomena, see the Introduction to this thesis. For more explanations about efforts to counteract climate change and protect biodiversity, see my discussion of EnBioMex and the Aichi goals in Chapter 1 of this thesis.

^{iv} From here on, I use the broader term *place* to refer to different entities that more often than not align with the concept of *nation*.

^v This part of the process was performed mostly through custom SQL on Microsoft Access.

^{vi} As part of its open access stance, all of BHL's data is available in different formats on their online database website (Biodiversity Heritage Library, www.biodiversitylibrary.org-/data/). Additionally, these data are updated on a monthly basis. For this chapter, I employed the files creator.txt, subject.txt, and title.txt (as of July 1st, 2021) to extract all data employed in my analyses.

^{vii} I extracted these data, built these subsets, and began my metadata analyses during an internship with BHL in the summer of 2021 under the supervision of Program Director Martin Kalfatovic. As part of this internship, all the extracted metadata—spreadsheets (.xlsx) containing all records in each subset—are available online through BHL's GitHub: <https://github.com/gbhl/bhl-us-data-sets/tree/master/Metadata-LatinAmerica>. These files are also available as comma-separated values files (.csv) through my personal GitHub: <https://github.com/LidiaPV/BHL-Thesis>

^{viii} Number of records in each subset out of the 166,339 titles contained in BHL as of July 1st, 2021. Total numbers for these subsets include non-unique ID records, meaning that the numbers, volumes, or issues of periodicals are considered individually, even if they share the same titleID.

^{ix} Percentage of the entire BHL collection (see previous note) that each subset represents. Together, all subsets make up 9.2832% of the Library's collection, meaning that under 10% of BHL's materials are dedicated to topics related to Latin America as understood in this thesis.

^x These numbers are for unique IDs, meaning that the numbers, volumes, or issues of periodicals are conflated into their shared title ID and counted as a single record. See note vii above.

^{xi} List of subjects used as filters to extract records for each subset. Latin American-related subjects were selected manually from BHL's subject data file (Biodiversity Heritage Library, www.biodiversitylibrary.org - /data/). Each record in a subset includes one or more of the listed subjects in their subject lists.

^{xii} I do not include the subject *Mexico* in the Latin American Countries (LAC) subset and treat it as a separate subset given that a large portion of materials about Mexican biodiversity in BHL comes from the BHL México project. Thus, considering these materials as a separate subset can illuminate the impact of global collaboration in the diversification of the Library's collection, as explained in the final section of this chapter.

^{xiii} This subset is built around subjects that refer to Latin American Indigenous peoples in generalizing/homogenizing terms. Although of a different nature, the subjects *Aztecs* and *Incas* are also included in this subset as they refer to the Indigenous empires that existed at the arrival of European colonizers in the Americas but that no longer exist and were conglomerates of several Indigenous groups of these regions. I recognize that several groups, such as the Indigenous

communities of Huilloc, Rumira-Sondormayo, Patacancha, and Challwacocha (‘Visión – Inkas Vivientes’), still identify as Inca descendents. However, a manual revision of materials in BHL that include the subject *Inca* revealed that this subject refers indeed to the pre-Columbian Inca Empire and not to modern-day Inca descendents.

^{xiv} The process of extraction for the IP-S subset was through an SQL query to extract all subjects listed in BHL’s database that included the word *Indian(s)*. The resulting list was reviewed manually to select Indigenous peoples roughly located in the region we call Latin America. The use of the word *Indian* in these subjects is further discussed later in this chapter.

^{xv} I cleaned the extracted data directly on Microsoft Excel, separating values by punctuation and manually replacing terms that needed modernization and/or translation. I base all translations from Latin on the *Latin Place Names* database of the Rare Books and Manuscripts Section of the Association of College and Research Libraries (Rare Books and Manuscripts Section). Additionally, I employed Microsoft Excel’s geographical data identification to obtain coordinates (longitude and latitude) for each place of publication included in the subsets. Finally, I manually added coordinates for locations that were not accurately identified by Excel.

^{xvi} Although beyond the scope of this analysis, the need to translate the names of *places* into English for software readability highlights yet another instance of Anglocentric (geo)politics in digital technology.

^{xvii} I consider the place of publication of a record as a rough indicator about where knowledge production takes place. I recognize, however, that this can be a simplistic approach, as it does not contemplate all actors, places, relationships, individuals, and dynamics that contribute to knowledge production. I especially recognize that not including, for example, the origins and background of authors leaves out a great portion of a record’s (hi)stories, which should be explored

in future work around these collections. Nevertheless, given that the main focus of my analysis is metadata—which already require great simplification of a material’s paths—I consider the field of place of publication as a fundamental indicator of important geopolitical associations of the records contained in BHL. The category of place of publication in metadata is geopolitically charged and communicates “the place associated with the publication, release, or issuing of a resource document” (Haider) and, therefore, the main *places* associated with the knowledge production the record contains.

^{xviii} Considering that there were 166,339 titles contained in BHL as of July 1st, 2021, the LAC subset represents about 4.09% of the entire BHL collection as of that date. See Figure 22 in this chapter.

^{xix} This lack of cross-Global South interaction in networks of bio-diverse knowledge also manifests in data on traffic trends, as mentioned in Chapter 1 of this thesis.

^{xx} I developed custom Google maps for most subsets discussed in this chapter during my internship with BHL in the summer of 2021. All Google maps are linked through a BHL blog series on metadata I wrote after this internship and that served as the basis for this chapter (Ponce de la Vega, ‘Understanding BHL Through Metadata’). The complete data for all subsets is available through BHL on GitHub (see note vii for this chapter).

^{xxi} This fact echoes my arguments regarding the issues of ownership in digital and non-digital archives highlighted in Chapter 2 of this thesis.

^{xxii} Blurry and abstract ... specific subjectivities and localities ... asymmetric character.

^{xxiii} Although beyond the scope of this thesis, it is important to note that translations make up a significant portion of the subsets included in this chapter and highlight yet another dimension of bio-diverse networks of knowledge production.

^{xxiv} This is precisely the kind of representation for which I argue throughout this thesis (see Chapter 2) as well as in my collaboration with the Biodiversity Heritage Library itself (Ponce de la Vega, *Closing Keynote: Decolonizing Strategies for an Equitable Biodiversity Heritage Library*).

^{xxv} As explained in the Introduction to this thesis, I employ a mixed-methods approach to BHL precisely as to find the gaps in the archive from different combined angles, that is to say, this approach allows for multiple ways of reading the archive and the texts it contains.

^{xxvi} These are the main forms of access that web analytics services consider as direct traffic (Similarweb; Google Analytics).

^{xxvii} Domain Rating (DR) is a measure of “the strength of a website’s backlink profile compared to the others in [a] database on a 100-point scale” (Ahrefs, ‘What Is Domain Rating (DR)?’). It considers a website’s inbound and external links as well as the authority of such linking domains (*ibid.*). In general terms, the higher the DR, the more authority the site holds.

^{xxviii} It is important to note that the DR is relative in nature, which means it only speaks to the authority of a website when it proves to be “higher than or comparable to similar sites” (Ahrefs, *Website Authority Checker*). For comparison, CONABIO’s biodiversity website has a DR of 66 on Ahrefs and 68 on Moz, while its social media platform, NaturaLista has a DR of 52 on Ahrefs and 54 on Moz.

^{xxix} I am referring to the two main websites compared in Chapter 1 of this thesis: www.biodiversitylibrary.org (BHL) and www.biodiversidad.gob.mx (CONABIO). See also Appendix.

^{xxx} I personally collaborated with BHL’s Digital Collection Manager Bianca Crowley on this Acknowledgement during an internship under the supervision of Program Director Martin Kalfatovic in the summer of 2021.

^{xxxix} These three tools are common methods in text mining and visualization. In KH Coder 3, word frequency lists present all words in a document in descending order (from most frequent to least frequent), indicating the number of occurrences of each word. Co-occurrence networks are tree-like structures to visualize relationships between words based on the frequency in which they occur together in a document, i.e., based on co-occurrence. Hierarchical clustering is a method to group words in clusters based on their association and co-occurrence in a given document.

^{xxxix} Given that these subsets were created with the sole purpose of identifying patterns in subject lists and to avoid repetition of identical subject lists, only unique IDs were considered.

^{xxxix} Like the MEX subset (see note xii for this chapter), *Brazil* was treated as a separate subset given that a large portion of materials about Brazilian biodiversity in BHL come from BHL SciELO project.

^{xxxix} I first developed and analyzed my findings around the case of Panama during my internship with BHL in the summer of 2021 (Ponce de la Vega, “The Geopolitics of Metadata”).

^{xxxix} Frequencies generated on KH Coder 3 do not contemplate compound words. However, compounds can be identified intuitively. For example, the words *field* and *note* have the same frequency and appear together—*field note*—in all instances in the subjects lists of this subset, as was verified by manually looking at word contexts in KH Coder 3. The same is true for *Costa Rica* (99 instances) and *Barro Colorado* (61 instances). Additionally, most instances of *United* appear in the compound *United States* (67 out of 68), most instances of *behavior* appear in the compound *Animal behavior* (49 out of 52), and most instances of *Canal* appear in the compound *Canal Zone* (41 out of 44)—the remainder being in *United Kingdom* (1 out of 68), *Ant behavior* (3 out of 52), and *Panama Canal* (3 out of 44) respectively.

^{xxxix} The terms in this table were adjusted to include frequencies for compound terms (see

note xxxv above). Additionally, the compounds *Panama Canal* and *Canal Zone* were included as a single term for they refer to very similar concepts and are relevant to the rest of the arguments included in this chapter.

^{xxxvii} The one exception is Dr. William Mark Whitten's Ph.D. thesis (1985) at the University of Florida (Whitten).

^{xxxviii} The affiliations of these expeditions vary but are mostly associated with academic and research institutions throughout the United States, such as the New York Botanical Garden and Harvard University, and government dependencies, such as the US Navy and the US Department of Agriculture.

^{xxxix} The other two were field notes published prior to the 20th century. In this regard, it is notable that out of the 16 materials in the PAN subset published prior to the 20th century, only six are affiliated with the US: four published in New York and the two field notes referred to in this note. The contrast between these numbers and the prolific production of the US in the 20th century supports the hypothesis of the US-centrism of materials about Panama in BHL by showing a decrease in the interest in biodiversity that parallels the decrease in economic and political interest in the country.

^{xl} I am referring here to the Smithsonian Tropical Research Institute's *Panamá, puente biológico: Las Charlas Smithsonian del Mes*. These talks took place between 1996 and 1999 and were published in 2001.

^{xli} Missing fields for language in the PAN subset were mostly for albums and field notes. These fields were filled by manually revising the language of notes, comments, introductions, and/or descriptions and captions for images or photographs, which were all in English.

^{xlii} This is the one material affiliated to the STRI in the PAN subset that is not written in

English, meaning that almost all materials affiliated with the STRI are in this language. See note xl above.

^{xliii} BHL offers the possibility of searching and downloading metadata of materials in its catalogue by scientific name. The search results discussed here are as of January 2022. The complete file is available on my GitHub: <https://github.com/LidiaPV/BHL-Thesis/blob/main/Bertholletia%20excelsa.csv>

^{xliv} I am referring to the *Diccionario de botanica brasileira; ou, Compendio dos vegetaes do Brasil, tanto indigenas como acclimados* by Joaquim de Almeida Pinto (1873) and the *Boletim do Museu Paraense de Historia Natural e Ethnographia* (vol. 2, 1897), both of which include information about *Bertholletia excelsa*.

^{xlv} A full list of these records is available on my GitHub. See note xliii above.

^{xlvi} Given that materials contributed to BHL are locally curated, that is, have their metadata already assigned when incorporated to the Library, BHL would need to request the implementation of such changes by each partner institution or develop a system that allows for the changes to happen once the materials enter the Library's catalogue.

^{xlvii} These records were extracted utilizing the same methodology explained in previous sections of this chapter (see note v above).

^{xlviii} A full list of the subject lists of these records is available on my GitHub. See note vii above.

^{xlix} Data were cleaned to keep only subjects that include the word Indigenous in their subject list to refer to Indigenous peoples. Eliminated subjects include *Chinese indigenous pesticides*, *nonindigenous pests*, and *indigenous species*.

¹ See note viii for this chapter.

^{li} Includes combined occurrences of the term written with lower and uppercase: indigenous (9 occurrences) and Indigenous (8 occurrences).

^{lii} I recognize that this is the most optimistic scenario, but I suggest this interpretation of the journal's (hi)story as a means to exemplify all the (hi)stories and meanings that can potentially be communicated through metadata.

^{liii} I include here the most updated number of records as of the moment of writing (December 16, 2021). However, most of the rest of the data in this chapter are as of July 1st, 2021. See notes i and viii for this chapter.

^{liv} Archival decolonial projects have mainly changed metadata categories, incorporating culturally specific and contextual attributes that can be added and modified by the originating communities, such as the Plateau Peoples' Web Portal (Christen 194–207), sometimes creating a catalogue of exclusive use for the Indigenous communities, as is the case of The Zuni Collaborative Catalog (Boast and Enote 107–08). Similarly, these projects often revise copyright and access standards. For instance, in many Indigenous cultures, certain artifacts are of exclusive use for specific groups, such as elders, women, youth, etc. Therefore, establishing universal forms of privacy protection, copyright, and open access can threaten a community's cultural practices. Decolonial projects thus seek to adapt standards to respect the cultural and epistemic sovereignty of Indigenous peoples. This led, for instance, to the creation of "Traditional Knowledge (TK) Labels" by the Local Contexts organisation "to support Native, First Nations, Aboriginal, and Indigenous communities in the management of their intellectual property and cultural heritage specifically within the digital environment"(Local Contexts). These labels were used, for example, in a pilot project for the digitization of Maasai traditional culture (Wendland). Furthermore, some decolonial projects, particularly those undertaken directly by the Indigenous communities, like the Cherokee Stories and

Songs DVD archive (see Cushman, ‘Wampum, Sequoyan, and Story: Decolonizing the Digital Archive.’), have created multilingual and multi-experiential archives that arise from and respond to the specific cultural needs of multiple communities.

^{lv} A full list of the subject lists of these records is available on my GitHub. See note vii above.

^{lvi} The software used for the generation of the co-occurrence network (KHCoder3) considers the words *Indian* and *indian* (with upper- and lowercase) as separate terms.

^{lvii} These six titles are listed below by place of publication:

Bogotá, Colombia: *Memoria sobre la historia del estudio de la botánica en la Nueva Granada* (1860-1861) by Florentino Vezga.

Mexico: 1) *Historia de la Conquista de México* (1829) by Bernardino de Sahagún and Carlos María de Bustamante; 2) *Nomenclatura geográfica de México. Etimologías de los nombres de lugar correspondientes a los principales nombres que se hablan en la República* (1897) by Antonio Peñafiel; 3) *Teatro mexicano: Descripción breve de los sucesos exemplares, históricos, políticos, militares y religiosos del nuevo mundo occidental de las Indias* (1697-1698) by Agustín de Vetancurt; 4) *Colección de las antigüedades mexicanas que ecsisten en el Museo Nacional* (1827) by Isidro Rafael Gondra.

Rio de Janeiro, Brazil: *História de uma viagem feita á terra do Brasil* (1889) by Tristão de Alencar Araripe Júnior.

^{lviii} The same happens in occurrences of other subjects related to Indigenous peoples, such as *Indian art*, *Indian architecture*, *Indian baskets*, *Indian dance*, *Indian pottery*, etc.

^{lix} All terms in this range have 3 occurrences in the subset and are assigned their specific place alphabetically.

^{lx} This subset was introduced in section 3.2 of this chapter.

^{lxi} These 2989 records about Mexico make up 1.7969% of the entire BHL collection (166,339 titles) as of July 1st, 2021.

^{lxii} This local diversity is similar to what happens in the Latin American Countries – LAC subset as well as with Brazil in materials about *Bertholletia excelsa*. However, no Latin American country nor Brazilian city in these subsets is as dominant in terms of publications as Mexico is in the MEX subset. See sections 3.2 and 3.4 of this chapter.

^{lxiii} For instance, a flaw that I recognize in my research is the use of geocolonial frameworks of nation to refer to Indigenous peoples. As has been acknowledged by multiple researchers and scholars, the use of “European-defined geographic borders” to locate Indigenous peoples is, at best, “arbitrary and meaningless” (Bone and Loughheed 89), and, at worst, another instance of geopolitical colonization.

^{lxiv} The materials published in these cities were mentioned in section 3.3 of this chapter, including Marquís’s *Algunas palmeras industriales de la flora istmeña*, and are all in Spanish, thus highlighting how local diversity can aid in the broader diversification of the Library’s collection.

^{lxv} El Colegio de la Frontera Sur is a research centre affiliated to Mexico’s Consejo Nacional de Ciencia y Tecnología (National Council for Science and Technology, CONACyT). El Colegio de la Frontera Sur is a partner of BHL México.

^{lxvi} See note xxiii for Chapter 1.

^{lxvii} As mentioned in the previous section of this chapter, it is notable that the IP-S subset—along with its dichotomy between the Global South and North in terms of places of publication—is also the only subset with no materials in Spanish.

^{lxviii} Although there is one material (two issues) published in Mexico City and labeled as being in English in BHL (as of July 2021), this labelling is wrong and the record is, in fact, in Spanish. The

material in question is *Reseña sobre el cultivo de algunas plantas industriales que se explotan ó son susceptibles de explotarse en la República* (1884) by José C. Segura and Manuel D. Cordero.

^{lxix} This limited local diversification also echoes in the case of the Martín de la Cruz's *Libellus de Medicinalibus Indorum Herbis*, as explained in the conclusions of this thesis.

^{lxx} It is precisely in this importance that the use of a mixed methodology that tackles all layers of storytelling, as I propose in this dissertation, becomes essential.

The (Im)Possibilities of (De)Colonial (Hi)Stories

Conclusion

As outlined thus far in this thesis, digital archives of bio-diverse collections are multilayered storytelling mechanisms that represent the narratives of human and nonhuman subjects. In the case of the *Biodiversity Heritage Library*, these cyborgian, rhizomatic, and sympoietic (hi)stories exist at the levels of outreach and representation, intercultural partnerships and exchanges, and curation and annotation. These are the different components of BHL that I have explored throughout this dissertation and that constitute the key dimensions where the Library should focus to become a decolonial archive as delineated by each component of the CRSEUoB model. In this sense, I have focused on the (digital) (decolonial) archive as a storytelling machine that enacts the (re)telling of bio-diverse (hi)stories.

The shortcomings and challenges I have identified so far, point, at their core, to the still unfulfilled need to diversify BHL's collections, that is, its narratives. If the (hi)stories contained in the archive are exclusive to a specific human group, such constraints and biases will have an impact on every other layer of the storytelling process. As explored throughout this thesis, when exclusion, silencing, and marginalization characterize the catalogue of (hi)stories in archives, then exclusion, silencing, and marginalization permeate *all* dimensions of those archives, including but not restricted to dissemination, cultural and linguistic representation, inter, intra, and transnational relationships, inter and intraspecies relationships, and metadata standards.

Before concluding this dissertation, I would like to extend an invitation to close-read the texts contained in and, especially, absent from BHL to better understand the roots and—in a cycle of inclusion and exclusion—the consequences of limited diversity in biodiversity archival collections. In this sense, I propose the CRSEUoB model not only as an archival ideal but as a mode of reading, a conscious and decolonial approach to specific included and absent materials in BHL. Such an

approach can inform archival practices and is fundamental to BHL's (re)structuring and diversification, which begin in the texts—both present and absent—in its collections and move up to every other layer of the (online) presence and activities of the Library.

1. What is Missing? De la Cruz's and Badiano's *Libellus de Medicinalibus Indorum Herbis*

In looking at all layers of the storytelling processes of BHL, I have continuously argued for the inclusion of marginalized voices in all dimensions of the archive, a need that can be better grasped by scrutinizing one example, that of Martín de la Cruz's *Libellus de Medicinalibus Indorum Herbis* (1552). The *Libellus* is a compendium that focuses on the medical properties of Mexican plants and is the first documented herbal written in the Americas (Brito Guadarrama 16; Abbot; Moreno Toscano 7), also considered by several researchers to be an essential source to understand Indigenous medical and botanical practices during and after the Conquest (Sánchez Ruiz and Tejeda Rosales 41; Somolinos d'Ardonis 165; Byland ix). The historical importance of this text is further outlined by its language, author, and translator, as the *Libellus* is not only the first herbal of the continent but an instance of bio-diverse Indigenous knowledge: the *Libellus* was produced in Nahuatl by Nahua doctor at the Colegio de la Santa Cruz, Martín de la Cruz, and translated into Latin by his colleague, Nahua scholar of the same Colegio, Juan Badiano (Tucker and Janick 285; Moreno Toscano 8). De la Cruz's and Badiano's *Libellus* is, in fact, “el único gran herbario que utiliza el idioma náhuatl para designar a las plantas, de la misma manera que es el único que contiene elementos vegetales completamente desconocidos en la botánica europea y de origen autóctono mexicano”ⁱ (Somolinos d'Ardonis 187). Thus, the *Libellus* posits Nahuatl as a language of knowledge and the Nahua doctor as an epistemic subject at the centre of bio-diverse knowledge production. In this regard, this work is not only a landmark in botanical knowledge and natural history but represents an expression of Indigenous knowledges and medical practice, as well as the relationships between the human and

nonhuman Other in its description of the uses of plants in such practice.

Surprisingly, despite its decolonial, bio-diverse, and cultural, medical, and botanical relevance, the *Libellus* is not part of BHL's collection. I take it, then, as an example of records that are left out due to the limited diversity of archival practices in the Library that I have continuously highlighted. The (hi)stories of the *Libellus*'s origins, its travels, and its digital presence embody the multiplicity of sympoietic narratives that a CRSEUoB requires. However, these potentially decolonial narratives have been historically excluded from bio-diverse systems of knowledge exemplified by BHL, evidencing the "autopoietic systems" that a "self-producing" and oppressive (Hi)Story tells (Haraway, *Staying with the Trouble: Making Kin in the Chthulucene* 61). This is not to say that BHL has consciously or voluntarily omitted the *Libellus* from its collection. It is, on the contrary, a consequence of the systemic coloniality of the natural historical record, of which archives are instruments.

Thus, I consider the *Libellus* to be evidence of the colonial roots and ground of archival collections as much as an example of their decolonial potentialities. In other words, the intertwining (de)colonial bio-diverse (hi)stories of the (re)production and dissemination of the *Libellus*—including its absence from BHL—point to the benefits, urgency, and challenges of the (digital) archive as a cyborgian rhizomatic sympoietic existential utopia of biodiversities in the Anthropocene. The *Libellus* is but one example, one case, one voice of the many that have been systematically excluded from the historical and archival record. The advantages that the *Libellus* could bring to BHL represent but a drop in the ocean of possibilities that a conscious, historically-informed, bio-diverse, and plurally inclusive collection could offer.

2. Indigenous Agency and Representation: The Bicultural Value of the *Libellus*

The decoloniality communicated through the (hi)stories of the *Libellus de Medicinalibus Indorum Herbis*

begins not with an opposition between colonizer and colonized but with an intertwining of epistemic traditions. Given that its author and translator were Indigenous peoples, a fundamental decolonial characteristic of the *Libellus* lies in its expression of Indigenous agency, particularly in the challenge it poses to dichotomous understandings of the relationship between the European and Indigenous subjects. Thus, while the oppression of the colonial epistemic subject is patent in its history, the work of De la Cruz and Badiano is simultaneously an instance of decolonial agency.

Regarding coloniality, the (hi)stories of the production of the *Libellus* demonstrate that the Indigenous medical knowledge contained in the text was instrumentalized as part of the colonial machine. The *Libellus* was produced in the context of the colonial period in New Spain, now Mexico, and stemmed from European interests, which determined its origins and travels, thus showing “the impact of the colonial enterprise on indigenous culture” (Gimmel 175). Martín de la Cruz, originally from Santiago Tlatelolco, was commissioned in 1552 by Francisco de Mendoza, son of the first viceroy of New Spain, “para que en un herbario plasmara los conocimientos que poseía sobre yerbas medicinales mexicanas”ⁱⁱ (Brito Guadarrama 23). The goal of this project was to “alcanzar el favor de su majestad para el Colegio y los indígenas residentes en él” and “satisfacer los intereses personales de la familia del virrey Mendoza”ⁱⁱⁱ (26). The enterprise was particularly important as a response to the human and economic losses brought about by an epidemic in 1545 and the reduced budget allotted for the Colegio de la Santa Cruz in which the *Libellus* was produced (21–22). Like the Indigenous practices and knowledge instrumentalized by Godman and Salvin in the production of the *Biologia Centrali-Americana* (discussed in Chapter 2), the origins of the *Libellus* evidence how “indigenous writers and possessors of local knowledge were pawns used by the Spanish to increase their personal and national wealth and status” (Gimmel 175), Francisco de Mendoza being a case in point. Even if part of the project’s motivation was to continue to finance the endeavours of Indigenous scholars in the Colegio, the economic interests of the viceroy were the

main concern. The Mendoza family was particularly interested in circulating a catalogue of Mexican plants and their medicinal virtues to incentivize European interest and consumption and become the main suppliers of a new market (Brito Guadarrama 27). In this sense, the work of De la Cruz and Badiano represents “the cultural hegemony imposed by the Spanish on the native populations” (Gimmel 175) and evidences that natural historical coloniality was “the result of the European interest in biodiversity in the Americas and the incorporation of these species as products in the colonial world market” (Brito Guadarrama 14). Therefore, the (hi)stories of the *Libellus* reveal the shared colonial oppression of nonhuman species and of Indigenous peoples. Both the plants in the book and its Indigenous authors were instruments of colonial interests in New Spain. Indigenous doctors and scholars were educated and *allowed* to practice medicine in the Colegio de la Santa Cruz but denied an autonomous place in the circuits of knowledge and economy in which they worked, a form of alterity that extends to the nonhuman species described in the *Libellus*, valued for their potential commercial worth in the European markets. While the Indigenous and medical epistemologies and (bio)diverse (hi)stories contained in the *Libellus* hold great significance on their own, this value is overshadowed by the instrumentalizing process that subsumes them to coloniality and turns them into the cogs made to uphold the colonial machine itself.

Nevertheless, although the text can be seen as a tool for coloniality, it is, simultaneously, a powerful means for decoloniality. The *Libellus* counteracts colonial instrumentalization and evidences the epistemic agency of Indigenous peoples, despite colonization. Showcasing an argument echoed by several researchers of the *Libellus*, Millie Gimmel considers that the work of De la Cruz and Badiano “illustrates the ability of indigenous inhabitants to appropriate European forms to their own ends, even when seemingly conforming to European traditions and theories,” making it an example of bicultural knowledge production (169). On the one hand, the *Libellus* was produced in the context of the Imperial Colegio de la Santa Cruz de Tlatelolco, founded by the Spanish Crown

and administered by Franciscan friars, not only to convert Indigenous peoples—mainly Indigenous nobility—but also to educate them based on Western epistemologies (Brito Guadarrama 16). On the other, one of the most interesting characteristics of the Colegio is that several friars and chroniclers documented the process of learning as being mutual, that is, Indigenous students shared their language, knowledge, and traditions with their European instructors (17–18). In this context, for example, Indigenous students and researchers in the Colegio became important sources for fundamental Spanish works such as those of Fray Juan de Torquemada and Fray Bernardino de Sahagún (18). Therefore, the *Libellus* and the larger knowledge exchange and production of the Colegio are, simultaneously, a testimony of colonial oppression and objectification as much as a testament to Indigenous agency and knowledge production and their influence on European epistemologies.

In this regard, the biculturality of the *Libellus* challenges simplistic and dichotomous perspectives on the colonizer-colonized relationship. The Indigenous doctor and translator might be instruments of the colonial structure of power but are, at the same time, epistemic agents producing bio-diverse knowledge, that is, recording their relationships with-in biodiversity, and amalgamating the medical and cultural traditions of their peoples and those of the Europeans. In this regard, while the text follows the structure of European medical treatises such as Pliny's (Tucker and Janick 4), it incorporates specific Indigenous practices and worldviews, and even an expression of an Indigenous collectivity. For instance, Badiano's Latin translation mentions several times the phrase *vinum nostrum*, our wine, as part of the ingredients of certain remedies (De la Cruz 41). This ingredient most likely refers to the *pulque*, a popular Mexican liquor of Aztec origin that is still widely consumed in the country (Garibay, 'Advertencia Sobre El Texto y La Versión' 11). Likewise, when describing the treatment for condyloma, the translator mentions that the plant used for this remedy is one "quod nostro sermone dicitur holli" (De la Cruz 43v), roughly translated as "that *in our language* is

called holli.” In this case, the translator is not only keeping the names of plants in Nahuatl but also highlighting the belonging of Nahuatl and themselves, author and translator, as epistemic actors to the Indigenous community. Therefore, the use of the possessive “our” in these and other phrases and ingredients specifically tied to Indigenous practices and traits, allows for a reading of the *Libellus* as an expression of the cultural and epistemic identity of the Indigenous Other that finds a place within the paradigms of European epistemic production.

Regarding Indigenous languages and Badiano’s mention of *nostro sermone*, it is noteworthy that all names for nonhumans in the *Libellus*—“plants, stones, and animals” (Emmart, ‘Concerning the Badianus Manuscript, an Aztec Herbal, “Codex Barberini, Latin 241” (Vatican Library) (with Four Plates)’ 2)—are kept in Nahuatl and were not translated into Latin by Badiano. While this might be explained by differences between taxonomic systems, the bilingual nature of the manuscript speaks, once more, to the biculturality of the *Libellus*, located at the merging of Indigenous and European medical and botanical traditions, and of Indigenous cultural and botanical production:

There are in fact some 313 Aztec words in the manuscript, many of which do not appear in any dictionary. [...] Aztec nouns, as in German, are built upon descriptive roots so that the analysis of the word may relate to the color of the flower or its location or perhaps to some characteristic of the plant itself such as spiney, small, large, climbing or creeping, etc. [...]

Aztec symbols are incorporated in the illustrations. (Emmart, ‘The Badianus Manuscript, an Aztec Pharmacopoeia’ 773)

In this regard, the *Libellus* is, on the one hand, a reflection of biculturality and the coexistence of Indigenous and European traditions, and, on the other, an expression of Indigenous cultures and worldviews, contained not only in the practices it describes but in the names of nonhuman species and their pictorial representation. As explained by Emmart, given that Nahuatl is an agglutinative

language, the names of plants in the *Libellus* often reflect the properties of each species. An example of this is *yolloh-xochitl*,^{iv} whose name highlights its medical effects on the heart: *yolotl* means heart and *xochitl* means flower (Del Pozo, ‘Valor Médico y Documental Del Manuscrito’ 205). Thus, the names of the species kept in Nahuatl represent Indigenous systems of knowledge and interspecies relationships specific to Indigenous peoples in the description of the plant that the name entails.

De la Cruz’s and Badiano’s decision to not translate the names of plants is echoed in the translations in Spanish and English consulted here and discussed in later sections, all of which preserve the names in Nahuatl. Many critics point to the importance of conserving and analyzing the Nahua taxonomy of the *Libellus* as a tool for identifying the species it contains, even though there remain numerous challenges (Guerrini 33), with some equivalences being hard to make, especially due to the differences between languages (Guerra v): “One might expect that the Nahuatl name provided by Martin de la Cruz would make the modern identification straightforward, but in fact there is no recognized flora based on Nahuatl names” (Tucker and Janick 11). Despite the difficulty to translate Nahua taxonomy into Linnean taxonomy, this characteristic of the *Libellus*—and its translations inasmuch as they keep plant names in Nahuatl—speaks to the importance of the text in terms of Indigenous representation. In this regard, the *Libellus* not only represents Nahuatl as a language for bio-diverse knowledge production but also as a language of bio-diverse taxonomy (Gates, ‘Introduction to the Mexican Botanical System’ xxi; Gates, ‘Classification’ xxix) and, as a result, an expression of a different and valuable worldview and an Indigenous understanding of human-plant relationships. The translations of the *Libellus* make it clear that the language communicates meanings, worldviews, and epistemologies, and the use of Nahuatl for plant and other nonhuman names in the *Libellus* is an articulation of Indigenous bio-diverse (hi)stories.

In terms of bicultural traits, numerous researchers analyze other specific characteristics of the *Libellus* that illustrate the coexistence of the two systems of knowledge, European and

Indigenous. Researchers have identified such bicultural traits, for example, in the (European) structure of the herbal vis-à-vis the use of Nahuatl as the exclusive language of plants (Rojas Silva 42); the “persistencia de códigos culturales nahuas,” [persistence of Nahua cultural codes] especially in the presence of the glyph atl (water), alongside “seres vivos que no son plantas” [living beings other than plants] (Viveros Espinosa 847), such as ants and snakes (848); the *Libellus*’s “beneficial adaptation of European alphabetic script to indigenous culture” (Gimmel 187); the combination of Aztec iconography and European naturalism in the illustrations of the *Libellus* (Fernández 104–06); and the study of Mexican plants in the tradition of European medieval herbals (Somolinos d’Ardonis 185). Thus, the *Libellus* becomes an instance of what Alejandro Javier Viveros Espinosa calls “escritura codigofágica” [codigofagic writing] (844). This concept adopts Martin Lienhard’s notion of “crónica mestiza” [mestizo chronicle] as a text that follows a mixed tradition, that is, combines elements from Indigenous and European cultures (842), in conjunction with Bolívar Echeverría’s concept of “codigofagia” that defines “mestizaje cultural” [cultural hybridity] as a process in which one culture consumes or devours another’s cultural code, a process that requires the consumer to change their own cultural subjectivities (843). This process, which engenders “una transformación bajo la cual las identidades culturales están siendo constantemente re-construidas”^{iv} (*ibid.*) manifests in the biculturality of the *Libellus*. The Indigenous Other represented by De la Cruz and Badiano consumes and follows European traditions but expresses and represents the cultural practices and epistemologies of their people. In turn, the European subject exercises epistemic coloniality but consumes Indigenous knowledges in the cultural exchange that takes place in the Colegio, even if power and colonial relations remain at play.

3. National Imaginaries: The Current Cultural Relevance of the *Libellus*

The cultural identities of the Indigenous and European subjects constructed around the *Libellus*

illustrate not just an intercultural moment but the merging and negotiation of two modes of living and seeing the world that converge in the emergence of a mestizo identity. Pointing to the simultaneous coloniality and biculturality of De la Cruz's and Badiano's work, Ángel María Garibay mentions that the *Libellus* is an example of the colonial European pillage of cultural artifacts from the Americas, safeguarded in institutions in Europe, but also an instance of the efforts of the peoples of the Americas to “amalgamar dos almas, dos módulos de cultura, dos formas de belleza”^{vi} (‘Introducción’ 8). The cultural soul as conceived by Garibay constitutes a trait at the essence of the imaginary of the nation. Thus, the *Libellus* showcases the negotiation between the Indigenous and Spanish traditions and manifests the construction of a mestizo identity—one that was to become the Mexican identity—rooted in a cultural exchange that signifies both coloniality and Indigenous agency.

In terms of national identity, the presence of the work of De la Cruz and Badiano in the medical, artistic, and cultural imaginaries of modern-day Mexico is notable, as the *Libellus* is represented as a fundamental moment of the country's medical tradition and history. For instance, the emblem of the Instituto Nacional de Cardiología [National Institute of Cardiology] incorporates several Indigenous symbols, such as “un corazón azteca tal y como se representa en un gran número de códices”^{vii} (Cárdenas 173). This heart represents mestizaje as key in medical epistemologies in Mexico, especially given that “[a] este corazón lo abrazan dos ramas de una planta, en una de ellas hay una flor europea, la digital, en la otra una americana, la yolloxóchitl, las dos con igual acción farmacológica sobre el corazón”^{viii} (*ibid.*). The genus *Digitalis*, endemic to Europe, and the species yolloxochitl, endemic to Mexico, are thus included in the emblem as symbols of biculturality, of the mestizo identity, culture, past, and present of the country. Interestingly, the illustration of yolloxochitl incorporated into the emblem is, in fact, an exact copy reproduced from the *Libellus* (Cárdenas 174), employed, then, as a source of historical medical and botanical knowledge and as an

expression of Indigenous identities. Therefore, this emblem ties the *Libellus* to past and present medical practice in Mexico, acknowledging the importance of Indigenous knowledges in the development of modern-day medicine and emphasizing the importance of De la Cruz's text in Mexican epistemologies and imaginaries.

A similar instance of the presence of the *Libellus* in Mexican imaginaries can be found in the work of Diego Rivera (Salinas de Gortari VIII). In his mural "El pueblo en demanda de salud" (1951), located in the Hospital Médico La Raza in Mexico City, Rivera copies and incorporates the images of several plants from the *Libellus* at the center of his work, on a pillar on which the Aztec goddess of fertility, Tlazeoteotl, rests (Cabello 1462; Herbert Doctor). This central figure and the images from the *Libellus* act as a bridge between the Indigenous medical tradition (represented to the right) and modern medical practice (represented to the left). Thus, the iconography of this mural, as well as the central presence of the illustrations from the *Libellus* point to the fundamental role this work plays in Indigenous and national identities as well as the medical and botanical practice in Mexico. The representation of Indigenous medical practices alongside the illustrations of the *Libellus* creates an affective relationship with the Indigenous roots and medical history of the country. This mural incorporates Rivera's knowledge of national and historical imaginaries into popular cultural and artistic representation, showcasing the importance of Indigenous iconography and history in the Mexican identity.

The bridging role—between Indigenous and modern-day medicine—that the *Libellus* plays in Rivera's mural points as well to the cultural and medical significance that Indigenous knowledge and medicine hold in the current practices of the peoples of Mexico. In fact, some of the remedies described in the *Libellus* continue to be used in modern-day Mexican and Indigenous communities as well as in Mexican botanical and medical practices and studies (Salinas de Gortari VII). For example, De la Cruz mentions opossum tails as remedies used to facilitate birth (De la Cruz 57v), a practice

that is still performed by midwives in modern-day Mexico (Sánchez Ruiz and Tejeda Rosales 43). In this sense, the connections highlighted in the emblem of the Instituto Nacional de Cardiología, the work of Diego Rivera, and current medical practices of Indigenous origin in Mexico point to the existence of a bridge between the past and present of Indigenous communities and their epistemic legacy in the country, exemplified by the *Libellus*.^{ix}

The work of De la Cruz and Badiano thus becomes a symbol of national history and identity in which Indigenous and European traditions coexist. The *Libellus* challenges dichotomous understandings of coloniality not by concealing the very real presence of colonial violence and oppression but by nuancing the role of the colonizer and the colonized. In Chapter 3 of this thesis, I argued that the shared (hi)stories of Indigenous peoples with the species *Bertholletia excelsa* challenge traditional notions of the Indigenous subject as static and as an object of study. Likewise, the *Libellus* challenges those same notions, for it is in itself an instance of Indigenous bio-diverse epistemologies and Indigenous epistemic agency, as well as a manifestation of the importance of Indigenous knowledges in the formation of a national cultural and epistemic identity in Mexico. The *Libellus* is an attestation of the relationships between the Indigenous and nonhuman Others, not by virtue of a denial of its colonial roots but by virtue of an expression, precisely, of biculturality.

4. The Local and the Global: The Travel (Hi)Stories of the *Libellus*

In addition to its place as a fundamental work in the history of medical practice in the Americas, as an expression of Indigenous epistemic agency, as an instance of cultural exchange and biculturality, and as representative of present cultural and intraspecies practices in Mexico, the historical travels of the *Libellus* reflect the intertwining of the local and the global as well as the negotiations between nations and epistemic traditions. The 20th-century history of the *Libellus*—its translations into English and Spanish, its repatriation to Mexico, and its physical and digital dissemination in the

country—reveals an important network of intertwining (hi)stories that continue to highlight the colonial struggles and decolonial potentialities of this text.

The *Libellus* was produced in New Spain but travelled widely across Europe and has been translated several times into English and Spanish. Shortly after it was concluded, the *Libellus* was sent to King Carlos V but found its way, instead, to his son, Felipe II, who kept it in the Royal Library, later to be acquired by Royal medic Diego de Cortavila y Sanabria (Byland iv; Del Pozo xvii). The *Libellus* was then passed to Francisco Berberini, nephew of Pope Urbano VIII, and, finally, to Cassiano dal Pozzo, member of the Lincei Academy, until it was incorporated, in 1902, into the Vatican Library (Brito Guadarrama 28). The (hi)stories of the *Libellus* in Europe are thus an example of the numerous cultural artifacts that were introduced into the continent from the colonies and that remained—and still remain—in the hands of hegemonic institutions of power.

The manuscript of the *Libellus* in the Vatican Library was found by Charles Clark while he was researching pre-Columbian cultures for the Smithsonian Institution. Clark recognized the uniqueness of the *Libellus* and presented it to a group of researchers at John Hopkins University, eventually leading to the first two English translations and editions of De la Cruz's and Badiano's work: the first by Emily Walcott Emmart in 1935 and the second by William Gates in 1939 (Somolinos d'Ardonis 171–73). Several years later, the text was finally translated into Spanish. Francisco Guerra's translation was the first attempt to translate the work into this language (Brito Guadarrama 31) and was “based on Gates's version” (Tucker and Janick 7). Although this edition had limited resources (Somolinos D'Ardonis 173-174; Guerra i-ii) and many shortcomings (Somolinos D'Ardonis 175), particularly in its translation and incorporation of images, it constitutes the first effort to circulate the *Libellus* in its country of origin. Thus, these editing and translating endeavours mark a fundamental moment of revalorization of the text and the recovery of Indigenous epistemologies otherwise undocumented in hegemonic systems of knowledge.

Nevertheless, the travels of the *Libellus* from the Americas to Europe and its early editions and translations into English and Spanish originate in and, in many cases, perpetuate the colonial appropriation of cultural artifacts and biodiversity-related knowledge. The first translations into English, for instance, hardly ever list De la Cruz as the author of the *Libellus*, giving the credit, more often than not, to Badiano—as in the case of Emmart’s version—or to the current translator and/or editor—as does Guerra’s edition, its stance vis-à-vis the manuscript as a fundamental text for Mexican and Indigenous epistemologies notwithstanding. In this sense, the passing of hands of the *Libellus* in Europe and the early translations that do not credit the author exemplify the past and present coloniality of Indigenous epistemologies. As mentioned in Chapter 2 in my discussions of the case of *Biologia Centrali-Americana*, the archive and curatorial practices around it often conceal the role of Indigenous peoples as epistemic agents and separate them from their knowledge production (Longair). Similarly, the erasure of De la Cruz as the author of the text reveals the issues of authorship that still mark metadata standards, as discussed in Chapter 3. Thus, editorial and archival decisions around the different versions of the *Libellus* in English and Spanish perpetuate, at least in part, the epistemic violence of its colonial roots.

It was not until the sixties that a critical and solid edition of the *Libellus* with a Spanish translation saw the light in Mexico. This critically-acclaimed edition was developed by the Instituto Mexicano del Seguro Social (IMSS) [Mexican Institute of Social Security] and published in 1964. In contrast to Emmart, Gates, and Guerra, the IMSS edition—with a second release in 1991—acknowledges De la Cruz as the author of the text and Badiano as its translator. Additionally, it includes several studies by important Mexican researchers (Brito Guadarrama 32) who continuously highlight the value of the *Libellus* as a symbol of national and Indigenous identities (Salinas de Gortari), a pictorial work of art (Fernández), and a fundamental source for the study of Mexican and global history of botany (Miranda and Valdés), zoology (Martín del Campo) and medicine (Del

Pozo, ‘Valor Médico y Documental Del Manuscrito’), amongst others. Despite its value, the shortcoming of this edition was its limited and highly localized circulation (Fondo de Cultura Económica and Instituto Mexicano del Seguro Social XI), meaning that it did not reach the more general population in the country. Regardless of its limited reach, this edition still constitutes the first solid attempt to circulate the *Libellus* in Mexico while highlighting its significance for medical and cultural production in the country with an emphasis on Indigenous epistemologies, a stance that can be seen as plural, bio-diverse, and decolonial.

The (de)colonial travel (hi)stories of the *Libellus* culminate in the repatriation of the manuscript to Mexico. After its multiple travels, from the Americas to Europe and within Europe, in 1992, the facsimile of the *Libellus* that was kept in the Vatican Library for almost a century was repatriated to Mexico by Pope John Paul II (Byland iii). The initiative took place in the context of the celebration of the fifth centenary of the arrival of Columbus to the Americas and was seen as “símbolo del restablecimiento de las relaciones oficiales entre nuestro país y la Santa Sede”^x (Brito Guadarrama 32). The physical repatriation of the manuscript signified the acknowledgement of colonial pillage and the importance of the relationships between national and institutional powers. The 1964 IMSS edition of the *Libellus* was re-edited and published in 1991 to commemorate this occasion and to counteract the limited circulation of the previous edition (Fondo de Cultura Económica and Instituto Mexicano del Seguro Social XI) so that the manuscript could actually *return* to Mexican audiences.

In addition to promoting a wider circulation of the text, the repatriation of the *Libellus* engendered new forms of storytelling around De la Cruz’s and Badiano’s work, especially in digital environments. Since its repatriation, the facsimile has been in the custody of the Instituto Nacional de Antropología e Historia (INAH) in Mexico City (Brito Guadarrama 33) and its incorporation into the special collections of the Biblioteca Nacional de Antropología e Historia, the library of INAH, is

perceived as fundamental in country-wide efforts to restore the memory and heritage of Mexican history and culture (Moreno Toscano 7). In 2014, INAH's Museo Nacional de Antropología e Historia curated an exhibition of 44 Mexican codices from the 16th to 19th centuries titled "Códices de México: Memorias y saberes" [Codices of Mexico: Memories and knowledges] (Mediateca - Instituto Nacional de Antropología e Historia). Following Mexico's stance to promote free and widespread access to cultural heritage, INAH created a virtual visit of the exhibition so that "tanto el público general como los especialistas, puedan acercarse a estos materiales, los cuales constituyen una de las fuentes más importantes para conocer las culturas antiguas de México"^{xi} (*ibid.*).^{xii} Moreover, INAH curated interactive and culturally and historically contextualized versions of the 44 facsimiles plus four more, which are available online through the microsite *Códices de México*^{xiii} (Instituto Nacional de Antropología e Historia et al.; Brito Guadarrama 34). The interactive version of the *Libellus* on this microsite includes explanations of the cosmologies of Indigenous peoples that inform the botanical and medical practices described by De la Cruz. In this sense, INAH's version exemplifies the importance of contextualization in the decolonial representation of historical and Indigenous artifacts, as I argued for metadata practices in Chapter 3. By providing open access to the fundamental work of De la Cruz and Badiano, INAH is creating a digital bridge between the cultural past and present of Indigenous and Mexican peoples, as well as analogue and digital environments, a key aspect of open access and virtual repatriation, in this case, also complemented by physical repatriation, as explained in Chapter 2 of this thesis.

Depending on the edition that one chooses, the *Libellus* can also attest to the present cultural importance of Indigenous peoples in Mexico, as highlighted in previous sections. For example, the facsimile edited and published by INAH is dedicated to the labour of Indigenous and Mexican workers that continue to cultivate the plants included in the *Libellus*. This project also demonstrates a consciousness of the importance of return and public display of the work so that it goes back to

those who “ha[n] mantenido vivo ese conocimiento y ha[n] contribuido a preservar la diversidad evolutiva y la riqueza cultural de México”^{xiv} (Moreno Toscano 8), showing a profound connection between the knowledge included in the *Libellus*, historical memory, and the labour of Indigenous and Mexican farmers and botanists.

Given its history, circulation, translations, repatriation, cultural representation, and open access, I believe the *Libellus* can be considered a point of decoloniality in the past and the present and in online and offline settings, an expression of Indigenous and Mexican identities, and a perpetual potential new beginning for sympoietic and rhizomatic actual and cyborgian bio-diverse (hi)stories of human and nonhuman subjects, especially plural humanities, that is, the *anthropos*. Only one step remains, its inclusion in a global digital archive that promotes such a beginning beyond the landscape of virtual and analogue Mexican and Indigenous knowledges. Enter, BHL.

5. Colonial Absence and Decolonial Presence: BHL and the *Libellus*

Why is the *Libellus* not part of BHL’s collection? My hypothesis echoes some of the very arguments that I have advanced throughout this dissertation; first, a lack of diversification of partnerships—leading to limited diversification of institutional participation—and second, the local centralization of those partnerships. Because BHL’s network of partnerships is greatly constrained, especially in the Global South, its collections continue to incorporate mostly hegemonic (European and Anglo-North American) materials, while marginalized artifacts like the *Libellus* remain systematically absent from this and other (digital) archives. The absence of materials such as the *Libellus* reminds us of the power dynamics at the basis of the archive, where the archive, and the voices that find a place in it, are imbued with privilege (Derrida and Prenowitz 10), not because BHL itself privileges certain materials over others but because the archive has historically and systematically remained in the hands of those who “held and signified political power” (9) and who possess “the power to interpret

the archives” (10). In this regard, systemic power in the conformation of archives, digital and non-digital, implies the inclusion of narratives closer to those holding the power and the absence of narratives pertaining to those marginalized from and by that same system of power.

Although explained by the systematic exclusion of oppressed voices in archives, it is still surprising that the *Libellus* is not part of BHL through the BHL México project. This gap highlights the complexity of the diversification of archives and the importance of the local. Even the collaboration with CONABIO is highly centralized, as this organism itself has limited ties in Mexico, and many important archives containing bio-diverse (hi)stories are consequently left out of CONABIO’s and BHL’s collections, such as the case of the Archivo Histórico Casa de Morelos discussed in Chapter 1. This is not to say that BHL or CONABIO have willingly omitted the *Libellus* or archives such as Casa de Morelos, but these and other absences are symptomatic of a hegemonic and colonial system of power that determine which (hi)stories are told through archives, digital and non-digital, and by whom. The storytelling mechanism that is BHL is limited by the colonial dynamics of such a system, dictating the presence and absence of voices in the archive.

Therefore, I argue that the *Libellus* and its potential integration into networks of bio-diverse knowledge production through BHL embody a decolonial option that can promote the equitable representation of plural humanities within a CRSEUoB framework for bio-diverse (hi)stories. In terms of the global and the local, one of the main advantages of incorporating the *Libellus* into BHL’s collection lies in the global relevance of the Library. As I argued in Chapter 2 of this dissertation, repatriation and virtual epistemic repatriation are two separate concepts that overlap and complement each other. In the case of the *Libellus* and given that actual (physical) repatriation has already taken place, the incorporation of this work into BHL could be a parallel case of virtual epistemic repatriation that extends the value of the return in digital environments and allows for the enactment of (re)new(ed) narratives that stem from the *Libellus* and reach global archives and

audiences. While INAH's digital version of the facsimile is already providing open access to the *Libellus* and engendering such narratives, it remains a highly localized site. In this sense, INAH's microsite where the *Libellus* is available registered only 6.2k visits during April of 2022, with an average visit duration of 2:09 minutes and 100% of traffic coming from Mexico (Similarweb). These data show strikingly limited reach and access when compared to BHL's stats, which show 374.3k visits to the BHL website in the same month, with an average visit duration of 5:23 minutes and traffic by country from various places such as the US, Brazil, Germany, and Italy, amongst others.^{xv} Therefore, the inclusion of the *Libellus* in BHL and the establishment of a digital bio-diverse network that includes INAH's online versions, for example, could enhance the text's existing online presence and promote more global bio-diverse networks of digital epistemologies and (hi)stories around this text.

In this regard, it is noteworthy that the *Libellus* is already indirectly present in BHL through the work of Dr. Emily Walcott Emmart, who engaged greatly in the study of the *Libellus*. Not only is Emmart's translation considered to be more polished and well-documented than Gates's edition (Byland v), particularly because of her greater expertise in botany (Byland v; Tucker and Janick 7), but she rapidly became the best-known expert on matters related to this work (Somolinos D'Ardonis 173). She published several critical studies and continues to be the most cited scholar when analyzing the textual and botanical nuances of the *Libellus*. One of Emmart's first papers about the herbal, "Concerning the Badianus Manuscript, An Aztec Herbal, 'Codex Barberini, Latin 241' (Vatican Library)" (1936), was published in the *Smithsonian Miscellaneous Collections* (vol. 94, no. 2), which is, in turn, part of BHL's collection. While the work of Emmart highlights the importance of women in natural historical research, as was the case of Lena Lowis explored in Chapter 2, the presence of Emmart's article *about* the *Libellus* in BHL vis-à-vis the absence of the text itself communicates, albeit unwillingly, an unequal valorization of Indigenous epistemologies as opposed

to knowledge production from Europe and the US. As discussed in Chapters 2 and 3, BHL acts, in many cases, as an instance of legitimization for biodiversity-related epistemologies. Because the *Libellus* is only present in BHL as an object of study, it is only “legitimized” inasmuch as it is an epistemic interest for researchers in and from the Global North. Additionally, the absence of the text itself denies a space for counter-hegemonic and Indigenous knowledges and, thus, a space for the telling of the shared (hi)stories of Indigenous and nonhuman subjects. In that sense, regardless of intention, BHL communicates a stance that continues to establish the archive as a mechanism for colonial violence.

Of importance to BHL given its institutional affiliations, the Smithsonian itself is a player in the (de)colonial (hi)stories of the *Libellus*. As mentioned before, the manuscript in the Vatican Library was found by Charles Upson Clark while conducting research for the Smithsonian Institution (Somolinos d’Ardonis 171) and it was he who introduced the manuscript to Emmart. Emmart herself mentions the role of the Smithsonian Institution in ensuring the completeness and publication of her edition of the *Libellus* (Emmart, ‘Preface’ xxii). Likewise, Emmart’s paper in BHL discussed above, is present through a Smithsonian publication. Finally, Guerra’s translation, the first translation of the *Libellus* into Spanish, was, in fact, funded by the Smithsonian Institution’s Dawes Fund (Guerra i). Thus, the first translations of the *Libellus* into English (Emmart, 1935) and Spanish (Guerra, 1952) are directly connected to the Smithsonian Institution. Similar to the case of Panama and the work of the Smithsonian Tropical Research Institute, the gaps in BHL reveal the colonial roots of the natural historical record and the role that research institutions and archives such as the Smithsonian’s organisms, including BHL, play in perpetuating epistemic coloniality.

Considering the indirect presence of the *Libellus* and its subordination to European epistemologies and US institutions in BHL, the inclusion of this work into the Library could help counteract, on the one hand, the biases of the so-called scientific and epistemic canon, and, on the

other, the lack of access to oppressed and marginalized narratives:

publications in the history of science and ideas as practiced in Spain and Latin America are often inaccessible in the United States and Northern Europe, marginalizing many of these historians and their work [...] By incorporating the Codex de la Cruz into the canon of early modern histories of science and literacy, our understanding of both the colonial enterprise and the resiliency of indigenous culture in the early modern period becomes richer and more nuanced. (Gimmel 171)

The incorporation of Indigenous voices into networks of bio-diverse knowledge would mean a reformation of general and hegemonic understandings of bio-diverse epistemologies and, therefore, of biodiversity, as well as of Indigenous peoples. Already in 1935, Emmart herself acknowledged that scholarly views of coloniality draw attention to the introduction of European culture into the Americas and often conceal “the reciprocal transmission of Aztec learning into Europe” (“The Badianus Manuscript, an Aztec Pharmacopoeia’ 771), falling into dichotomous understandings of the roles of the colonizer and the colonized, which oppose the meanings advanced by the *Libellus*, as explained thus far. In this sense, the incorporation of materials produced by Indigenous peoples, such as the *Libellus*, can help counteract the canonical colonizer-colonized dichotomy that often translates into a subject-object opposition and is present in every layer of the archive, such as metadata, as explained in Chapter 3. The *Libellus* demonstrates that the relationship between the colonizers and the colonized is considerably more nuanced and that Indigenous scholars such as De la Cruz and Badiano exercised an epistemic agency in the crevices of the colonial apparatus that also had an impact on European knowledge. Therefore, its presence in BHL’s collections could open spaces for a re-understanding of cultural and epistemic exchange in bio-diverse (de)colonial contexts that goes hand in hand with the equitable representation of Indigenous knowledges.

In addition to engendering decolonial representation and inclusion, the incorporation of the

Libellus into BHL would create a decolonial connection to the colonial past by potentially counteracting the historical oppression the herbal itself faced. As mentioned before, the *Libellus* was produced by Indigenous medical practitioners and academics working in the Colegio de la Santa Cruz. However, despite the enriching exchange and work undertaken in the Colegio, several advisors to the King and other intellectuals of the period saw the education of Indigenous peoples in the Americas as “inapropiada” (Brito Guadarrama 21) and pushed for the reduction of the budget for the Colegio (22) and even its closure. Moreover, Martín de la Cruz and his *Libellus* were victims of epistemic coloniality and canonical marginalization. For instance, while several researchers discuss diverse hypotheses as to why the *Libellus* was not quoted by authors such as Fray Bernardino de Sahagún or Francisco Hernández (Somolinos d’Ardonis 168; Tucker and Janick 285), Ángel María Garibay suggests that this was probably due to them not finding enough value in the work of an Indigenous doctor (‘Introducción’ 4). In that same regard, Efrén del Pozo considers that the *Libellus* was intentionally ignored due to the origins of its author and translator:

Los autores eran indios de un país recién conquistado, uno de ellos se llamaba «médico» y otro escribía latín. El Colegio de Santa Cruz fue combatido porque en él se enseñaba demasiado a los indios ... ¿Cómo iba a citar un autor que se respetara una obra escrita en latín por los propios indios? Una cosa era estudiar las costumbres y curiosidades de los indios y otra dar crédito a un libro escrito por ellos mismos.^{xvi} (Del Pozo, ‘Valor Médico y Documental Del Manuscrito’ 196)

In this passage, Del Pozo points to a colonial stance of biodiversity knowledge that has emerged continuously throughout this dissertation: the unequal valorization of Indigenous epistemologies and the dichotomy between Europe as a producer of knowledge and Indigenous peoples as objects of that knowledge. Martín de la Cruz and Juan Badiano transgressed such dichotomy by taking the role of epistemic subjects, which is a plausible explanation for the historical silencing of the *Libellus*,

as highlighted by Del Pozo. Moreover, the author suggests that the European influence found in De la Cruz's work might have been perceived as contamination concerning Indigenous knowledges (197) and, in that sense, not "authentic" enough to be representative of Indigenous cultures, marked by an expected "authenticity" as defined by European colonial paradigms.

This historical and present attitude towards cultural products, in this case, the *Libellus*, leads to the tokenization and stereotyping of said products and of plural humanities. Considering its travels in Europe and its passing from one collector to another, it is possible to conclude that the *Libellus* "was clearly appreciated as a beautiful and *exotic* work of art about medicine" (Byland iv, emphasis mine) but not so much as a medical compendium of the same status of those produced by Europeans. This colonial perspective points to the objectification of Indigenous epistemologies and cultural production and continues to determine bio-diverse knowledges, for example, in the dichotomy between the European subject and the Indigenous object found in metadata, as explained in Chapter 3. Therefore, the inclusion of the *Libellus* in BHL could counteract the epistemic colonization of Indigenous peoples and knowledges by taking a step toward the opening of spaces for historically oppressed and marginalized voices, positing Indigenous epistemologies alongside the historically privileged production of the Global North, and promoting Indigenous self-representation and identity in global online spaces.

In that same sense, if the *Libellus* were part of BHL's collection, its presence, promotion, and curation could counteract historical colonial constructions of the Indigenous subject, a fundamental characteristic of which points to another already familiar issue of the colonality of archives: *authorship*. As discussed in the metadata analyses presented in Chapter 3, the category of *author* can be problematic when dealing with colonial texts since it perpetuates the historical appropriation of Indigenous knowledges by European conquerors. In the major texts of European natural history and the work of the most important European herbalists and natural historians of the 16th century,

there are several “references to Aztec medical practices” (Emmart, ‘The Badianus Manuscript, an Aztec Pharmacopoeia’ 771) that, on the one hand, are key to the knowledge production of these European texts themselves but, on the other, are filtered “through the eyes of Europeans” (*ibid.*). On the contrary, Martín de la Cruz’s and Badiano’s work “representa la raíz autóctona prehispánica descrita directamente por un médico azteca”^{xxvii} (Del Pozo, ‘Prefacio’ xix). The status of *author* has been systematically and historically denied to De la Cruz and other Indigenous scholars, erasing their work and existence in epistemic networks. In this sense, with the incorporation of the *Libellus* into BHL, the Indigenous Other would no longer be erased but come to exist in the archive: “[t]o be symbolically annihilated is to be an eternal outsider whose very existence is presumed an impossibility. In the wake of this absence, marginalized communities fail to see themselves or their places in the world” (Caswell et al. 58). Therefore, the incorporation of the *Libellus* into BHL’s collection would signify not only the inclusion and presence of Indigenous voices and the expression of Indigenous relationships with-in biodiversity but also the representation of Indigenous authors producing bio-diverse knowledges in Indigenous languages, that is, the existence of Indigenous epistemologies with-in biodiversity in BHL.

6. A Drop in the Ocean: Closing Remarks about the *Libellus*

While the incorporation of the *Libellus* into BHL’s collections would be a powerful move towards the representation of Indigenous peoples in the archive, it is important to mention that this is but one tiny first step. Its significance as an instance of Indigenous epistemic agency and its relevance in local and global networks of bio-diverse knowledges notwithstanding, the incorporation of one, two, three texts does not remedy the systematic coloniality of archives. In this regard, even the *Libellus* itself has shortcomings: it belongs to the 16th century and does not represent current Indigenous knowledges, languages, or taxonomy (De Ávila 47–48), nor regional variants of Nahuatl (Emmart,

‘Preface’ xx). If we see its inclusion into BHL as enough to constitute a decolonial move, we risk falling into colonial conceptions of Indigenous peoples as homogenous and fixed. Even if I continue to argue for the incorporation of the *Libellus* into BHL, the inclusion of a single text is not in itself decolonial and can, instead, lead to the tokenization of said text.

As I mentioned at the beginning of this conclusion, I wanted to close this thesis with an invitation to look at the texts present in and absent from BHL. We have to look at the minute to understand the grand. This discussion seeks to reveal the power of a singular text to hint at the potential power and value of every other text that is absent from archival collections. My discussions of the *Libellus* are but an exercise in imagination, informed by the gaps and shortcomings of BHL that this dissertation has brought to light. What else is out there? What textual worlds remain absent, for intentional or unintentional reasons? What happens when we bring one voice into an archive that lacks such voices? What would happen if we brought two voices? What would happen if we brought intersectional voices? What if we searched for these texts—one, two, a thousand—and incorporated them into otherwise hegemonic collections?

The big question that remains as I conclude this thesis is, precisely, what if...?

7. Bio-Diverse Decolonial Strategies for Digital Archives: What’s Next?

What if we were to create a decolonial bio-diverse archive? My aim throughout this dissertation has been to argue, precisely, for archival practices, broadly understood, that take a decolonial stance vis-à-vis archival retellings of the shared bio-diverse (hi)stories of human and nonhuman subjects. The (hi)stories of biodiversity we collect, catalogue, curate, disseminate, share, and access are the (hi)stories that make possible and determine our relationships with-in biodiversity. An archive of the size and global relevance of the *Biodiversity Heritage Library* requires a critical approach to its materials and collections as well as to its audiences and overall digital presence to promote equitable

relationships with-in plural humanities and biodiversities. Considering that our relationships with-in biodiversity and with nonhuman subjects, in general, are highly virtual, if the (hi)stories of nonhuman species that we re-tell through archives are conditioned and determined by coloniality and cultural biases, then the relationships we establish through such narratives with our human and nonhuman kin will be equally biased and colonial.

Archives are not only sources of information and knowledge but also sources of relationships. We know nature and humanity through archives, and we establish relationships with them through that knowledge. If I were to establish a relationship with the biodiversity of Panama through BHL's documents, for example, then my relationship would not be plural nor sympoietic, as it would be inevitably influenced by the Anglo- and US-centrism of these materials. If I were to establish a relationship with the Brazil nut through BHL, my relationship with *Bertholletia excelsa* would be shaped by the coloniality exercised by the British empire throughout the Global South and by the objectification and erasure—voluntary or involuntary—of Indigenous peoples, languages, cultures, and epistemologies.

The main goal of this thesis has been to dissect the layers of storytelling of BHL as a means to develop decolonial archival practices in the context of the Anthropocene that follow each of the components of the proposed theoretical model: the virtuality of intraspecies relationships (cyborgian); the heterogeneous, interconnected, non-binary, and multiple ramifications of human and nonhuman (hi)stories (rhizomatic); the coexistence of the narratives and experiences of human and nonhuman kinship (sympoietic); and an appeal to justice for a multiplicity of worlds (existential utopia). On the one hand, BHL can be considered a decolonial option regarding its global and open access outlook, global partnerships beyond the Global North, outreach campaigns such as #HerNaturalHistory, special collections such as *Publicaciones en español*, and recent strategies such as the development of the Library's first *Acknowledgement of harmful content*.^{xviii} On the other hand,

however, BHL is still ingrained in the colonial apparatus, as revealed by the mixed-methodology employed in this thesis, and most of its materials continue to communicate the coloniality of human and nonhuman subjects, especially for regions in the Global South and for marginalized and Indigenous communities.

In this sense, my approach to BHL makes important contributions to the study of digital archives and biodiversity collections. A major contribution lies in devising and applying a mixed-methods approach to the analysis of archival natural historical materials. Employing a wide array of tools and methods, such as language distribution, web analytics, social media analysis, and critical metadata studies, allows for better and more efficient identification of the gaps and shortcomings of archives from an ecocritical and decolonial standpoint. Regarding eco-decolonial approaches to digital archives, another fundamental contribution of this dissertation has been to propose and apply this mixed-methods approach in combination with a theoretical model at the intersection of digital humanities and ecocriticism that allows for a reformation and questioning of archival practices, especially in online spaces.

As I have argued throughout this dissertation, such a theoretical model is necessary as a backbone for the decolonial (re)structuring of digital archives, to understand the importance of the narratives contained in and absent from such archives, and to open spaces for the decolonial representation of human and nonhuman groups. As revealed by this interdisciplinary and mixed methodology and theoretical framework, the Anglo- and Global-North-centric nature of BHL's collections interferes with its efforts toward multilingualism and multiculturalism. Following my analyses in Chapter 1, BHL's partnerships in the Global South are still greatly dominated by English as the *lingua franca* of biodiversity-related knowledge production, concealing the shared (hi)stories of plural humanities with-in biodiversity. In turn, BHL's web traffic comes primarily from Europe and the United States, as well as from desktop devices, thus creating a schism between audiences from

the Global South and North and, therefore, limiting the value of so-called global open access.

By analyzing the case of BHL México and comparing web analytic data of various websites in Mexico to that of BHL, I have also shown that cultural and linguistic biases in BHL's collections limit the networks of bio-diverse narratives that could potentially be engendered by the materials the Library houses. While the partnership between BHL and institutions in the Global South such as CONABIO in Mexico can benefit both parties, especially considering the daunting panorama that many digital archival initiatives face in marginalized communities, the limited collaboration and superficial reformation of BHL's collections have not generated a deep restructuring of the Library and, in consequence, have failed to truly transform the archive from a decolonial standpoint. As analyzed in Chapter 2, the limitations of BHL's partnerships and outreach strategies impact its practices of representation through its catalogue and its overall online presence. The biases and partial (hi)stories communicated even in intersectional efforts such as the #HerNaturalHistory social media campaign continue to reveal such limitations. Similarly, despite the occasional consideration of open access as an instance of repatriation, the presence of materials concerning the Global South in BHL is still subsumed by networks of knowledge production and legitimization centred in the Global North.

One of the fundamental takeaways of this dissertation lies in the biases and colonial dynamics that are communicated in every layer of archives as storytelling machines. As discussed in Chapter 3, a fundamental component of the meanings communicated through texts in archival collections exists in the metadata categories that accompany each artifact. The geopolitics of metadata greatly determine the meanings we associate with human and nonhuman subjects as well as with places and a sense of place. The possibility of being a storyteller, that is, of actively participating in the production of knowledge around nonhuman species contained in BHL, is still to a large extent exclusive to a centralized network of producers in and from the Global North, while the

Global South and Indigenous peoples are relegated to the passive role of objects of study.

Decontextualized metadata, additionally, conceals the historical and present oppression of human and nonhuman subjects and denies them a place in biodiversity-related epistemologies.

Given, then, the coloniality of the storytelling machine that is BHL, but also considering its efforts towards decolonization, I would like to close this dissertation by providing five specific strategies that the Library and other similar archives might follow to promote the diversification of their collections for the establishment of a cyborgian rhizomatic sympoietic existential utopia of biodiversities.^{xix} To continue its path toward decoloniality, BHL must

1. Diversify BHL partnerships and global nodes.

One of the most prominent shortcomings that my analyses of BHL reveal is directly related to the centralization of its knowledge production. As my discussions of metadata show, a majority of materials contained in BHL were produced and are housed in institutions in Europe and the US. In this regard, employing a mixed-methods approach to metadata, as I do in this dissertation, can help identify specific gaps in BHL's collections and devise a tailored partnership strategy. For example, after identifying the Anglo- and US-centrism of its materials about Panama, BHL could reach out to local institutions in this country to promote self-representation and counteract otherwise geopolitically biased collections.

Similarly, despite the work of global nodes such as BHL Africa, BHL Singapore, and BHL China, the BHL collection continues to be overwhelmingly Anglophone. When scrutinizing these materials, it is possible to identify a correlation between limited language representation and the institution contributing the materials to BHL. Therefore, BHL requires a conscious development of outreach strategies that allow for the establishment of global nodes in marginalized communities and the Global South. These partnerships need not only commit to the contribution of materials to the Library's collections but also to a conscious examination of the diversity, and lack thereof, of those

materials in terms of authors, geopolitics, and language representation. Moreover, each global node can seek out marginalized yet fundamental examples of bio-diverse knowledge production tied to their local specificities, such as the *Libellus de Medicinalibus Indorum Herbis*, and prioritize their incorporation into BHL.

2. *Promote the equitable representation and active participation of Indigenous and marginalized communities.*

Archival efforts seeking to promote decoloniality have often adopted a participatory approach to the configuration of the archive (Cushman, ‘Supporting Manuscript Translation in Library and Archival Collections: Toward Decolonial Translation Methods’ 63). In this sense, BHL could follow the example of these initiatives and devise an outreach plan that promotes the participation of scholars and librarians from Indigenous communities and the Global South. The diversification of the teams working behind the archive can lead to the diversification of voices represented by that same archive.

Additionally, the absolute absence of Indigenous languages in BHL’s collections is one of the Library’s greatest shortcomings. Thus, BHL should actively seek out and incorporate biodiversity-related materials produced by Indigenous peoples and written in Indigenous languages. This move goes hand in hand with the previous strategy, as the inclusion of Indigenous and marginalized materials should become a key component of the establishment of global nodes. Moreover, the inclusion of materials in Indigenous languages is fundamental in counteracting the subject-object binary that characterizes the current presence of Indigenous peoples in the Library. Positing Indigenous languages as languages for epistemic production can counterbalance the exclusive and staggering presence of Indigenous peoples as objects of study.

3. *Continue to develop and implement a multilingual and multicultural approach.*

Given the overwhelming dominance of English as the language of biodiversity-related knowledge

production in its collection, BHL should prioritize the incorporation of materials written in languages other than English. While Indigenous languages should be the main concern, as explained in the second strategy, increasing the presence of other languages, especially those largely spoken in the Global South, can promote not only a more equitable representation of diverse linguistic communities but also more widespread access from such communities. As shown by the case of Spanish, the diversification of linguistic representation in BHL can lead to extended traffic from diversified global communities and, therefore, to wider networks of bio-diverse knowledges and epistemic exchange.

Moreover, by exploring web analytical data and scrutinizing the cases of different regions in the world, as I do in Chapter 1 of this dissertation, BHL can consider the specificities of access from these communities and undertake technological strategies that enhance and increase the Library's reach amongst these audiences. For example, BHL could improve its website by following the principles of web responsiveness, develop an app that attracts more traffic from mobile devices, and promote the creation of specific social media accounts for each global node, as has already been done in the case of BHL Australia. These strategies can lead to facilitated access from communities outside the Global North, where access through mobile networks and social media channels is of utmost importance.

4. Solidify and improve engagement with BHL's existing nodes.

The diversification of BHL's collections requires that existing nodes implement more solid and widespread strategies for engagement and collection. Following the previous strategy, global nodes can increase their online presence, for example, by creating their own social media accounts and interacting more closely with BHL's online activities. Similarly, BHL can encourage and promote the decentralization and diversification of collections put together by the institutions that lead each node at the local level. In the case of BHL México, for instance, CONABIO could partner with an even

wider network of institutions, such as INAH, in order to incorporate more diversified materials such as the Archivo Histórico Casa de Morelos or the multiple digital and analogue versions of De la Cruz's and Badiano's *Libellus*. In this regard, this strategy overlaps with previous ones in that global nodes can focus on the incorporation of more diverse local materials with an emphasis on fundamental and marginalized materials and artifacts through the establishment of stronger bio-diverse networks in their local context. In this case, BHL could act as a mediator, providing the infrastructure, plans, and guidelines to aid the participation of more diverse global nodes.

Additionally, a key aspect of this strategy lies in the promotion of networking with and, especially, among global partners. As revealed by web analytical and social media data as well as metadata patterns of BHL's collection, there is little to no cross-Global South collaboration and interaction around BHL. Thus, BHL should devise an outreach plan that promotes exchange not only between the Library and its partners but between partners themselves, especially those located in the Global South. This move, in turn, has the potential to diversify collections by establishing collaboration efforts around marginalized and shared artifacts from these regions, for example, opening spaces for the shared (hi)stories of *pyrostegia venusta* in Latin America and India and of *Bertholletia excelsa* in Brazil and Africa. In this regard, such diversification could lead to the inclusion of more bio-diverse interspecies (hi)stories as told by plural humanities.

5. *Revise metadata standards and vocabulary.*

As argued in Chapter 3, metadata from BHL not only reveals the nuances of the presences and absences in the archive but also carries colonial meanings in the very categories used for curation. In this sense, BHL should develop decolonial standards for metadata annotation. These standards can be implemented on two levels; by partners themselves, who would need to adjust their practices prior to contributing materials to BHL, and by BHL itself when incorporating those materials into its collection. Depending on the nature of the partnership and the resources of each partner

institution, one or both modes of implementation can be selected on a case-by-case basis.

Moreover, considering the patterns identified through the analyses presented in this dissertation, decolonial standards for metadata annotation in the case of BHL should focus on two main points of urgency: changing colonial vocabularies and contextualizing metadata. In terms of vocabularies, a fundamental change would be to eliminate the term *Indian* from metadata and replace it with more appropriate terms, such as *Indigenous peoples*. In terms of contextualization, this task might seem more daunting in that the hundreds of thousands of materials contained in BHL (177,014 titles as of May 2022) make it a challenge to annotate them all individually. In this sense, I suggest two main strategies. The first one would be to prioritize titles based on subject selection, following a similar methodology as the one proposed in Chapter 3. BHL could, for instance, focus on materials specific to regions in the Global South and/or published during colonial periods.

Additionally, the second feasible strategy for the contextualization of metadata would be to undertake a citizen science approach. As explained in Chapter 2, BHL has already implemented citizen science strategies, for example, during social media campaigns. As discussed in Chapter 1, citizen science can also be promoted through mobile apps, as is the case of NaturaLista. A project for metadata annotation in line with the most basic principles of citizen science, that is, for users of BHL to “actively contribute to science either with their intellectual effort or surrounding knowledge” (Socientize 8) in contextualizing materials might be a suitable and practical strategy for the Library. Likewise, BHL could follow the citizen science scheme of other collaborative catalogues (Boast and Enote 108), especially concerning materials by and/or about Indigenous peoples, such as the Plateau Peoples’ Web Portal (Christen 194–207) and the Cherokee Songs and Stories digital archive (Cushman, ‘Wampum, Sequoyan, and Story: Decolonizing the Digital Archive.’ 115–77).

Contextualized metadata has the potential to promote more equitable representation of marginalized groups, counteract knowledge appropriation by nuancing otherwise rigid categories

such as that of *author*, and continue with the Library's decolonizing endeavours following the publication of its *Acknowledgement of harmful content*. Similarly, contextualized metadata can become an instance of what Anne Gilliland and Michelle Caswell call "impossible archival imaginaries," that is, materials that "are archivally impossible in the sense that they will never result in actualized records in any traditional sense, although they may exist in some kind of co-constitutive relationship with actualized records" (61). If traditional archives are "the law of what can be said" (Foucault 129), contextualized metadata can translate into new avenues for the articulation of narratives that coexist, sympoietically, with those recorded in the artifacts and standard metadata.

Finally, contextualizing metadata can constitute a more genuine effort to repatriate the knowledge included in BHL and follow the principles sought by its Secretariat. As I argued in Chapter 2, while it is questionable whether BHL's openly accessible collection is an instance of repatriation, it can be seen as virtual epistemic repatriation inasmuch as it engenders (re)new(ed) cycles of storytelling by providing access to bio-diverse narratives. However, for virtual epistemic repatriation to be truly decolonial and sympoietic, it needs to open space for plural (hi)stories, a goal attainable by contextualizing metadata, especially so that systematically oppressed voices, historically removed and omitted from the archive, can find a way towards self-representation.

Overall, the main goal for BHL as advanced in this thesis should be to become the archive of a cyborgian rhizomatic sympoietic existential utopia of biodiversities in the Anthropocene, that is, a storytelling mechanism for bio-diverse (hi)stories of decoloniality that can promote an equitable mediation for interspecies relationships with a focus on plural humanities. BHL has consolidated as a widely known and consulted archive for matters related to biodiversity studies and natural history. Nevertheless, it still perpetuates colonial views of the human and nonhuman (hi)stories it contains and of those it does not. All knowledge production stemming from the records contained in BHL

will carry the biases and colonial roots of the narratives that precede it. The coloniality of knowledge that the archive has inherited passes from the Library to its readers and to its practices of representation and is harboured in digital environments. In the case of BHL, that coloniality also passes to the virtual relationships established between human users and nonhuman species.

I ask again, what if we were to create a decolonial bio-diverse archive? If BHL can become such an archive, and I believe it is on the right path to do so, then the intraspecies relationships it promotes as well as the epistemic and narrative relationships amongst plural humanities it engenders will become sympoietic and rhizomatic. BHL would then become a vehicle for storytelling processes characterized by the equitable coexistence, virtual and nonvirtual, of our human and nonhuman kin and their intertwining (hi)stories. BHL would be a decolonial archive of the Anthropocene.

Notes for Conclusion

ⁱ the only great herbal that employs the Nahuatl language to name plants, just as it is the only one that contains vegetable elements that were completely unknown to European botany and are of Mexican origin.

ⁱⁱ to capture in a herbal the knowledge he possessed on Mexican medicinal plants.

ⁱⁱⁱ to win the King's favor for the Colegio and its resident Indigenous peoples [and] fulfill the personal interests of the family of Viceroy Mendoza.

^{iv} This is the flower represented in the emblem of the Instituto Nacional de Cardiología, as discussed in the following section of this conclusion.

^v a transformation under which cultural identities are constantly re-constructed.

^{vi} amalgamate two souls, two modes of culture, two forms of beauty.

^{vii} an Aztec heart as represented in numerous codices.

^{viii} this heart is embraced by two branches of a plant; on one of them, there is a European flower, the foxglove [referring to the genus *digitalis*], on the other, an American one, the yolloxóchitl, both with comparable pharmacologic effects on the heart.

^{ix} In relation to cultural practices in Mexico, Brito Guadarrama highlights the influence of Indigenous markets, specifically in Tlatelolco, in the production of the *Libellus*, for there was a strong herbal tradition in these markets and they were also a site for the commercialization of materials “para la confección de *amoxtlis* o libros mesoamericanos” (15) [for the production of *amoxtlis* or Mesoamerican books]. Thus, the *Libellus* shows important medical and commercial traditions that still survive in Mexico's practices and cultural and social spaces, such as the tianguis.

^x a symbol of the reestablishment of the official relationships between our country [Mexico] and the Holy See.

^{xi} both the general public and specialists can approach these materials, which constitute one of the most important sources to study the ancient cultures of Mexico.

^{xii} As of May 2022, the virtual visit to the exhibition is still available through INAH's Mediateca (<https://mediateca.inah.gob.mx/webapps/compilaciones/codicesMexico/>).

^{xiii} *Códices de México, Memorias y Saberes* (<https://www.codices.inah.gob.mx/pc/index.php>) includes digitized and downloadable versions of 48 Mexican codices of the 16th to 19th centuries. An interactive version of the *Libellus*, with additional explanations about its content and structure, is available at <https://www.codices.inah.gob.mx/pc/micrositio.php>.

^{xiv} have kept that knowledge alive and have contributed to the preservation of the evolutive diversity and cultural richness of Mexico.

^{xv} Updated web analytic data for April 2022, not to be compared with data in Chapter 1 (pertaining to April-June 2020).

^{xvi} The authors were Indians of a recently-conquered country, one of them was called “medic” and the other wrote in Latin. The Colegio de Santa Cruz was opposed because in it, Indians were taught too much... How was a respectable author going to quote a work written in Latin by the Indians themselves? One thing was to study the customs and curiosities of Indians and another was to give credit to a book written by them.

^{xvii} represents autochtone prehispanic roots described directly by an Aztec medic.

^{xviii} During my internship with BHL in the summer of 2021, I worked with Digital Collections Manager Bianca Crowley in the edition of this Acknowledgement. The final version went live in September of that same year and is currently available at <https://about.biodiversitylibrary.org/about/harmful-content/>.

^{xix} I presented a preliminary version of these strategies at BHL's Annual Meeting in 2021 (Ponce de la Vega, *Closing Keynote: Decolonizing Strategies for an Equitable Biodiversity Heritage Library*).

Appendix

Websites selected for comparison in the analysis of web analytic data presented in Chapter 1 and referenced in subsequent chapters.

1. BHL's website: biodiversitylibrary.org
2. CONABIO's website: biodiversidad.gob.mx
 - a. CONABIO has two primary websites plus several affiliated ones. Its main sites are a subfolder¹ of the Mexican government's website, gob.mx/conabio, and a specific website for CONABIO's content about biodiversity, biodiversidad.gob.mx. I selected the latter for analysis because it offers more and more meaningful information concerning Mexican biodiversities and because it is not a subfolder, which means that the data from biodiversidad.gob.mx are not only more specific to CONABIO but also prevent an unbalanced comparison, that is, comparing domains and subdomains to subfolders.
3. CONABIO-affiliated websites:
 - a. Bioteca: bioteca.biodiversidad.gob.mx, subdomain² of CONABIO's website on biodiversity.
 - i. CONABIO's Bioteca is the organism's online library, which includes books, guides, posters, maps, audio files, and videos created by CONABIO. I include this website in the analysis not only because it is CONABIO's main repository for its original materials but also because it is, like BHL, an online archive. A comparison of these three websites provides a general panorama of the engagement of audiences with bio-diverse

¹ A subfolder is a content repository to a domain name that is not an independent URL, that is, a subfolder is always a path within a specific domain and is completely dependant to it (Valentino). In this case, www.gob.mx is the domain of which [/conabio](http://conabio) is a subfolder.

² Like subfolders, a subdomain is a repository within a domain. However, "subdomains are also URLs which means you can access them just like a regular website address" and are often created "when a portion of a website requires its own server" (Valentino). Therefore, even though bioteca.biodiversidad.gob.mx is a subdomain of www.biodiversidad.gob.mx, CONABIO's Bioteca has a separate URL, thus providing interesting web analytic data for comparison to the other selected websites.

knowledges, as well as the status of biodiversity-related online archives, especially considering the BHL-CONABIO partnership.

- b. NaturaLista: naturalista.mx, CONABIO-affiliated Mexican biodiversity social network.
 - i. NaturaLista is a project directly inspired by and in partnership with California-based iNaturalist (inaturalist.org) and constitutes its Mexican branch.
4. Other Mexican digital archives:
- a. UNAM's Repositorio Institucional [Institutional Repository] (RI-UNAM): repositorio.unam.mx.
 - i. RI-UNAM is the archival repository of the National Autonomous University of Mexico (UNAM). This archive has contributed to BHL's collections via CONABIO with digital materials on biodiversities from several UNAM faculties and institutions. RI-UNAM acts in these analyses as an important mid-point of reference because it includes materials specific to Mexican and other biodiversities (many of which are part of BHL México) but also a wide array of non-biodiversity-related materials.
 - b. MEXICANA: Repositorio del Patrimonio Cultural de México [Repository of the Cultural Heritage of Mexico], mexicana.cultura.gob.mx.
 - i. MEXICANA is the digital archive of national cultural heritage of the Mexican government, instituted as a repository of Mexican distinct cultural artifacts to be shared with the national population and other communities worldwide. While MEXICANA has no explicit connection to BHL, CONABIO, or biodiversities, its incorporation in this analysis highlights several issues around digital archives and archival practices in the country and overlaps with the idea of heritage behind bio-diverse knowledges and BHL itself.

Works Cited

- Abbot, C. G. 'Foreword'. *Concerning the Badianus Manuscript, an Aztec Herbal, 'Codex Barberini, Latin 241' (Vatican Library) (with Four Plates)*, by Emily Walcott Emmart, vol. 2, The Smithsonian Institution, 1935, <https://hdl.handle.net/2027/uiug.30112106573550>.
- Abraham, Itty. 'The Contradictory Spaces of Postcolonial Techno-Science'. *Economic and Political Weekly*, vol. 41, no. 3, Jan. 2006, pp. 210–17.
- Acosta, Joaquín. 'Advertencia Preliminar'. *Viajes científicos a los Andes Ecuatoriales ó Colección de memorias sobre física, química e historia natural de La Nueva Granada, Ecuador y Venezuela presentada a la Academia de Ciencias de Francia*, by Jean Baptiste Boussingault and Francois Desire Raulin, translated by Joaquín Acosta, Librería Castellana, 1849, pp. 10–11, <https://www.biodiversitylibrary.org/item/235575#page/6/mode/1up>.
- Adkins, Brent. *Deleuze and Guattari's A Thousand Plateaus: A Critical Introduction and Guide*. Edinburgh University Press, 2015.
- AECID México. 'Fondo Mixto de Cooperación Técnica y Científica México-España'. *Gobierno de España-Embajada de España en México-AECID*, <https://aecid.org.mx/fondo-mixto-de-cooperacion-tecnica-y-cientifica-mexico-espana/>. Accessed 20 May 2021.
- Aguilar-Rocha, Mónica. 'A Lifetime among Cacti: Helia Bravo-Hollis'. *Biodiversity Heritage Library Blog*, <https://blog.biodiversitylibrary.org/2019/03/helia-bravo-hollis.html>. Accessed 7 Oct. 2020.
- Abrefs. *Website Authority Checker*. Version 2021, <https://ahrefs.com/website-authority-checker>.
- . 'What Is Domain Rating (DR)?' *Abrefs Help Center*, <https://help.ahrefs.com/en/articles/1409408-what-is-domain-rating-dr>. Accessed 15 Sept. 2021.
- Alaimo, Stacy. 'Animal'. *Keywords for Environmental Studies*, edited by Joni Adamson et al., NYU Press,

- 2016, pp. 9–13, <http://www.jstor.org/stable/j.ctt15zc5kw>.
- Albertos, Carmaña, and Carmen Martín. *Guía de conceptos clave para el trabajo con pueblos indígenas*. Inter-American Development Bank, 2021, <https://publications.iadb.org/publications/spanish/document/Guia-de-conceptos-clave-para-el-trabajo-con-pueblos-indigenas.pdf>.
- Albornoz, Denisse, et al. ‘Principles for an Inclusive Open Science: The OCSDNet Manifesto’. *Contextualizing Openness. Situating Open Science*, edited by Leslie Chan, University of Ottawa Press, 2019, pp. 23–50.
- Alfaro, Anastasio. ‘Introducción’. *Lista de las plantas encontradas hasta ahora en Costa Rica y en los territorios limítrofes extractada de la ‘Biología Centrali-Americana.’*, 1887, pp. 1–2.
- Andermann, Jens. *Tierras en trance: Arte y naturaleza después del paisaje*. Metales Pesados, 2018.
- Añón, Valeria. ‘Los usos del archivo: reflexiones situadas sobre literatura y discurso colonial’. *(In)Disciplinar la investigación: Archivo, trabajo de campo y escritura*, edited by Frida Gorbach and Mario Rufer, Universidad Autónoma Metropolitana, Siglo Veintiuno Editores, 2017, pp. 251–74.
- Anti-Discrimination Commission Queensland. *Aboriginal People in Queensland: A Brief Human Rights History*. Anti-Discrimination Commission Queensland, 2017.
- Arredondo García, Arcelia. *Propuesta de reforma que adiciona una fracción al Artículo 2o de la Constitución Política de los Estados Unidos Mexicanos, en materia de lenguas indígenas, presentada por la Diputada Arcelia Arredondo García, del Grupo Parlamentario del PAN, en la sesión del jueves 3 de abril de 2003*. http://www.diputados.gob.mx/sia/coord/refconst_lvi/iii/html/249.htm. Accessed 29 June 2020.
- Asociación de Internet.mx. *14o Estudio sobre los hábitos de los usuarios de Internet en México 2018*. 17 May 2018, <https://www.asociaciondeinternet.mx/estudios/antiguos>.

- Autoridad del Canal de Panamá. 'Reseña histórica del Canal de Panamá'. *Canal de Panamá*, <https://micanaldepanama.com/historia-del-canal/resena-historica-del-canal-de-panama/>. Accessed 5 Oct. 2021.
- Banton, Mandy. 'Displaced Archives in The National Archives of the United Kingdom'. *Displaced Archives*, edited by James Lowry, Routledge: Taylor & Francis Group, 2017.
- Benítez-Díaz, Hesiquio. *The Like-Minded Megadiverse Countries Group (LMMC)*. https://www.environment.gov.za/sites/default/files/docs/mexicopresentation_lmmc.pdf. SBSTTA 17, Montreal, Canada.
- Bennet, Tom. 'The Complete Guide to Direct Traffic in Google Analytics'. *Moz*, <https://moz.com/blog/guide-to-direct-traffic-google-analytics>. Accessed 15 Sept. 2021.
- Bhambra, Gurinder K. *Rethinking Modernity: Postcolonialism and the Sociological Imagination*. Palgrave Macmillan, 2007.
- 'BHL Metadata'. *BHL Staff Wiki Archive*, <https://admin.biodiversitylibrary.org/wiki-archive/mainSpace/BHL%20Metadata.html#BHL%20Metadata%20Requirements>. Accessed 30 Oct. 2020.
- 'BHL México'. *Internet Archive*, <https://archive.org/details/%40conabio?&sort=-publicdate&page=2>. Accessed 30 May 2020.
- BiblioCommons. 'About Us'. *BiblioCommons*. www.bibliocommons.com, <https://www.bibliocommons.com/about-us>. Accessed 29 July 2020.
- 'Bignonia Venusta'. *International Plant Names Index*, <https://www.ipni.org/n/109094-1>. Accessed 30 Oct. 2020.
- Biodiversity Heritage Library. *About the Biodiversity Heritage Library*. <https://about.biodiversitylibrary.org/>. Accessed 27 Jan. 2022.
- . *Acknowledgment of Harmful Content – About BHL*.

- <https://about.biodiversitylibrary.org/about/harmful-content/>. Accessed 27 Jan. 2022.
- . 'Bibliography for "Bignonia Venusta"'. *Biodiversity Heritage Library*,
[https://www.biodiversitylibrary.org/name/Bignonia_venusta_Ker_Gawl\\$](https://www.biodiversitylibrary.org/name/Bignonia_venusta_Ker_Gawl$). Accessed 21 Oct. 2020.
- . 'Bibliography for "Pyrostegia Venusta"'. *Biodiversity Heritage Library*,
https://www.biodiversitylibrary.org/name/Pyrostegia_venusta. Accessed 21 Oct. 2020.
- . *Biodiversity Heritage Library Bylaws*. 14 Mar. 2018,
<https://about.biodiversitylibrary.org/about/bylaws/>.
- . *Biodiversity Heritage Library Outreach*. *YouTube*,
https://www.youtube.com/watch?v=yRqHEtberoU&list=PLYj_4vJM9EptmORlFdss4DMp40F3QvKvA&index=7&t=0s. Accessed 30 June 2020.
- . 'Browse Instituto de Biología UNAM'. *BHL-Biodiversity Heritage Library*,
<https://www.biodiversitylibrary.org/browse/contributor/IBUNAM01#/titles>. Accessed 3 Aug. 2020.
- . *Catalogue Record: Familiar Indian Flowers*.
<https://www.biodiversitylibrary.org/bibliography/49434#/summary>.
- . *Catalogue Record: The Botanical Register*.
<https://www.biodiversitylibrary.org/bibliography/382#/summary>.
- . 'Developer and Data Tools – About BHL'. *BHL-Biodiversity Heritage Library*.
about.biodiversitylibrary.org, <https://about.biodiversitylibrary.org/tools-and-services/developer-and-data-tools/>. Accessed 27 June 2020.
- . 'Her Natural History: A Celebration of Women in Natural History'. *BHL-Biodiversity Heritage Library*, <https://about.biodiversitylibrary.org/get-involved/events/her-natural-history/>.
Accessed 9 Oct. 2020.

- . 'Orange Trumpetvine (Pyrostegia Venusta)'. *Instagram*, 15 Mar. 2019, <https://www.instagram.com/p/BvB7Hh1AnSh/>.
- . *www.biodiversitylibrary.org-/data/*. July 2021, <https://www.biodiversitylibrary.org/data>. Biodiversity Heritage Library, and North Queensland Naturalists' Club. 'Metadata Record for The North Queensland Naturalist: The Journal and Magazine of the North Queensland Naturalist Club'. *BHL-Biodiversity Heritage Library*, pp. 1–126, <https://www.biodiversitylibrary.org/bibliography/174248>.
- 'Biodiversity Heritage Library Partners'. *Google My Maps*. *www.google.com*, <https://www.google.com/maps/d/viewer?mid=1HNC9UtgizxslZXG2Djq1oXCrPpI&hl=en>. Accessed 1 Aug. 2020.
- Biosafety Unit, Biosafety. *History of the Convention*. Secretariat of the Convention on Biological Diversity, 2 July 2020. *www.cbd.int*, <https://www.cbd.int/history/>.
- Blanc, Nathalie. 'The Aesthetics of Nature'. *Rethinking Nature. Challenging Disciplinary Boundaries*, edited by Aurélie Choné et al., Routledge, 2017, pp. 67–74.
- Boast, Robin, and Jim Enote. 'Virtual Repatriation: It Is Neither Virtual nor Repatriation'. *Heritage in the Context of Globalization: Europe and the Americas*, edited by Peter Biehl and Christopher Prescott, Springer Science+Business Media, 2013, pp. 103–13.
- Bone, Christine, and Brett Loughheed. 'Library of Congress Subject Headings Related to Indigenous Peoples: Changing LCSH for Use in a Canadian Archival Context.' *Cataloging & Classification Quarterly*, vol. 56, no. 1, 2018, pp. 83–95, <https://doi.org/10.1080/01639374.2017.1382641>.
- Boserup, Ivan. 'The Manuscript and the Internet: Digital Repatriation of Cultural Heritage'. *IFLA Journal*, vol. 31, no. 2, 2005, pp. 169–73, <https://doi.org/10.1177/0340035205054881>.
- Brito Guadarrama, Baltazar. 'Estudio introductorio'. *Códice De la Cruz-Badiano*, by Martín De la Cruz and Juan Badiano, edited by Ángel Jesús Beltrán Acosta and Eduardo Muñoz de Alba L.,

- Secretaría de Relaciones Exteriores, Secretaría de Cultura, Instituto Nacional de Antropología e Historia, Biblioteca Nacional de Antropología e Historia, 2020, pp. 11–35.
- Brody, Roberta. ‘Information Ethics in the Design and Use of Metadata.’ *IEEE Technology and Society Magazine*, Summer 2003, pp. 34–39.
- Byland, Bruce. ‘Introduction to the Dover Edition’. *An Aztec Herbal: The Classic Codex of 1552*, by William Gates, Dover Publications, 2000, pp. iii–xiii.
- Cabello, Felipe C. ‘Diego Rivera: Gran maestro y un didáctico y lúcido historiador de la medicina’. *Revista Médica de Chile*, vol. 142, no. 11, Nov. 2014, pp. 1458–66, <http://dx.doi.org/10.4067/S0034-98872014001100014>.
- Cámara de Diputados del Honorable Congreso de la Unión. *Ley General de Derechos Lingüísticos de los Pueblos Indígenas*. http://www.diputados.gob.mx/LeyesBiblio/pdf/257_200618.pdf.
- Cárdenas, Manuel. ‘El escudo del Instituto Nacional de Cardiología “Ignacio Chávez”’. *Archivos de Cardiología de México*, vol. 74, no. 3, Sept. 2004, pp. 173–75.
- Cardoso, Bárbara R., et al. ‘Brazil Nuts: Nutritional Composition, Health Benefits and Safety Aspects’. *Food Research International*, vol. 100, 2017, pp. 9–18, <http://dx.doi.org/10.1016/j.foodres.2017.08.036>.
- Carruth, Allison. ‘The Digital Cloud and the Micropolitics of Energy’. *Public Culture*, vol. 26, no. 2, 2014, pp. 339–64, <https://doi.org/10.1215/08992363-2392093>.
- Carver, Matthew. ‘Learning to Work Responsibly’. *The Responsive Web*, Manning Publications, 2015, https://learning.oreilly.com/library/view/the-responsive-web/9781617291241/kindle_split_010.html. O’Reilly Safari Learning Platform.
- Castro Escamilla, Minerva. ‘Jesús Sánchez’s Mexican Medical Zoology’. *Biodiversity Heritage Library Blog*, <https://blog.biodiversitylibrary.org/2016/09/jesus-sanchezs-mexican-medical-zoology.html>. Accessed 7 Oct. 2020.

- Castro-Gómez, Santiago. ‘¿Qué hacer con los universalismos occidentales? Observaciones en torno al giro decolonial’. *Sujeto, decolonización, transmodernidad: Debates filosóficos latinoamericanos*, edited by Mabel Moraña, Iberoamericana Editorial Vervuert, 2018, pp. 181–207, <https://doi.org/10.31819/9783954877003>.
- Castro-Gómez, Santiago, and Eduardo Mendieta. ‘La translocalización discursiva de “Latinoamérica” en tiempos de la globalización’. *Teorías sin disciplina: Latinoamericanismo, poscolonialidad y globalización en debate*, edited by Santiago Castro-Gómez and Eduardo Mendieta, Miguel Ángel Porrúa, University of San Francisco, 1998, pp. 5–30.
- Caswell, Michelle, et al. “‘To Suddenly Discover Yourself Existing’: Uncovering the Impact of Community Archives’. *The American Archivist*, vol. 79, no. 1, 2016, pp. 56–81.
- Chakrabarty, Dipesh. ‘The Climate of History: Four Theses’. *Critical Inquiry*, vol. 35, no. 2, 2009, pp. 197–222.
- . ‘The Human Condition in the Anthropocene’. *The Tanner Lectures on Human Values*, edited by Mark Matheson, vol. 35, University of Utah Press, 2016, pp. 139–88.
- . ‘The Seventh History and Theory Lecture. Anthropocene Time’. *History and Theory*, vol. 57, no. 1, 2018, pp. 5–32, <https://doi.org/10.1111/hith.12044>.
- Chan, Leslie. ‘Situating Openness: Whose Open Science?’ *Contextualizing Openness. Situating Open Science*, edited by Leslie Chan, University of Ottawa Press, 2019, pp. 5–22.
- Christen, Kimberly. ‘Opening Archives: Respectful Repatriation’. *The American Archivist*, vol. 74, no. 1, 2011, pp. 185–210.
- Cohen, Daniel J. ‘From Open Access to Maximal Access’. *Libraries and Archives in the Digital Age*, edited by Susan L. Mizruchi, Palgrave Macmillan, 2020, pp. 27–34.
- Comisión Nacional para el Conocimiento y Uso de la Biodiversidad (CONABIO). ‘CONABIO-España’. *Biodiversidad Mexicana*, 2016,

- <https://www.conabio.gob.mx/planeta/internacional/espana.html>.
- . *Estrategia Nacional sobre Biodiversidad de México (ENBioMex) y Plan de Acción 2016-2030*. Comisión Nacional para el Conocimiento y Uso de la Biodiversidad, 2016.
- . 'México megadiverso'. *Biodiversidad Mexicana*. www.biodiversidad.gob.mx, <https://www.biodiversidad.gob.mx/pais/quees>. Accessed 20 July 2020.
- . '¿Qué hacemos?' *Gobierno de México | Comisión Nacional Para El Conocimiento y Uso de La Biodiversidad*, <https://www.gob.mx/conabio/que-hacemos>. Accessed 21 July 2020.
- Comisión Nacional para el Desarrollo de los Pueblos Indígenas, and Programa de las Naciones Unidas para el Desarrollo. *Regiones Indígenas de México*. Edited by Enrique Serrano Carreto, Comisión Nacional para el Desarrollo de los Pueblos Indígenas, 2006.
- Consejo Nacional de Evaluación de la Política de Desarrollo Social. 'Informes de pobreza y evaluación de las Entidades Federativas 2020'. *CONEVAL - Entidades Federativas*, 2020, https://www.coneval.org.mx/coordinacion/entidades/Paginas/Informes_Pobreza_Evaluacion_2020.aspx.
- Constantino, Grace. 'Biología Centrali-Americana & Hispanic Heritage Month'. *Biodiversity Heritage Library Blog*, 20 Sept. 2012, <https://blog.biodiversitylibrary.org/2012/09/biologia-centrali-americana-hispanic-heritage-month.html>.
- . 'Empowering Research on Marine Bioinvasions to Support Conservation of Native Species and Ecosystems'. *Biodiversity Heritage Library Blog*, 8 Oct. 2020, <https://blog.biodiversitylibrary.org/2020/10/marine-bioinvasions-evangelina-schwindt.html>.
- Cresswell, Tim. *Place: A Short Introduction*. Blackwell, 2004.
- Croucher, Sheila. *Globalization and Belonging: The Politics of Identity in a Changing World*. Rowman & Littlefield, 2018.

- Crutzen, Paul J. 'Geology of Mankind'. *Nature*, vol. 415, Jan. 2002, p. 23.
- Crutzen, Paul J., and Eugene F. Stoermer. "The "Anthropocene"". *The Future of Nature: Documents of Global Change*, edited by Libby Robin et al., 2013, pp. 483–85.
- Cueto, Marcos. 'Spanish South America'. *The Cambridge History of Science*, edited by Hugh Richard Slotten et al., vol. 8, Cambridge University Press, 2020, pp. 763–81.
- Cushman, Ellen. 'Supporting Manuscript Translation in Library and Archival Collections: Toward Decolonial Translation Methods'. *Libraries and Archives in the Digital Age*, edited by Susan L. Mizruchi, Palgrave Macmillan, 2020, pp. 53–68.
- . 'Wampum, Sequoyan, and Story: Decolonizing the Digital Archive.' *College English. Special Issue: The Digital Humanities and Historiography in Rhetoric and Composition.*, vol. 76, no. 2, Nov. 2013, pp. 115–35.
- Darroch, Michael, et al. 'Node: Actuality-Virtuality'. *Mapping Intermediality in Performance*, edited by Sarah Bay-Cheng et al., Amsterdam University Press, 2010, pp. 141–42, <http://www.jstor.com/stable/j.ctt46mwjd.25>.
- DCMI. 'DCMI Metadata Terms'. *Dublin Core Metadata Initiative*, <http://dublincore.org/specifications/dublin-core/dcmi-terms/>. Accessed 27 June 2020.
- De Ávila, Alejandro. 'The Codex Cruz-Badianus: Directions for Future Research'. *Flora: The Aztec Herbal*, by Martin Clayton et al., The Royal Collection in Association with Harvey Miller Publishers, 2009, pp. 45–50.
- De la Cruz, Martín. *Libellus de medicinalibus indorum herbis. Manuscrito azteca de 1552*. Translated by Juan Badiano, vol. 2, Fondo de Cultura Económica & Instituto Mexicano del Seguro Social, 1991.
- De Lary Healy, Jessica. "'This Is the Circle of the Art World": Joe Gumbula and the Value of Digital Repatriation in Australia and Beyond'. *PDT&C*, vol. 47, no. 3–4, 2019, pp. 149–58, <https://doi.org/10.1515/pdte-2018-0025>.

- ‘Decolonizing the Internet’. *Whose Knowledge?*, <https://whoseknowledge.org/initiatives/decolonizing-the-internet/>. Accessed 7 Mar. 2020.
- Del Pozo, Efrén C. ‘Prefacio’. *Libellus de medicinalibus indorum herbis. Manuscrito azteca de 1552*, by Martín De la Cruz, translated by Juan Badiano, vol. 1, Fondo de Cultura Económica & Instituto Mexicano del Seguro Social, 1991, pp. xvii–xx.
- . ‘Valor médico y documental del manuscrito’. *Libellus de medicinalibus indorum herbis. Manuscrito azteca de 1552*, by Martín De la Cruz, translated by Juan Badiano, vol. 1, Fondo de Cultura Económica & Instituto Mexicano del Seguro Social, 1991, pp. 193–207.
- Deleuze, Gilles, and Felix Guattari. *A Thousand Plateaus: Capitalism and Schizophrenia*. Translated by Brian Massumi, University of Minnesota Press, 1987.
- . *Nomadology: The War Machine*. Semiotext(e), 1986.
- Department of Environmental Affairs South Africa. ‘Group of Like-Minded Megadiverse Countries (LMMC)’. *Environment, Forestry, and Fisheries. Republic of South Africa.*, https://www.environment.gov.za/likeminded_megadiversecountries_lmhc. Accessed 20 July 2020.
- Derrida, Jacques, and Eric Prenowitz. ‘Archive Fever: A Freudian Impression’. *Diacritics*, vol. 25, no. 2, 1995, pp. 9–63.
- Dimenstein, Izak B. ‘Laboratory Educational Authority Website Development’. *International Journal of Education and Information Technology*, vol. 2, no. 2, 2016, pp. 8–13.
- Dobson, Andy. ‘Biodiversity’. *Keywords for Environmental Studies*, edited by Joni Adamson et al., NYU Press, 2016, pp. 17–19, <http://www.jstor.org/stable/j.ctt15zc5kw>.
- Dorta-Duque, María E., and Dominique Babini. ‘Latin America and the Caribbean as Resources for Social Sciences Libraries’. *Open Access and Digital Libraries: Social Science Libraries in Action / Acceso abierto y bibliotecas digitales: Las bibliotecas de ciencias sociales en acción*, edited by Lynne M.

- Rudasill and María E. Dorta-Duque, De Gruyter Saur, 2013, pp. 35–54.
- ‘Dr. J. Medley Wood’. *Nature*, vol. 96, no. 2398, Oct. 1915, pp. 174–75.
- Dufoo-Hurtado, Elisa, et al. ‘Nuts By-Products: The Latin American Contribution’. *Valorization of Agri-Food Wastes and By-Products: Recent Trends, Innovations and Sustainability Challenges*, edited by Rajeev Bhat, Academic Press, 2021, pp. 289–315, <https://doi.org/10.1016/B978-0-12-824044-1.00025-8>.
- Ecology Project International. ‘About EPP’. *Ecology Project International*, 2015. www.ecologyproject.org, <https://www.ecologyproject.org/about>.
- ECOSUR. *Historia - Portal de El Colegio de la Frontera Sur*. May 2020, <https://www.ecosur.mx/historia/>.
- Edwards, Ashley. ‘Decolonizing the Library: What We’re Doing | SFU Library’. *Simon Fraser University Library*, 19 Apr. 2021, <https://www.lib.sfu.ca/help/academic-integrity/indigenous-initiatives/decolonization/activities>.
- Edwards, Sydenham, and James Ridgway. *The Botanical Register. Consisting of Coloured Figures of Exotic Plants Cultivated in British Gardens; with Their History and Mode of Treatment*. Printed for James Ridgway, 1817, pp. 1–284, <https://www.biodiversitylibrary.org/item/9039>.
- Emejulu, Akwugo, and Callum McGregor. ‘Towards a Radical Digital Citizenship in Digital Education’. *Critical Studies in Education*, vol. 60, no. 1, pp. 131–47, <https://doi.org/10.1080/17508487.2016.1234494>.
- Emmart, Emily Walcott. ‘Concerning the Badianus Manuscript, an Aztec Herbal, “Codex Barberini, Latin 241” (Vatican Library) (with Four Plates)’. *Smithsonian Miscellaneous Collections*, vol. 94, no. 2, 1935, pp. 1–22.
- . ‘Preface’. *The Badianus Manuscript (Codex Barberini, Latin 241)*. *Vatican Library. An Aztec Herbal of 1552*, The Johns Hopkins Press, 1940, pp. xiii–xxiv.

- . 'The Badianus Manuscript, an Aztec Pharmacopoeia'. *Journal of the American Pharmaceutical Association*, vol. 24, no. 9, Sept. 1935, pp. 771–74, <https://doi.org/10.1002/jps.3080240911>.
- Encyclopedia of Life. 'Crotalus Basiliscus (Cope 1864) Names - Encyclopedia of Life'. *Eol*, <https://eol.org/pages/815841/names>. Accessed 29 July 2020.
- Ernst, Wolfgang. "'Electrified Voices": Non-Human Agencies of Socio-Cultural Memory'. *Memory in Motion. Archives, Technology, and the Social*, edited by Ina Blom et al., Amsterdam University Press, 2017, pp. 41–59.
- Espinosa de los Monteros, Pamela. 'Decolonial Information Practices: Repatriating and Stewarding the Popol Vuh Online'. *Preservation, Digital Technology and Culture*, vol. 48, no. 3–4, 2019, pp. 107–19, <https://doi.org/10.1515/pdtc-2019-0009>.
- Farnel, Sharon, et al. 'Rethinking Representation: Indigenous Peoples and Contexts at the University of Alberta Libraries.' *The International Journal of Information, Diversity, & Inclusion*, vol. 2, no. 3, 2018, pp. 9–25.
- Fernández, Justino. 'Las miniaturas que ilustran el Códice'. *Libellus de medicinalibus indorum herbis. Manuscrito azteca de 1552*, by Martín De la Cruz, translated by Juan Badiano, vol. 1, Fondo de Cultura Económica & Instituto Mexicano del Seguro Social, 1991, pp. 101–06.
- 'Flamevine. Scientific Names'. *Encyclopedia of Life*, <https://eol.org/pages/578226/names>. Accessed 20 Oct. 2020.
- Fondo de Cultura Económica, and Instituto Mexicano del Seguro Social. 'Palabras preliminares'. *Libellus de medicinalibus indorum herbis. Manuscrito azteca de 1552*, by Martín De la Cruz, translated by Juan Badiano, vol. 1, Fondo de Cultura Económica & Instituto Mexicano del Seguro Social, 1991, p. IX–XI.
- Forns-Broggi, Roberto. *Knots like Stars. The ABC of Ecological Imagination in Our Americas*. Translated by Karen Rauch, Cambridge Scholars Publishing, 2016.

- Foucault, Michel. *The Archaeology of Knowledge and the Discourse on Language*. Translated by A. M. Sheridan Smith, Pantheon Books, 1972.
- Fox, Robert, and George Weisz. 'France: During the Long Nineteenth Century'. *The Cambridge History of Science*, edited by Hugh Richard Slotten et al., vol. 8, Cambridge University Press, 2020, pp. 192–216.
- Fredericks, Joel, and Marcus Foth. 'Augmenting Public Participation: Enhancing Planning Outcomes through the Use of Social Media and Web 2.0'. *Australian Planner*, vol. 50, no. 3, 2013, pp. 244–56, <http://dx.doi.org/10.1080/07293682.2012.748083>.
- Freeland, Chris. 'BHL Poster for AETFAT2010'. *ChrisFreeland*, 19 Apr. 2010, <http://blog.chrisfreeland.com/2010/04/>.
- Frick, Caroline. 'Repatriating American Film Heritage or Heritage Hoarding? Digital Opportunities for Traditional Film Archive Policy'. *Convergence: The International Journal of Research into New Media Technologies*, vol. 21, no. 1, 2015, pp. 116–31, <https://doi.org/10.1177/1354856514560999>.
- Gaikwad, Jitendra, and Vishwas Chavan. 'Open Access and Biodiversity Conservation: Challenges and Potentials for the Developing World'. *Data Science Journal*, vol. 5, June 2006, pp. 1–17.
- Galina Russell, Isabel. 'La digitalización de fondos patrimoniales. El caso de México'. *Relaciones. Estudios de Historia y Sociedad*, vol. 155, 2018, pp. 135–66, <http://dx.doi.org/10.24901/rehs.v39i154.300>.
- Garibay, Ángel María. 'Advertencia sobre el texto y la versión'. *Libellus de medicinalibus indorum herbis. Manuscrito azteca de 1552*, by Martín De la Cruz, translated by Juan Badiano, vol. 1, Fondo de Cultura Económica & Instituto Mexicano del Seguro Social, 1991, p. 11.
- . 'Introducción'. *Libellus de medicinalibus indorum herbis. Manuscrito azteca de 1552*, by Martín De la Cruz, translated by Juan Badiano, vol. 1, Fondo de Cultura Económica & Instituto Mexicano

- del Seguro Social, 1991, pp. 3–8.
- Gates, William. ‘Classification’. *An Aztec Herbal: The Classic Codex of 1552*, by William Gates, Dover Publications, 2000, pp. xxix–xliv.
- . ‘Introduction to the Mexican Botanical System’. *An Aztec Herbal: The Classic Codex of 1552*, by William Gates, Dover Publications, 2000, pp. xvii–xxviii.
- Ghilarov, Alexej. ‘What Does “Biodiversity” Mean - Scientific Problem or Convenient Myth?’ *TREE*, vol. 11, no. 7, 1996, pp. 304–06.
- Gil, Alex. ‘Interview with Ernesto Oroza’. *Debates in the Digital Humanities 2016*, edited by Matthew Gold and Lauren Klein, University of Minnesota Press, 2016, pp. 184–93.
- Gilliland, Anne J., and Michelle Caswell. ‘Records and Their Imaginaries: Imagining the Impossible, Making Possible the Imagined’. *Arch Sci*, vol. 16, 2016, pp. 53–75, <https://doi.org/10.1007/s10502-015-9259-z>.
- Gimmel, Millie. ‘Reading Medicine in the Codex De La Cruz Badiano’. *Journal of the History of Ideas*, vol. 69, no. 2, Apr. 2008, pp. 169–92.
- Godman, Frederick DuCane. ‘Introduction’. *Biologia Centrali-Americana. Zoology, Botany, and Archaeology*, by Frederick DuCane Godman, vol. Introductory Volume, R. H. Porter, 1915.
- Google Analytics. ‘Channels - Analytics Help’. *Google Analytics Help Center*, 2021, https://support.google.com/analytics/topic/6010089?hl=en&ref_topic=3125765.
- Gordillo Sánchez, Daniel Guillermo. ‘Decolonización, bibliotecas y América Latina: Notas para la reflexión’. *Investigación bibliotecológica*, vol. 31, no. 73, 2017, pp. 131–55.
- Guerra, Francisco. *Libellus de medicinalibus indorum herbis. El manuscrito pictórico mexicano-latino de Martín de la Cruz y Juan Badiano de 1552. Estudio, texto y versión*. Vargas Rea, El Diario Español, 1952.
- Guerrini, Luigi. ‘The Accademia Dei Lincei, the New World and the “Libellus de Medicinalibus Indorum Herbis”’. *Flora: The Aztec Herbal*, by Martin Clayton et al., The Royal Collection in

- Association with Harvey Miller Publishers, 2009, pp. 20–44.
- Guha, Ramachandra. ‘Radical American Environmentalism and Wilderness Preservation: A Third World Critique’. *The Future of Nature: Documents of Global Change*, edited by Sverker Sörlin et al., Yale University Press, 2013, pp. 409–31.
- Gwinn, Nancy, and Constance Rinaldo. ‘The Biodiversity Heritage Library: Sharing Biodiversity Literature with the World’. *IFLA Journal*, vol. 35, no. 1, 2009, pp. 25–34, <https://doi.org/10.1177/0340035208102032>.
- Haider, Salman. ‘Library and Information Science Encyclopedia’. *Librarianship Studies & Information Technology*, <https://www.librarianshipstudies.com/2018/03/library-information-science-encyclopedia.html>. Accessed 4 Feb. 2022.
- Haila, Yrjö, and Jari Kouki. ‘The Phenomenon of Biodiversity in Conservation Biology’. *Annales Zoologici Fennici*, vol. 31, no. 1, 1994, pp. 5–18.
- Haraway, Donna J. *Simians, Cyborgs, and Women: The Reinvention of Nature*. Routledge, 1991.
- . *Staying with the Trouble: Making Kin in the Chthulucene*. Duke University Press, 2016.
- Haynes, David. *Metadata for Information Management and Retrieval*. Facet Publishing, 2004.
- Hecker, Susanne, et al. ‘Innovation in Open Science, Society and Policy. Setting the Agenda for Citizen Science’. *Citizen Science. Innovation in Open Science, Society and Policy*, edited by Susanne Hecker et al., UCL Press, 2018, pp. 1–24, <http://www.jstor.com/stable/j.ctv550cf2.8>.
- Heise, Ursula. ‘From Extinction to Electronics: Dead Frogs, Live Dinosaurs, and Electric Sheep’. *Zoontologies: The Question of the Animal*, edited by Cary Wolfe, University of Minnesota Press, 2003, pp. 59–81.
- . ‘The Android and the Animal’. *PMLA*, vol. 124, no. 2, 2009, pp. 503–10.
- Hennessy, Kate. ‘Virtual Repatriation and Digital Cultural Heritage. The Ethics of Managing Online Collections’. *Anthropology News*, vol. 50, no. 4, 2009, pp. 5–6, <https://doi.org/10.1111/j.1556->

3502.2009.50405.x.

Herbert Doctor, Luis Alfredo. 'Diego Rivera y la representación de la ciencia en sus murales'. *Buzos*, 1 Aug. 2021, <https://buzos.com.mx/index.php/nota/index/8779>.

Holmes, George. 'What Do We Talk about When We Talk about Biodiversity Conservation in the Anthropocene?' *Environment and Society: Advances in Research*, vol. 6, 2015, pp. 87–108, <https://doi.org/10.3167/ares.2015.060106>.

Humboldt, Alexander von, and Aimé Bonpland. *Voyage de Humboldt et Bonpland. Sixième Partie, Botanique. Plantes Équinoxiales Recueillies Au Mexique, Dans l'île de Cuba, Dans Les Provinces de Caracas, de Cumana et de Barcelone, Aux Andes de La Nouvelle Grenade, de Quito et Du Pérou, et Sur Les Bords Du Rio-Negro de Orénoque et de La Rivière Des Amazones*. F. Schoell, 1808, <https://doi.org/10.5962/bhl.title.460>.

Instituto Cervantes. *El español: Una lengua viva. Informe 2019*. 2019, https://www.cervantes.es/imagenes/File/espanol_lengua_viva_2019.pdf.

Instituto Federal de Telecomunicaciones. 'En México hay 80.6 millones de usuarios de Internet y 86.5 millones de usuarios de teléfonos celulares: ENDUTIH 2019. 17 de febrero'. *Instituto Federal de Telecomunicaciones*, 17 Feb. 2020, <http://www.ift.org.mx/comunicacion-y-medios/comunicados-ift/es/en-mexico-hay-806-millones-de-usuarios-de-internet-y-865-millones-de-usuarios-de-telefonos-celulares>.

Instituto Nacional de Antropología e Historia, et al. 'Códices de México. Memorias y saberes'. *Gobierno de México*, <https://www.codices.inah.gob.mx/pc/micrositio.php>. Accessed 21 Mar. 2022.

Jansen, Bernard J. *Understanding User-Web Interactions via Web Analytics*. Morga & Claypool Publishers, 2009.

Jones, Paul Anthony. 'Rio de Janeiro, Brazil. Brazil Nut'. *Around the World in 80 Words: A Journey*

- through the English Language*, University of Chicago Press, 2020, pp. 211–15.
- Kalfatovic, Martin, and Constance Rinaldo. ‘Enabling Progress in Global Biodiversity Research: The Biodiversity Heritage Library’. *Enabling Progress, The Proceedings of the Eighth Shanghai International Library Forum*, Shanghai Scientific and Technological Literature Press, 2016, pp. 406–18.
- Kemmis, Amber. *The Difference Between Direct and Organic Website Traffic Sources*.
<https://www.smartbugmedia.com/blog/what-is-the-difference-between-direct-and-organic-search-traffic-sources>. Accessed 15 Sept. 2021.
- Kennedy, Helen. *Post, Mine, Repeat: Social Media Data Mining Becomes Ordinary*. Palgrave Macmillan, 2016.
- KHCoder 3, 2017, Koichi Higuchi, <https://kncoder.net>.
- Klier, Gabriela, and Guillermo Folguera. ‘¿Caras de una misma moneda? Conservación de la biodiversidad y extractivismo en América Latina’. *Letras Verdes. Revista Latinoamericana de Estudios Socioambientales*, no. 22, 2017, pp. 182–204,
<http://dx.doi.org/10.17141/letrasverdes.22.2017.2704>.
- La Counte, Scott. *Going Mobile: Developing Apps for Your Library Using Basic HTML Programming*. American Library Association, 2012.
- Lagoze, Carl, et al. ‘The Open Archives Initiative Protocol for Metadata Harvesting’. *The Open Archives Initiative Protocol for Metadata Harvesting*, 14 June 2002. www.openarchives.org,
<http://www.openarchives.org/OAI/openarchivesprotocol.html#Introduction>.
- Latour, Bruno. *Politics of Nature: How to Bring the Sciences into Democracy*. Translated by Catherine Porter, Harvard University Press, 2004.
- Lee, Maurice S. ‘Globalism, Transparency, and Loss’. *Libraries and Archives in the Digital Age*, edited by Susan L. Mizruchi, Palgrave Macmillan, 2020, pp. 171–78.

- Legrand-Galarza, Valérie. ‘An Archive on the Intangible Cultural Heritage of Andean Populations in Peru and Bolivia’. *Digital Audiovisual Archives*, edited by Peter Stockinger, John Wiley & Sons, 2012, pp. 63–103.
- ‘Lena Lowis’. *Wikipedia*, 7 Oct. 2020. *Wikipedia*,
https://en.wikipedia.org/w/index.php?title=Lena_Lewis&oldid=982264483.
- LMMC. *Cancun Declaration of Like-Minded Megadiversity Countries*. 18 Feb. 2002,
https://www.environment.gov.za/sites/default/files/docs/cancun_lmmc_declaration1.pdf.
- Local Contexts. ‘Traditional Knowledge (TK) Labels’. *Local Contexts*, <https://localcontexts.org/tk-labels/>. Accessed 27 June 2020.
- Longair, Sarah. *The Coco-de-Mer in the 19th-Century Indian Ocean World: Connections, Conservation and Colonialism*. Plants in Africa and the Global South: Multi-Species Materialities, Ecologies, and Aesthetics (MMEA), Consortium for History of Science, Technology and Medicine.
- López, Luis Enrique. ‘Pueblos, Culturas y Lenguas Indígenas En América Latina’. *Atlas Sociolingüístico de Pueblos Indígenas En América Latina*, by UNICEF and FUNPROEIB Andes, 2009, pp. 19–99.
- Lorenzo, Josique, et al. ‘On Openness and Motivation: Insights from a Pilot Project in Latin America’. *Contextualizing Openness. Situating Open Science*, edited by Leslie Chan, University of Ottawa Press, 2019, pp. 87–106.
- Lorimer, Jamie. ‘Multinatural Geographies for the Anthropocene’. *Progress in Human Geography*, vol. 36, no. 5, 2012, pp. 593–612, <https://doi.org/10.1177/0309132511435352>.
- Lovett, John. *Social Media Metrics Secrets: Do What You Never Thought Possible with Social Media Metrics*. Wiley, 2011.
- Lyal, Christopher H. C. ‘The Dating of the “Biologia Centrali-Americana”’. *Zoological Bibliography*, vol. 1, no. 2, 2011, pp. 67–100.

- Machado Chavarin, Gerardo. *Jinetes de Los Machado: Ejemplo de Ciencia Ciudadana Esencial En Proyectos de Conservación*. <https://www.facebook.com/CONABIO/videos/1948084435321933>. Veranea por la Naturaleza. Ciclo de charlas CONABIO.
- Marder, Michael, and Patrícia Vieira. *Existential Utopia: Of the World, the Possible, the Finite*. Continuum International Publishing, 2012, pp. 35–50.
- Márquez, Juan, et al. ‘Especies de staphylininae (coleoptera: staphylinidae) de “El Mirador”, Veracruz, México’. *Dugesiana*, vol. 10, no. 2, 2004, pp. 21–46.
- Martín del Campo, Rafael. ‘La zoología del Códice’. *Libellus de medicinalibus indorum herbis. Manuscrito azteca de 1552*, by Martín De la Cruz, translated by Juan Badiano, vol. 1, Fondo de Cultura Económica & Instituto Mexicano del Seguro Social, 1991, pp. 149–54.
- Mayer, Philipp. ‘Biodiversity-The Appreciation of Different Thought Styles and Values Helps to Clarify the Term’. *Restoration Ecology*, vol. 14, no. 1, 2006, pp. 105–11.
- McCook, Stuart. ‘Greater Caribbean: Mexico, Central America, and the West Indies’. *The Cambridge History of Science*, edited by Hugh Richard Slotten et al., vol. 8, Cambridge University Press, 2020, pp. 782–98.
- Mediateca - Instituto Nacional de Antropología e Historia. ‘Códices de México: Memorias y saberes’. *Mediateca - Instituto Nacional de Antropología e Historia*, 2015, https://mediateca.inah.gob.mx/islandora_74/islandora/object/compilacion%3A3.
- Meineke, Emily K., et al. ‘Biodiversity in the Anthropocene: Prospects and Policy’. *Proceedings of the Royal Society B*, vol. 374, no. 20170386, 2018, pp. 1–9, <http://dx.doi.org/10.1098/rstb.2017.0386>.
- Mignolo, Walter. *The Darker Side of Western Modernity: Global Futures, Decolonial Options*. Duke University Press, 2011.
- Ministerio de Cultura Argentina. ‘Aborígenes, indígenas, originarios. ¿Cuál es la diferencia entre cada

- término?’ *Ministerio de Cultura Argentina*, 9 Oct. 2018, https://www.cultura.gob.ar/aborigenes-indigenas-originarios-a-que-refiere-cada-termino_6293/.
- Ministerio de las Culturas, las Artes y el Patrimonio. Gobierno de Chile. *Recomendaciones para nombrar y escribir sobre pueblos indígenas y sus lenguas*. Ministerio de las Culturas, las Artes y el Patrimonio. Gobierno de Chile, July 2018, <https://www.cultura.gob.cl/wp-content/uploads/2018/07/guia-recomendaciones-pueblos-indigenas.pdf>.
- Miranda, Faustino, and Javier Valdés. ‘Comentarios botánicos’. *Libellus de medicinalibus indorum herbis. Manuscrito azteca de 1552*, by Martín De la Cruz, translated by Juan Badiano, vol. 1, Fondo de Cultura Económica & Instituto Mexicano del Seguro Social, 1991, pp. 107–48.
- Miranda Trigueros, Ernesto, and Vania Ramírez Islas. ‘Retos y contextos para la construcción del Repositorio Digital del Patrimonio Cultural de México.’ *Conectando los saberes de Bibliotecas, Archivos y Museos (BAM) en torno a la preservación de documentos analógicos y de origen digital.*, pp. 25–46.
- ‘Mission Statement’. *E.O. Wilson Biodiversity Foundation*, 2020, <https://eowilsonfoundation.org/mission-statement/>.
- MODS. ‘Outline of Elements and Attributes in MODS Version 3.7: MetadataObject Description Schema: MODS (Library of Congress)’. *Metadata Object Description Schema (MODS)*, <https://www.loc.gov/standards/mods/mods-outline-3-7.html>. Accessed 27 June 2020.
- Moedas, Carlos. ‘Foreword’. *Citizen Science. Innovation in Open Science, Society and Policy*, edited by Susanne Hecker et al., UCL Press, 2018, pp. v–vi, <http://www.jstor.com/stable/j.ctv550cf2.8>.
- Moreno, Hiram A. ‘Tras las elusivas huellas de Rafael T. Marquís Oropeza. El primer director del Museo Nacional de Panamá’. *Canto Rodado*, vol. 10, 2015, pp. 163–75.
- Moreno Toscano, Alejandra. ‘Presentación’. *Códice De la Cruz-Badiano*, by Martín De la Cruz and Juan

- Badiano, edited by Ángel Jesús Beltrán Acosta and Eduardo Muñoz de Alba L., Secretaría de Relaciones Exteriores, Secretaría de Cultura, Instituto Nacional de Antropología e Historia, Biblioteca Nacional de Antropología e Historia, 2020, pp. 5–6.
- Mori, Scott A., and Ghilleen T. Prance. ‘Taxonomy, Ecology, and Economic Botany of the Brazil Nut (*Bertholletia Excelsa* Humb. & Bonpl.: Lecythidaceae)’. *Advances in Economic Botany*, vol. 8, 1990, pp. 130–50.
- Moz SEO Analysis Tool*, Version 2020, Moz Inc., <https://moz.com>.
- Müller, Martin. ‘In Search of the Global East: Thinking between North and South’. *Geopolitics*, vol. 25, no. 3, 2020, pp. 734–55, <https://doi.org/10.1080/14650045.2018.1477757>.
- National Museum of Australia. ‘Defining Moments - Mabo Decision’. *National Museum of Australia*, 20 July 2021, <https://www.nma.gov.au/defining-moments/resources/mabo-decision>.
- National Research Council. *Perspectives on Biodiversity: Valuing Its Role in an Everchanging World*. The National Academies Press, 1999.
- Navarrete Linares, Federico. *Los Pueblos Indígenas de México*. Comisión Nacional para el Desarrollo de los Pueblos Indígenas, 2008, https://www.gob.mx/cms/uploads/attachment/file/255517/monografia_nacional_pueblos_indigenas_mexico.pdf.
- Nelson, Gil, and Shari Ellis. ‘The History and Impact of Digitization and Digital Data Mobilization on Biodiversity Research’. *Phil. Trans. R. Soc.*, vol. 374, no. 20170391, 2018, pp. 1–9, <http://dx.doi.org/10.1098/rstb.2017.0391>.
- Network Development and MARC Standards Office, Library of Congress. ‘MARC 21 Format for Bibliographic Data: 260: Publication, Distribution, Etc. (Imprint)’. *Library of Congress*, Sept. 2011, <https://www.loc.gov/marc/bibliographic/bd260.html>.
- Neylon, Cameron. ‘Section 2. Governing Open Science. Introduction’. *Contextualizing Openness*.

- Situating Open Science*, edited by Leslie Chan, University of Ottawa Press, 2019, pp. 125–32.
- Nielsen IBOPE. ‘Audiencias y consumo digital’. *Nielsen IBOPE*, 27 Apr. 2020. www.nielsenibopecom,
<https://www.nielsenibopecom/2020/04/27/audiencias-y-consumo-digital>.
- Norton, Richard. ‘What Is Virtuality?’ *The Journal of Aesthetics and Art Criticism*, vol. 30, no. 4, 1972, pp. 499–505.
- Ochoa Jiménez, María Julia. ‘Reapropiación de bienes culturales y derechos humanos’. *Derecho y Realidad*, no. 21, 2013, pp. 116–32.
- Olivé, León. ‘Por una auténtica interculturalidad basada en el reconocimiento de la pluralidad epistemológica’. *Pluralismo epistemológico*, edited by Emir Sader and Lucas Sablich, Consejo Latinoamericano de Ciencias Sociales, 2009, pp. 19–30.
- Padelford, Norman J. ‘Panama Canal’. *Encyclopedia Britannica*, 2005,
<https://www.britannica.com/topic/Panama-Canal>.
- ‘Panama Canal Zone in World War II’. *WW2DB - World War II Database*,
https://ww2db.com/country/panama_canal_zone. Accessed 5 Oct. 2021.
- Papavero, Nelson, and Sergio Ibáñez-Bernal. ‘Contributions to a History of Mexican Dipterology. Part II.- The Biología Centrali-Americana’. *Acta Zoológica Mexicana*, vol. 88, 2003, pp. 143–232.
- Pilsk, Suzanne, et al. ‘The Biodiversity Heritage Library: Advancing Metadata Practices in a Collaborative Digital Library’. *Journal of Library Metadata*, vol. 10, no. 2–3, 2010, pp. 136–55,
<https://doi.org/10.1080/19386389.2010.506400>.
- Ponce de la Vega, Lidia. *Closing Keynote: Decolonizing Strategies for an Equitable Biodiversity Heritage Library*.
<https://www.youtube.com/watch?v=czgdAn1BIMo>. BHL Day 2021: Reflections in Crises.
- . ‘The Geopolitics of Metadata: Knowing Panama Through the Biodiversity Heritage Library’. *Biodiversity Heritage Library*, 18 Nov. 2021,

<https://blog.biodiversitylibrary.org/2021/11/geopolitics-of-metadata-knowing-panama-through-biodiversity-heritage-library.html>.

---. 'Understanding BHL Through Metadata: Patterns of Bio-Diverse Knowledge Production'.

Biodiversity Heritage Library, 16 Nov. 2021,

<https://blog.biodiversitylibrary.org/2021/11/understanding-bhl-through-metadata-patterns-of-bio-diverse-knowledge-production.html>.

Prelinger, Rick. 'Archives of Inconvenience'. *Archives*, by Lison Andrew et al., meson press, University of Minnesota Press, 2019, pp. 1–45.

Pullin, Andrew S. *Conservation Biology*. Cambridge University Press, 2002.

Quijano, Aníbal. 'Colonialidad del poder y clasificación social'. *El giro decolonial: Reflexiones para una diversidad epistémica más allá del capitalismo global*, edited by Santiago Castro-Gómez and Ramón Grosfoguel, Siglo del Hombre Editores; Universidad Central, Instituto de Estudios Sociales Contemporáneos; Pontificia Universidad Javeriana, Instituto Pensar, 2007, pp. 93–126.

Rabasa, José. *Inventing America: Spanish Historiography and the Formation of Eurocentrism*. University of Oklahoma Press, 1993.

Raftopoulos, Malayna, and Joanna Morley. 'Ecocide in the Amazon: The Contested Politics of Environmental Rights in Brazil'. *The International Journal of Human Rights*, vol. 24, no. 10, 2020, pp. 1616–41, <https://doi.org/10.1080/13642987.2020.1746648>.

Rajamannar, Shefail. *Reading the Animal in the Literature of the British Raj*. Palgrave Macmillan, 2012.

Rare Books and Manuscripts Section. 'Latin Place Names | An RBMS Resource'. *RBMS. Association of College and Research Libraries. A Division of the American Library Association*, 2015, <https://rbms.info/lpn/>.

Raynor, Cecily, and Rhian Lewis. 'Introduction'. *Digital Encounters. Envisioning Connectivity in Latin American Cultural Production*, edited by Cecily Raynor and Rhian Lewis, Preliminary

unpublished manuscript, 2022, pp. 6–15.

Reitz, Joan M. 'ODLIS. Online Dictionary for Library and Information Science'. *ABC CLIO*.

Explore. Connect. Understand., https://products.abc-clio.com/ODLIS/odlis_1.aspx. Accessed 26 June 2020.

República Federativa de Brasil. *Constitución Política de 1988*.

<https://www.wipo.int/edocs/lexdocs/laws/es/br/br117es.pdf>.

Rinaldo, Constance. 'The Biodiversity Heritage Library: Exposing the Taxonomic Literature'. *Journal of Agricultural & Food Information*, vol. 10, no. 3, 2009, pp. 259–65, <https://doi.org/10.1080/1049650090301466>.

Ríos Ortega, Jaime. 'Prefacio'. *Conectando los saberes de Bibliotecas, Archivos y Museos (BAM) en torno a la preservación de documentos analógicos y de origen digital*, p. XVII–XXIV.

Risam, Roopika. 'Colonial Violence and the Postcolonial Digital Archive'. *New Digital Worlds: Postcolonial Digital Humanities in Theory, Praxis, and Pedagogy*, Northwestern University Press, 2018, pp. 47–64, <https://muse.jhu.edu/book/62714>.

---. 'Decolonizing the Digital Humanities in Theory and Practice'. *The Routledge Companion to Media Studies and Digital Humanities*, edited by Jentery Sayers, Routledge, 2018, pp. 78–86.

Rodríguez Reséndiz, Perla Olivia. 'Breve introducción a la preservación digital de los BAM.' *Conectando los saberes de Bibliotecas, Archivos y Museos (BAM) en torno a la preservación de documentos analógicos y de origen digital*, p. IX–XVI.

Rojas Silva, Alejandra. 'Gardens of Origin and the Golden Age in the Mexican "Libellus de Medicinalibus Indorum Herbis" (1552)'. *Bulletin of Latin American Research*, vol. 37, Nov. 2018, pp. 41–56, <https://doi.org/10.1111/blar.12789>.

Rose, Deborah. 'What If the Angel of History Were a Dog?' *Cultural Studies Review*, vol. 12, no. 1, Mar. 2006, pp. 67–78.

- Rosenthal, Olimpia E. 'Academic Colonialism and Marginalization: On the Contentious Postcolonial–Decolonial Debate in Latin American Studies'. *Postcolonial Studies*, vol. 25, no. 1, 2022, pp. 17–34, <https://doi.org/10.1080/13688790.2022.2030576>.
- Royal Botanic Gardens, Kew. 'Introduction of the Brazil Nut to the East Indies and Australia. (Bertholletia Excelsa, Humb.)'. *Bulletin of Miscellaneous Information (Royal Botanic Gardens, Kew)*, vol. 1887, no. 12, 1887, pp. 11–13.
- Saeed, Shahzad. 'What Is Direct Traffic in Google Analytics? (A Beginner's Guide)'. *MonsterInsights*, 21 Feb. 2019, <https://www.monsterinsights.com/what-is-direct-traffic-in-google-analytics/>.
- Salinas de Gortari, Carlos. 'Presentación'. *Libellus de medicinalibus indorum herbis. Manuscrito azteca de 1552*, by Martín De la Cruz, translated by Juan Badiano, vol. 1, Fondo de Cultura Económica & Instituto Mexicano del Seguro Social, 1991, p. VII–VIII.
- Sánchez Ruiz, Juan Francisco, and María Elena Tejeda Rosales. 'Las formas farmacéuticas en el "Libellus de medicinalibus indorum herbis"'. *Revista Mexicana de Ciencias Farmacéuticas*, vol. 42, no. 4, Dec. 2011, pp. 39–49.
- Sarkar, Sahotra. 'Biodiversity'. *Encyclopedia of Environmental Ethics and Philosophy*, edited by J. Baird Callicott and Robert Frodeman, vol. 1, Macmillan Reference USA, 2009, pp. 104–09. Gale eBooks, *Gale*, https://link.gale.com/apps/doc/CX3234100044/GVRL?u=crepuq_mcgill&sid=GVRL&xid=97f618fc.
- Sarukhán Kermez, José. 'Presentación'. *Estrategia Nacional sobre Biodiversidad de México (ENBioMex) y Plan de Acción 2016-2030*, by Comisión Nacional para el Conocimiento y Uso de la Biodiversidad (CONABIO), Comisión Nacional para el Conocimiento y Uso de la Biodiversidad, 2016, pp. 5–7.
- Schramm, Sally. 'Marjorie Eileen Doris Courtenay-Latimer: Beyond the Coelacanth'. *Biodiversity*

- Heritage Library Blog*, <https://blog.biodiversitylibrary.org/2019/03/marjorie-eileen-doris-courtenay-latimer.html>. Accessed 12 Oct. 2020.
- Schultes, Richard Evans. 'Gifts of the Amazon Flora to the World'. *Arnoldia*, vol. 50, no. 2, 1990, pp. 21–34.
- Schwindt, Evangelina, et al. *Especies exóticas marino-costeras: Argentina. Marine-Coastal Exotic Species: Argentina*. Edited by Evangelina Schwindt and Alejandro Bortolus, Vázquez Mazzini Editores, 2018, <https://www.biodiversitylibrary.org/bibliography/169323>.
- Scollon, Ron, and Suzie Wong Scollon. *Discourses in Place. Language in the Material World*. Routledge: Taylor & Francis Group, 2003.
- 'Search Results for Biología Centrali-Americana'. *Biodiversity Heritage Library*, https://www.biodiversitylibrary.org/search?searchTerm=biologia%20centrali-americana&tinc=&searchCat=&stype=F&lname=&ninc=&vol=&yr=&subj=&sinc=&lang=&col=&nt=&ntinc=&txt=&txinc=&ppage=1&apage=1&kpage=1&npage=1&facet=Genre_Book#/titles. Accessed 21 May 2021.
- Secretaría de Medio Ambiente y Recursos Naturales. 'México y Colombia acuerdan cooperación en temas ambientales'. *Gobierno de México*, 27 Oct. 2016. [www.gob.mx](http://www.gob.mx/semarnat/prensa/mexico-y-colombia-acuerdan-cooperacion-en-temas-ambientales?idiom=es), <http://www.gob.mx/semarnat/prensa/mexico-y-colombia-acuerdan-cooperacion-en-temas-ambientales?idiom=es>.
- Seddon, Natalie, et al. 'Biodiversity in the Anthropocene: Prospects and Policy'. *Proceedings of the Royal Society B*, vol. 283, no. 20162094, 2016, pp. 1–9, <http://dx.doi.org/10.1098/rspb.2016.2094>.
- SEMARNAT México, et al. *Declaración de los Ministros de Ambiente de la Alianza del Pacífico hacia una plataforma de crecimiento verde (Cartagena de Indias, 30 de marzo 2016)*. Alianza del Pacífico, 30 Mar. 2016, <https://alianzapacifico.net/wp-content/uploads/Declaracion-Ministros-de-Ambiente-de-la-AP.pdf>.

- Shepard, Glenn H., and Henri Ramirez. “‘Made in Brazil’: Human Dispersal of the Brazil Nut (Bertholletia Excelsa, Lecythidaceae) in Ancient Amazonia’. *Economic Botany*, vol. 65, no. 1, 2011, pp. 44–65.
- Similarweb. Version 2020, Similarweb LTD, <https://www.similarweb.com>.
- Similarweb. ‘Glossary’. *Similarweb - Knowledge Center*, <https://support.similarweb.com/hc/en-us/categories/360000099577-Glossary>. Accessed 5 Sept. 2020.
- Sinclair, Stéfan, and Stephanie Posthumus. ‘Digital? Environmental: Humanities’. *The Routledge Companion to the Environmental Humanities*, edited by Ursula Heise et al., Routledge, 2017, pp. 369–77.
- Singh, J. S. ‘The Biodiversity Crisis: A Multifaceted Review’. *Current Science*, vol. 82, no. 6, Mar. 2002, pp. 638–47.
- Sitechecker. *Traffic Checker - biodiversidad.gob.mx*. July 2020, <https://sitechecker.pro/app/main/traffic-checker-land?pageUrl=https:%2F%2Fwww.biodiversidad.gob.mx>.
- Smithsonian Institution, et al. ‘Electronic Biologia Centrali-Americana’. *Electronic Biologia Centrali-Americana*, <https://www.sil.si.edu/DigitalCollections/bca/explore.cfm>. Accessed 24 May 2021.
- Smithsonian Libraries and Archives. ‘Biologia Centrali Americana’. *Smithsonian Libraries*, <https://library.si.edu/collection/biologia-centrali-americana>. Accessed 21 May 2021.
- Smithsonian Tropical Research Institute. *Biological and Cultural Diversity of the Tropics: Extraordinary Opportunities and Challenges in the Midst of the Anthropocene. Strategic Plan 2019-2024*. Smithsonian Tropical Research Institute, 2019, https://stri.si.edu/sites/default/files/stri_strategic_plan_aug_2019.pdf.
- . ‘Why Is the Smithsonian in Panama?’ *Smithsonian Tropical Research Institute*, Smithsonian Tropical Research Institute, 19 Dec. 2016, <https://stri.si.edu/why-panama>.

Snyder, Thomas, et al. 'James Zetek. 1886-1959'. *Journal of Economic Entomology*, vol. 52, no. 6, 1959, pp. 1230–32, <https://doi.org/10.1093/jee/52.6.1230>.

Socientize. *White Paper on Citizen Science for Europe*. European Commission, 2014.

Society of American Archivists. 'What Are Archives and How Do They Differ from Libraries? | Society of American Archivists'. *SAA Society of American Archivists*, <https://www2.archivists.org/usingarchives/whatarearchives>. Accessed 26 June 2020.

Somolinos d'Ardonis, Germán. 'Estudio histórico'. *Libellus de medicinalibus indorum herbis. Manuscripto azteca de 1552*, by Martín De la Cruz, translated by Juan Badiano, vol. 1, Fondo de Cultura Económica & Instituto Mexicano del Seguro Social, 1991, pp. 165–91.

Statista. 'Smartphone Penetration in Latin America 2025'. *Statista*. www.statista.com, <https://www.statista.com/statistics/218531/latin-american-smartphone-penetration-since-2008/>. Accessed 20 July 2020.

Steffen, Will. 'Commentary to Paul J. Crutzen and Eugene F. Stoermer, "The 'Anthropocene"' (2000).? *The Future of Nature: Documents of Global Change*, edited by Libby Robin et al., 2013, pp. 486–90.

Sudulich, Laura, et al. 'Introduction: The Importance of Method in the Study of the "Political Internet"'. *Analysing Social Media Data and Web Networks*, edited by Rachel Gibson et al., Palgrave Macmillan, 2014, p. 287.

Sutton, John. 'Material Agency, Skills and History: Distributed Cognition and the Archaeology of Memory'. *Material Agency. Towards a Non-Anthropocentric Approach*, edited by Carl Knappett and Lambros Malafouris, Springer, 2008, pp. 37–55.

Szabo, Gabor, et al. 'Introduction'. *Social Media Data Mining and Analytics*, Wiley, 2019, pp. xvii–xxxv. *Tableau*. Version 2021.1, Tableau Software LLC, <https://www.tableau.com>.

TallBear, Kim. *Diversity V. Decolonization in the Academy, a Conversation with Kim TallBear*. Department

of English, Dawson College.

Tapia Tinajero, María del Socorro, and Rosa María Guzmán Vera. 'La Biodiversity Heritage Library (BHL), un proyecto colaborativo con el Instituto de Biología para la preservación digital del Acervo Histórico.' *Conectando los saberes de Bibliotecas, Archivos y Museos (BAM) en torno a la preservación de documentos analógicos y de origen digital.*, edited by Perla Olivia Rodríguez Reséndiz and María Teresa Fernández Bajón, pp. 47–61.

The Society for the History of Natural History. 'The John Thackray Medal 2010'. *The Society for the History of Natural History. Awards, Honours and Medals*, 2010, <https://shnh.org.uk/awards-honours-medals/shnh-book-prize/john-thackray-medal-2010/>.

Tuck, Eve, and K. Wayne Yang. 'Decolonization Is Not a Metaphor'. *Decolonization: Indigeneity, Education & Society*, vol. 1, no. 1, 2012, pp. 1–40.

Tucker, Arthur O., and Jules Janick. *Flora of the 'Codex Cruz-Badianus'*. Springer, 2020.

Turkish Radio and Television Corporation. 'Perú y México piden la protección de biodiversidad a fin de lograr un desarrollo sostenible.' *TRT Español*, 5 July 2017. www.trt.net.tr, <https://www.trt.net.tr/espanol/ciencia-y-tecnologia/2017/07/05/peru-y-mexico-piden-la-proteccion-de-biodiversidad-a-fin-de-lograr-un-desarrollo-sostenible-764420>.

Tyler, Peter. 'Science for Gentlemen – The Royal Society of New South Wales in the Nineteenth Century'. *Journal & Proceedings of the Royal Society of New South Wales*, vol. 143, 2010, pp. 29–43.

Ulloa, Astrid. 'Dinámicas ambientales y extractivas en el siglo XXI: ¿Es la época del Antropoceno o del Capitaloceno en Latinoamérica?' *Desacatos*, vol. 54, 2017, pp. 58–73.

UMass Amherst Center for Heritage and Society. 'What Is Heritage?' *UMass Amherst*, <https://www.umass.edu/chs/about/whatisheritage.html>. Accessed 26 June 2020.

UNICEF España. *UNICEF presenta el Atlas Sociolingüístico de Pueblos Indígenas en América Latina* | *UNICEF*. <https://www.unicef.es/prensa/unicef-presenta-el-atlas-sociolingüistico-de->

- pueblos-indigenas-en-america-latina. Accessed 29 June 2020.
- United Nations. *Convention on Biological Diversity*. United Nations, 1992, p. 28.
- Valentino, Franco. 'Subdomains vs Subfolders: What's the Difference and Which Is Better for SEO in 2020?' *IMPACT*, <https://www.impactbnd.com/blog/subdomains-vs-subfolders>. Accessed 4 Sept. 2020.
- Vargas Garcia, Eugenio. *Anglo-American Rivalry in Brazil: The Case of the 1920s*. University of Oxford. Centre for Brazilian Studies, 2000.
- 'Visión – Inkas Vivientes'. *Inkas Vivientes*, 2020, <http://inkasvivientes.org/vision/>.
- Viveros Espinosa, Alejandro Javier. 'La escritura codigofágica en el "Libellus de medicinalibus indorum herbis" (1552)'. *Hipogrifo*, vol. 8, no. 2, 2020, pp. 841–54, <http://dx.doi.org/10.13035/H.2020.08.02.50>.
- Voutssas, Juan. 'Long-Term Digital Information Preservation: Challenges in Latin America'. *Aslib Proceedings: New Information Perspectives*, vol. 64, no. 1, 2012, pp. 83–96, <https://doi.org/10.1108/00012531211196729>.
- we are social, and Hootsuite. *Digital 2020. Global Digital Overview. Essential Insights into How People Around the World Use the Internet, Mobile Devices, Social Media, and Ecommerce*. 2020, https://p.widencdn.net/1zybur/Digital2020Global_Report_en.
- Weik von Mossner, Alexa. 'Touching the Senses: Environments and Technologies at the Movies'. *The Routledge Companion to the Environmental Humanities*, edited by Ursula Heise et al., Routledge, 2017, pp. 337–45.
- Wendland, Wend. 'Managing Rights in Digitized Indigenous Music'. *WIPO World Intellectual Property Organization - WIPO Magazine*. www.wipo.int, https://www.wipo.int/wipo_magazine/en/2016/05/article_0003.html. Accessed 27 June 2020.

- Whitten, William Mark. *Variation in Floral Fragrances and Pollinators in the Gongora Quinquenervis Complex (Orchidaceae) in Central Panama*. University of Florida, 1985,
<https://www.biodiversitylibrary.org/bibliography/42485>.
- Whose Knowledge?* <https://whoseknowledge.org/>. Accessed 19 May 2020.
- Wolfe, Cary. 'Introduction'. *Zoontologies: The Question of the Animal*, edited by Cary Wolfe, University of Minnesota Press, 2003, pp. ix–xxiii.
- World Population Review. 'Median Age 2020'. *World Population Review*,
<https://worldpopulationreview.com/country-rankings/median-age>. Accessed 16 Nov. 2020.
- Zajícová, Lenka. 'Lenguas indígenas en la legislación de los países hispanoamericanos'. *Onomázein. Revista de Lingüística, Filología y Traducción*, 2017, pp. 171–203, [https://doi.org/DOI: 10.7764/onomazein.amerindias.10](https://doi.org/DOI:10.7764/onomazein.amerindias.10).
- Zien, Katherine. *Your Dissertation - Comments (E-Mail Correspondence with Lidia Ponce de La Vega)*. 8 Aug. 2022.