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INVESTIGATING INTELLECTUAL DIVERSITY: A CRITICAL EXAMINATION OF ACADEMIC PUBLISHING PRACTICES AND THEIR EFFECTS ON WILDLIFE CONSERVATION

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INVESTIGATING INTELLECTUAL DIVERSITY: A CRITICAL EXAMINATION OF ACADEMIC PUBLISHING PRACTICES AND THEIR EFFECTS ON WILDLIFE CONSERVATION

By

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Chapter 1: Overview

Introduction

Academic publishing processes and standards are formed by historic dispossession, marginality, and colonialism (Curry & Ellis 2022, Morrison & Steltzer 2021, Davies et al. 2021, Ramírez-Castañeda 2020, Di Bitetti & Ferreras 2017, Hopkins et al. 2013, Salager-Meyer 2008). Academic publishing processes are the basis for how science is communicated, reviewed, and expanded. Science-based decision making is one of the tenets of the North American Model of Wildlife Conservation, and this tenet relies on published, peer-reviewed research from biologists and researchers around the world. However, the current publishing system perpetuates racial and gender biases that leave out some important research perspectives and privilege others. This research studies the connection between publishing culture and knowledge used to inform wildlife management and policy. Specifically, this study seeks to quantify intellectual diversity in the field of wildlife conservation and identify how publishing biases negatively affect knowledge available to decision-makers by perpetuating specific worldviews and creating gaps in knowledge.

In the face of global issues like climate change, habitat degradation, and species loss, the field of wildlife conservation, management, and policy is ever-growing and changing. As new knowledge is constantly being generated by researchers worldwide, it becomes increasingly crucial to prioritize progress in diversity, equity, and inclusion alongside advancements in the field. Going forward, a diversity in perspectives and strengths will be needed to address complex challenges that require collaboration across disciplines. If one geographic area or group of people is disproportionately cited and published more often, then a full picture of wildlife conservation around the world is impossible. High quality science becomes lost along the way, and potential approaches to conservation issues do not get the visibility they deserve.

As far as identifying direct effects on environmental knowledge, a gap exists in current literature. Mott & Cockayne (2017) have noted biases of citation metrics and how field research is easier for white males (US Census 2020), who do not experience the same safety concerns as women and people of color and are more widely accepted in the outdoor community. Many other studies acknowledge the existence of racial and gender biases in publishing culture (Davies et al. 2021, Hopkins et al. 2013, Mott & Cockayne 2017). Morrison & Steltzer (2021) specifically identify a lack of social diversity in ecology to an inevitable lack of intellectual diversity, but intellectual diversity and its effects on the environment today are not actually quantified. Quantifying intellectual diversity and its effects on conservation research and practices will be complex, but it would be the next step beyond acknowledging that so many barriers and biases exist.

Positionality

I am a white, straight, able-bodied female who grew up in an upper-middle class family, which gives me a privileged position in society without barriers that affect other researchers. Both of my parents have master's degrees, and I grew up in a supportive

environment with the encouragement to pursue any career I felt called to. My master's thesis challenges the basis of conservation knowledge by highlighting how biases in academic publishing leads to gaps in the research we use for science-based decision making. I am a member of the academic community, and while I have yet to publish an article, I will eventually be involved in the publishing process myself. I will be publishing research in the United States in my first language, an advantage over many other researchers given an overwhelming amount of research is published in English, and by researchers based in the United States. While I plan to publish open access, my understanding of the biases of the academic publishing world has been greatly informed by both open access and pay to access articles, so some of my understanding was not available to the public. I am fortunate to attend a university that affords subscriptions to academic journals and provide internet access to all students.

I am using text mining to analyze words in researcher articles, and language is highly reflective of a researcher's epistemology, ontology, and axiology. Additionally, I recognize that science is subjective and cultural, and emphasize that a lack of social diversity in research will have inevitable impacts on intellectual diversity. The survey portion of the study will work to gather information that text mining will inevitably miss, such as beliefs and experiences not included in a single selected article. Finally, I see language and text data as ultimately socially constructed: the result of human interaction and cultural influences.

Background

Intellectual Diversity

Intellectual diversity incorporates ontological, epistemic, and axiological differences (See Table 1 for definitions). These differences are difficult to quantify, but intellectual diversity can be equated to social diversity, which highlights how important it is to allow for social diversity in the academic world (Morrison & Steltzer 2021). According to Rodriguez (2016), social diversity "involves the recognition of the visible and invisible physical and social characteristics that make an individual or group of individuals different from one another" (242). Proxies for social diversity include race, ethnicity, gender, socioeconomic status, educational experiences, and languages spoken (Morrison & Steltzer 2021).

Ontology refers to the nature of reality and being (Schraw 2013). A researcher's ontology could involve whether or not they study observable or unobservable phenomena, as well as whether they see the ability to collect empirical data as a requirement for a phenomena to exist (Martin 2010). Additionally, researcher ontology incorporates beliefs in an objective reality (universal laws of reality regardless of observer) versus a subjective reality (reality being dependent on observer (Ghassib 2010). There is a distinct gap in research and theory connected to measuring ontology, and ontological belief questionnaires are not widely used like epistemological and axiological questionnaires (Schraw 2013). Because of this, ontology is not specifically included in the below research questions. However, since social diversity is used as a proxy for intellectual diversity, by intentionally surveying researchers from diverse backgrounds the effects of ontology are still present in the results of the study. As Saunders et al.'s (2009) visualization demonstrates,

conducting any research involves a series of beliefs and decisions that are reflective of a researcher's overarching research philosophy (Figure 1). Hofer (2000) describes epistemology as related to how someone perceives and understands knowledge itself. An individual's personal epistemology can be broken down in two ways: the nature of knowledge and the process of knowing (Hofer 2000). The nature of knowledge focuses on how certain knowledge is and how simple knowledge is, while the process of knowing entails the justification of knowledge and source of knowledge. Axiology refers to the role of values in scientific research (Biedenbach & Jacobsson 2016). Values transcend situations, are stable over time, and are known to affect a wide range of environmental beliefs and behaviors (Bouman et al. 2018, Rokeach 1973, Schwartz 1992).

Term	Definition	Source
Ontology	Beliefs about the nature of being and reality, and how personal perspectives are influenced	Schraw 2013
Epistemology	Studies the origin, nature, limits, methods, and justification of human knowledge	Hofer 2000
Axiology	The role of values in knowledge creation and influence on research processes	Biedenbach & Jacobsson 2016
Intellectual Diversity	Differences in ontology, epistemology, and axiology	Morrison & Steltzer 2021
Social Diversity	Differences in visible and invisible physical and social characteristics	Rodriguez 2016

Table 1: Definitions.

Ontology, epistemology, and axiology are foundations for the philosophy of research. They are important to scientific research because they impact every researcher's design process, methodology, analysis, and conclusions (Al-Ababneh 2020). Different research traditions offer different ways of looking at the world, building knowledge, and appropriate methodologies to use to engage in research. For example, a sociologist would likely approach research questions differently compared to a statistician. Understanding ontology, epistemology, and axiology are therefore important to collaboration across fields and allows for intentional utilization of multiple research traditions. (Varpio & MacLeod 2020). Saunders et al. (2009) demonstrate the complex research design process using a visualization called 'The Research Onion,' which highlights all the different decisions researchers make when designing a study (Figure 1). A 'research onion' for each individual researcher would reflect their ontology, epistemology, and axiology. Therefore, another way to conceptualize the importance of intellectual diversity to conservation is to imagine how important it would be to have variation in onion structure among researchers contributing to wildlife management, conservation, and policy (Figure 2). For example, if only positivists were publishing research that used experiments to answer questions, there is a large combination of research philosophies and methodologies missing from the field.

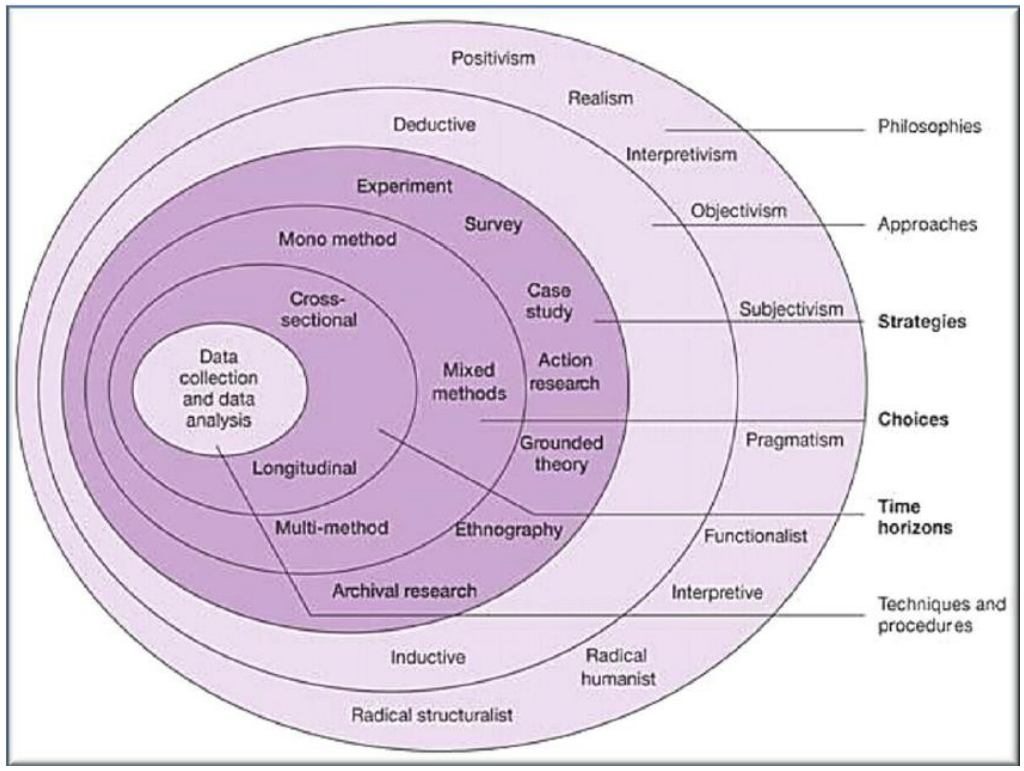


Figure 1: The Research Onion (Saunders et al., 2.1 Epistemology 2009, p.108)

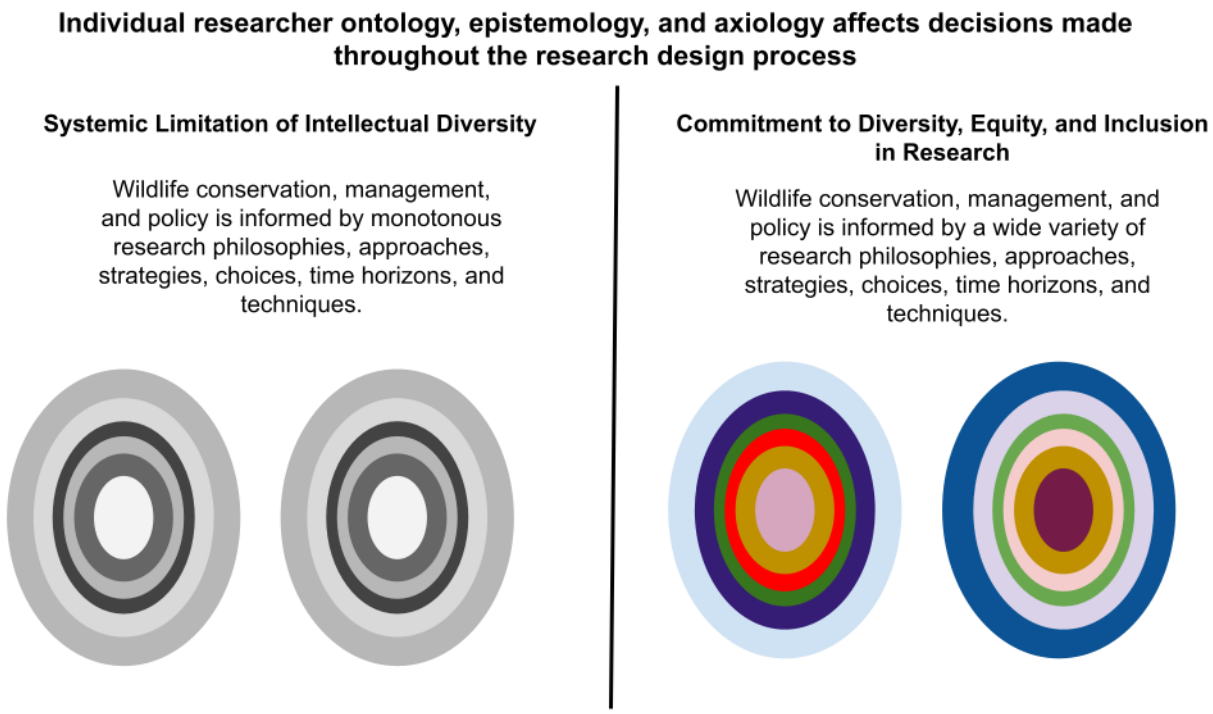


Figure 2: The Saunders (2009) visualization of individual researcher decisions and characteristics highlights how intellectual diversity allows for variation in research design processes.

Colonialism and Marginalization in Publishing

A critical lens guiding this research is colonialism and marginalization, and its results are meant to inspire others to think critically and reflect on their own research processes. According to Robbins (2012), "Marginalization is a process whereby politically and socially marginal (disempowered) people are pushed into ecologically marginal spaces and economically marginal social positions" (91). A marginalization lens is relevant to this work because researchers are expected to publish often and in high impact

journals to be considered credible and competitive, but minority researchers are already at a disadvantage because they are cited less, experience more barriers, and must conform to an English system. McMichael (2012) defines colonialism as "the subjugation by physical and psychological force of one culture by another - a colonizing power - through military conquest of territory and stereotyping the relation between the two cultures" (27). Economic profit and cultural dominance can give rise to colonialism, and Western values are often forced upon other cultures (Belsky 2020). The phrase 'publish or perish' has long been used to describe academic publishing, as authors feel they must write as many articles as possible and get cited often to be considered credible. The widespread adoption of 'publish or perish' mindsets is an example of Western values becoming standard in academics.

Science, therefore publishing culture, is overwhelmingly English (Ramírez-Castañeda 2020, Siverston 2018, Belcher 2007). Over 98% of all publications are in English, many conferences only allow presentations in English, and most journals don't even have an option to publish in a different language (Ramírez-Castañeda 2020). According to Ramírez-Castañeda (2020), "Diversity in language promotes diversity in thinking, affecting creative process and imagination; thus, the maintenance of multilingualism in science could have an impact on scientific knowledge in itself"(2). English proficiency is a strong predictor of the likelihood of getting published (Salager-Meyer 2008, Di Bitetti & Ferreras 2017). At the same time, English proficiency also correlates with a country's economic status and an individual's socioeconomic status (Ramírez-Castañeda 2020, Salager-Meyer 2008).

Social diversity allows for a diversity in approaches to research and global issues. However, in addition to getting published more often, white males are also cited more often in academic literature (Davies et al. 2021, Morrison & Steltzer 2021, Mott & Cockayne 2017, Hopkins et al. 2013). Citations are impactful for numerous reasons: metrics such as number of citations, impact factors and h-indices can be determining factors in hiring decisions, tenure, research funding, and presumed authority in a field (Davies et al. 2021, Kumar & Karusala 2021, Mott & Cockayne 2017). This prioritization of white, male researchers perpetuates sexism and racism in the academic community. Citations create the basis for knowledge itself, and therefore ideas, worldviews, and values represented in a field (Kumar & Karusala 2021, Mott & Cockayne 2017). Fully acknowledging the citation gap also requires acknowledging an inevitable consequence that some viewpoints and ideas are missing from ecology and current environmental knowledge. There is a large body of research identifying and criticizing the citation gap in academics, but the effect of this phenomena, especially in relation to ecology and the environment, is yet to be quantified.0

Another important aspect of studying potential gaps in environmental knowledge is acknowledging the U.S. and 'developed' nations as extremely influential in the volume of research produced. While developing countries comprise ~80% of the world's population, only ~2% of scientific publications come from them (Salager-Meyer 2008). Funding also represents a significant barrier for many researchers, and in the U.S. about 30% of research is publicly funded while 70% of research is privately funded. In developing countries, over 75% of funding comes from the public sector. Another factor that affects the ability to publish research in other countries is a digital gap, which refers to how many countries have a lack of overall access to computers and the internet at home

and in a working environment (Belcher 2007, Salager-Meyer 2008). In the U.S., access to the internet, computers, databases, and reliable electricity are taken for granted.

Within the fields of wildlife conservation, management, and ecology, the growth of indigenous and local knowledge (ILK) demonstrates that researchers are starting to acknowledge the importance of including diverse knowledge systems (Kadykalo et al. 2021, Wheeler & Root-Bernstein 2020). ILK does not have a single unified definition because there are so many different cultures and understandings of the natural world, but instead simply recognizes knowledge of Indigenous and local people and embraces diversity in ways of knowing (Wheeler & Root-Bernstein 2020). ILK also accepts that individuals can engage in multiple knowledge systems, as Indigenous researchers are Indigenous knowledge holders and scientists. However, despite understanding that ILK has significant benefits for wildlife management and conservation, it is not utilized as often compared to western scientific knowledge processes and experience or opinion-based knowledge (Kadykalo et al. 2021). Traditional Western science operates from an epistemology that focuses on objectivity, existence and prioritization of universal fact, causal reasoning, and conclusions based on controlled systems, while other cultural traditions have different epistemologies (Wheeler & Root-Bernstein 2020). Additionally, traditional science often uses the terms ‘reliability’ and ‘precision’ to describe ways to validate knowledge, but in difference knowledge systems the criteria used to evaluate science can look very different (Tengö et al. 2014). Finally, Wheeler & Root-Bernstein (2020) stress that collaboration across knowledge systems leads to a more complex and effective knowledge base to inform decision-making.

Science, and knowledge generation, is a cultural process. Morrison & Steltzer (2021) emphasize that ecologists should be making a point to engage with marginalized communities, as they have deep sociocultural resilience, scientific understandings, and cultural wealth in connection to the natural world that is otherwise not realized. Multiple knowledge systems enhance understandings of ecological processes, and introduce methods, theories, and practices for sustainable management that have evolved from experimentation, learning, and adaptation after long periods of time (Tengö et al. 2014). One methodological approach that specifically looks to address power dynamics and diverse knowledge systems in science is the Multiple Evidence Base approach (MEB)(Figure 3). MEB acknowledges that an enriched picture of ecological issues can only be achieved through integration of knowledge, cross-fertilization of knowledge, and co-production of knowledge. In some areas of conservation, incorporation of multiple knowledge systems is already standard. For example, conservation work that inherently involves co-production of knowledge includes co-management, community-based management of resources, and community-based participatory research (Tengö et al. 2014). Incorporation of multiple social and cultural groups is also relevant to wildlife policy. Agrawal (1995) notes that leaving out perspectives of different knowledge holders in policy-making processes negatively affects the participation of knowledge holders and their perception of the legitimacy of policy actions.

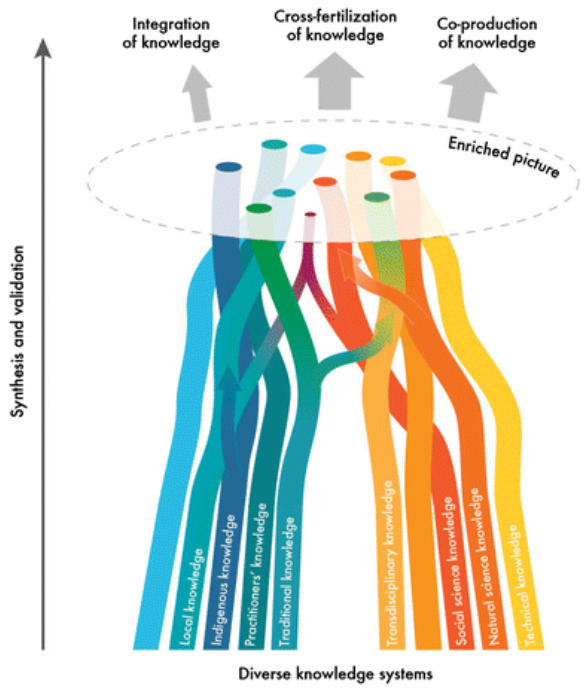


Figure 3: Tengö et al. (2014) emphasize how a Multiple Evidence Base Approach (MEB) allows for the integration of diverse knowledge systems

Ultimately, the wildlife conservation community should be concerned about academic publishing biases because they ultimately restrict intellectual diversity. Addressing global conservation concerns will involve understanding the interactions of people and nature at a global scale, and in an era of a human-dominated landscape these dynamics are ever-evolving. The research and policy community will need to involve numerous research traditions and be open to knowledge that does not fit into traditional frameworks (Tengö et al. 2014). Wildlife conservation is not exempt from a knowledge system that often uses publication counts as a form of currency, which have long been recognized as biases and inaccurate in terms of true scientific contribution and quality.

Research Questions

1. How are differences in intellectual diversity reflected in the social diversity of researchers publishing articles related to wildlife conservation, management, and ecology?
2. How can trends in research design (subject, objectives, theories, methods) for studies related to wildlife conservation, management, and ecology be connected to researcher social diversity?

Methods

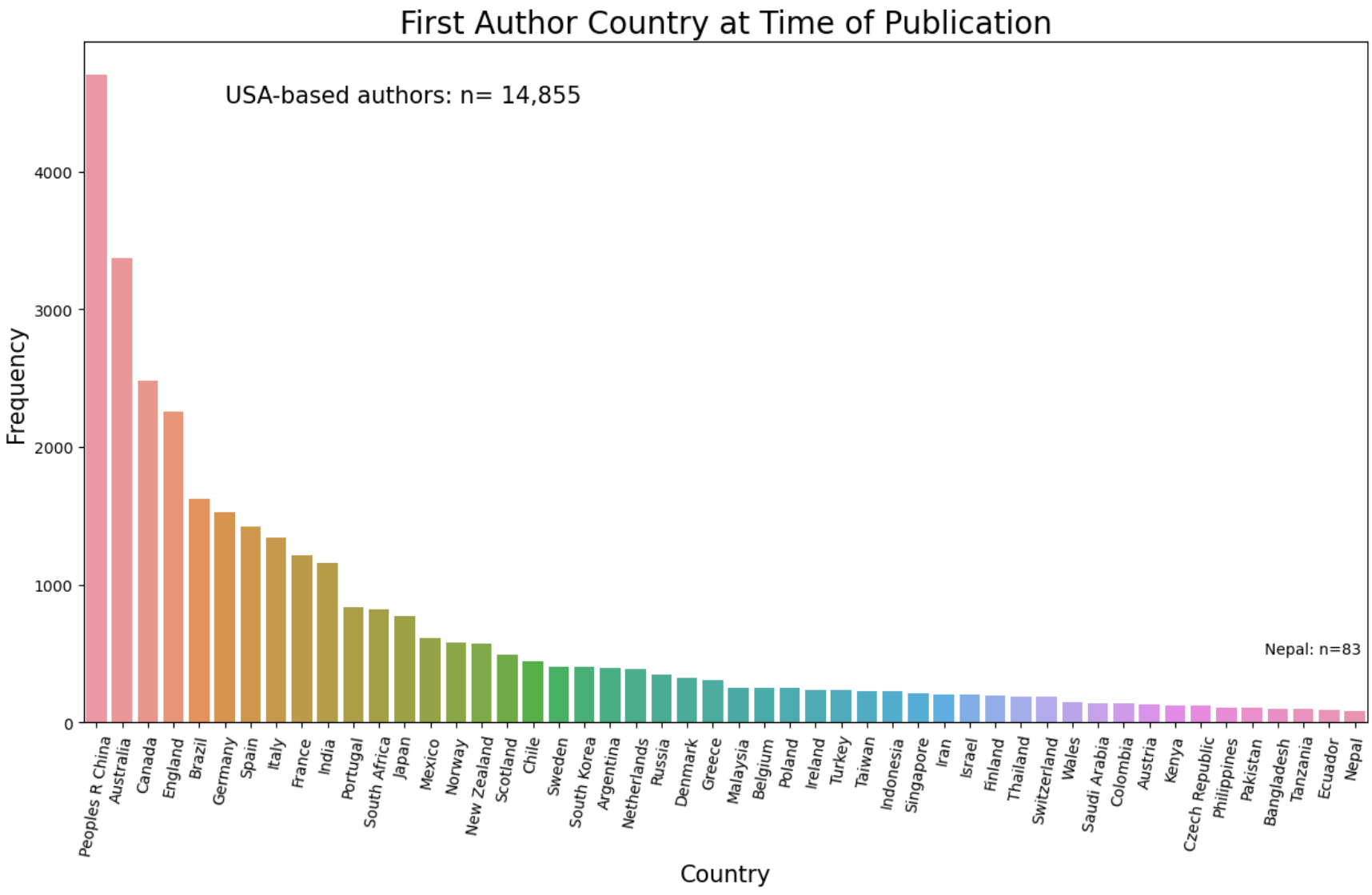
Key Informant Interviews

Key informant interviews were conducted before my proposal was written in order to identify important perspectives that may not be prevalent in the literature and acknowledge my own positionality in relation to this subject. Since I have no publishing experience myself and have privilege in this field as a white person born in the United States, I felt this was important to the formation of a quality proposal. I found individuals who study within the field of conservation and ecology through Gage, a database created by 500 Women Scientists. Notes from these interviews are listed in Appendix 2.

Sample

The sample of publications and authors was collected using the Web of Science database. The sample was based on a 5-year time frame, which included articles published between 2018 and 2022. A shorter time frame was selected because a more current state of conservation, rather than changes over time, is of interest. The following search query was used: (ALL=(ecolog* or conserv*)) AND ALL=(wildlife biology or marine biology or wildlife or marine). 50,000 article records were downloaded, which included the following: authors, article title, source title, keywords, abstract, addresses, email address, times cited, publisher, year, and open access designation. The full sample was used to answer RQ2, and a smaller randomized sample was used to answer RQ1 (described below). The composition of the full sample is shown in Graph 1.

Graph 1: Web of Science Sample Composition



Note. Only the 50 most frequently occurring countries are included in the above graph

Intellectual Diversity Survey

The intellectual diversity survey addressed RQ1. It is important to note that the goal of this survey was not to confirm that racial and gender biases exist. A large body of literature already exists that presents thorough research identifying these biases (Davies et al. 2021, Morrison & Steltzer 2021, Kumar & Karusala 2021, Mott & Cockayne 2017, Hopkins et al. 2013). This work focused on demonstrating the connection between social diversity and intellectual diversity, and inevitable gaps in conservation knowledge as a

result. The intellectual diversity survey has four primary components: measuring axiology, measuring epistemology, measuring specific publishing culture dynamics, and collecting demographic information.

No specific identifying information was linked with the participant's responses in any data record. Names and contact information are kept in a separate locked location from the final dataset used for analysis. Demographic information was collected in a manner that determines general factors (age, gender, ethnicity, country of residence, first language, etc.) that is non-identifying. Additionally, the only required question in this survey was consent to participate, and respondents were able to skip any questions that made them feel uncomfortable or stop the survey at any time.

Survey Sample and Implementation

The target was 250 responses from international authors (IA) and 250 responses domestic authors (DA). Given a previous response rate of 19.6% in a study that collected demographic information from authors via email (Hopkins et al. 2013), we needed to send the survey to at least 1,276 researchers from each group. Given multiple emails were likely to no longer exist, the survey sample was rounded up to 1,300 researchers.

Web of Science records contained each author’s mailing address and email address at the time of publication. Regular expressions, or sequences of characters used to extract specific patterns in text, were used to extract just the first author’s country of residence and email address. 35,145 records had first authors who resided outside the United States at the time of publication, and the remaining 14,855 records all had first authors who had addresses within the United States at the time of publication. Based on these addresses, 1,300 first author email addresses were randomly selected for both international and domestic authors. The intellectual diversity survey was initially sent to this sample of 2,600 first authors. Any authors who had set up automatic replies indicating a new email address (n = 13) received the survey at the suggested email address. For any records selected that had the same first author (n= 55), replacement records were randomly selected. Additionally, replacement records were randomly selected for emails that bounced back or no longer existed (n = 268). The composition of the survey sample for international authors is shown in Graph 2. As described in the results section, due to lower response rates for the international group, an additional 1,100 first authors were randomly selected to receive the survey.

Graph 2: Survey Sample for Authors Based Outside the United States

Note. Only the 50 most frequently occurring countries are included in this graph

Survey Measures

Epistemology

The Discipline Focused Epistemic Beliefs Questionnaire (DFEBQ) developed by Hofer (2000) consists of 27 items on a 5-point likert scale. Since epistemological beliefs differ as a function of field of study, the DFEBQ specifically addresses beliefs within a single discipline (i.e. conservation, ecology) rather than the General Epistemological Beliefs Questionnaire (Qian and Alvermann 1995). Its goals are to assess source of knowledge, certainty of knowledge, simplicity of knowledge, and justification of knowledge (Schraw 2013). Survey-takers report their agreement with a statement such as, *Experts in this field can ultimately get to the truth,* or *A theory in this field is accepted as true and correct if experts reach consensus* (Schraw 2013). The DFEBQ was selected for this study because it is the product of refining previously used survey instruments and is therefore representative of years of epistemological beliefs research (Muis et al. 2014). Respondents were asked how they would describe their discipline or field of study before this section of the survey in order to identify what informed their responses to the DFEBQ.

Axiology

Generally, personal values transcend situations, are stable, and affect beliefs and behavior (Rokeach 1973, Schwartz 1992). The Environmental Schwartz Values Survey (E-SVS) measures four human values related to environmental beliefs and behaviors: biospheric, altruistic, egoistic, and hedonic values (Schwartz 1992, Steg et al. 2014, Bouman et al. 2018). The original Schwartz Values Survey asks respondents about their own values, but concerns about the accuracy of self-reporting and effect of desiring a positive self-representation led to the development of Portrait Value Questionnaires (PVQ). A PVQ asks respondents to evaluate the behavior of other people. The Environmental Portrait Questionnaire (E-PVQ), developed by Bouman et al. (2018), is the result of combining the rationale behind both the PVQ and the E-SVS. It consists of 17 items with descriptions of situations involving another person, and participants respond on a 7-point likert scale (1 *not like me* to 7 *very like me*). For example, one item from the E-PVQ is, *It is important to (him/her/them) to prevent environmental pollution*.

Publishing Culture Dynamics

The survey created also specifically addressed an author's current experiences with publishing culture. These questions were primarily inspired by the key informant interviews described in the positionality statement and current research. A set of likert-style questions focused on experiences with things like financial barriers, open access barriers, and language bias. Other data collected include questions like motivations to publish research, expected number of publications for current position, and years served in current position.

Demographics

Collecting demographic data was central to understanding how intellectual diversity and social diversity connect. The demographic information collected from participants included year of birth, gender, ethnicity, country of residence, country of birth, and languages spoken. Note that the only proxies for social diversity being used to answer research questions were global region of birth and first language. Global region of residence was also tested (Appendix 1), but region of birth was used as a primary social diversity proxy in order to capture the phenomenon of academic migration. Complexity around information like ethnicity and gender makes generating questions that truly capture the truth about these characteristics difficult. Each question involving these topics included space for participants to self-describe themselves. For example, to collect ethnicity data the survey reflected how the United States Census (2020) utilizes a multi-step question to capture ethnicity. While the census cannot truly capture all ethnicities, its questions are recognized as being thoroughly tested and validated. While the use of the United States Census makes some demographic questions U.S.-centric, the goal of this initial study was to get a baseline idea of intellectual diversity where privilege is experienced most vs all other areas. Ideal future work will build off of the feedback and results from international authors for a more full demographic picture.

Natural Language Processing - Full Sample

Manually conducting systematic reviews involves individually reading and identifying important information, which takes a large amount of time and restricts the amount of articles that a researcher can feasibly include in a review (Callaghan et al. 2020, Cheng et al. 2018, Lambert et al. 2021). Text mining and natural language processing offer an alternative to this manual process that extracts, processes, and analyzes text to identify patterns and organize articles faster than traditional systematic reviews. Despite the advantages to these processes, they are not yet used widely in conservation-related research, and this study will serve as a transparent and replicable example of how advantageous these methods can be when applied correctly.

Topic modeling is a process that uses word co-occurrences to learn a set of topics within a corpus, or group of documents (Callaghan et al. 2020). Topic modeling will determine how many different topics are appearing within the full sample of articles (n = 50,000), and then topics most prevalent in countries and regions around the world can be identified. Of various topic modeling methods, Latent Dirichlet Allocation (LDA) was used, which is very widely utilized in studies involving topic modeling across many different fields. LDA minimizes the topics assigned to an abstract and defines topics with as few words as possible (Albrecht et al. 2020). Other topic modeling methods that were tested include singular value decomposition (SVD) and nonnegative matrix factorization (NMF). A very important limit to these topic modeling methods is that while the computer limits biases when identifying topics within data, it only stores all the words that are underneath a topic. It will only label a topic as ‘Topic 1,’ and the researcher decides how to title the topic based on the topic’s words. For example, if frequent words for ‘Topic 1’ were ‘legislation’, ‘policy-makers’, ‘conservation’, and ‘policy’, the researcher might title Topic 1 *Conservation Policy*.

Before analysis and topic modeling begins, article abstracts go through a text cleaning and tokenization process. Cleaning text involves removing punctuation, numbers, and commonly occurring words (stopwords). A process called lemmatization reduces multiple forms of a single word into just one, such as word/words. Additionally, all words were changed to a lowercase form. Tokenization essentially breaks down sentences in an abstract into individual words, commonly called tokens.

Natural language processing was a key component in answering RQ2. In order to preserve meaningful words, abstracts were broken into bigrams (pairs of words) and trigrams (trios of words). Most common topics studied, theories used, and methods were identified. For example, groups of words that involve the words ‘theory’ or ‘theories’ were stored and further examined, as well as in what context studies mention ‘model’. All natural language processing and topic modeling was completed using the Python language in Jupyter Notebook, and a repository of all code is available upon request.

Chapter 2 : The Intersection of Academic Publishing and Intellectual Diversity: A Comparative Analysis of First Authors in Wildlife Conservation Across Demographic Groups

Introduction

In the face of global issues like climate change, habitat degradation, and species loss, the field of wildlife conservation, management, and policy is ever-growing and changing. As new knowledge is constantly being generated by researchers worldwide, it becomes increasingly crucial to prioritize progress in diversity, equity, and inclusion alongside advancements in the field. Going forward, a diversity in perspectives and strengths will be needed to address complex challenges that require collaboration across disciplines. However, research has demonstrated that academic publishing processes, a basis for the sharing and critique of scientific knowledge, is inherently flawed and formed by historic dispossession, marginalization, and colonialism (Curry & Ellis 2022, Morrison & Steltzer 2021, Davies et al. 2021, Ramírez-Castañeda 2020, Di Bitetti & Ferreras 2017, Hopkins et al. 2013, Salager-Meyer 2008). An academic publishing system that privileges select research perspectives over others perpetuates racial, gender, and language biases that limit social and intellectual diversity in wildlife conservation. If one geographic area or group of people is disproportionately cited and published more often, then a full picture of wildlife conservation around the world is impossible. This research studies the connection between publishing culture dynamics and the knowledge used in evidence-based decision processes in wildlife management and policy. Morrison & Steltzer (2021) specifically identify a lack of social diversity in ecology to an inevitable lack of intellectual diversity, but intellectual diversity and its effects on the environment today are not actually quantified. Quantifying intellectual diversity and its effects on conservation research and practices will be complex, but it would be a next step beyond acknowledging that so many barriers and biases exist.

Literature

Intellectual diversity, which directly connects to social diversity and cultural capital, is defined as differences in ontology, epistemology, and axiology (Morrison & Steltzer 2021). Ontology, epistemology, and axiology are foundations for the philosophy of research. According to Rodriguez (2016), social diversity involves visible and invisible physical and social characteristics that differentiate groups from each other. Proxies for social diversity include race, ethnicity, gender, socioeconomic status, educational experiences, and languages spoken (Morrison & Steltzer 2021).

Ontology refers to the nature of reality and being and involves whether or not researchers study observable or unobservable phenomena, as well as whether they see the ability to collect empirical data as a requirement for a phenomena to exist (Schraw 2013, Martin 2010). Survey instruments measuring ontology are not widely used and are therefore not used in this study. Incorporation of both axiology and epistemology is assumed to approximately capture ontological differences. Epistemology relates to how someone

perceives and understands knowledge itself and can be broken down in two ways: the nature of knowledge and the process of knowing (Hofer 2000). The nature of knowledge focuses on how certain knowledge is and how simple knowledge is, while the process of knowing entails the justification of knowledge and source of knowledge.

Axiology refers to the role of values in scientific research, which transcend situations, are stable over time, and are known to affect a wide range of environmental beliefs and behaviors (Biedenbach & Jacobsson 2016, Bouman et al. 2018, Rokeach 1973, Schwartz 1992). Wildlife value orientations, or sets of basic values about wildlife, have been widely studied in the United States and abroad (Manfredo et al. 2009, Manfredo et al. 2016, Teel & Manfredo 2010, Manfredo et al. 2020, Teel et al. 2007). Teel et al. (2007) study these orientations cross-culturally, and Teel & Manfredo (2007) specifically note that value orientations connect to Schwartz (2006) cultural value orientations. This allows for a direct connection between this study's axiological survey component (based on the Schwartz Value Survey) to wildlife-specific value orientations. Schwartz (2006) mapped 76 countries across three different value dimensions (Figure 4): autonomous vs. embeddedness, egalitarianism vs hierarchical, and harmony vs. mastery. The United States, where publishing privilege is experienced most, would be expected to value mastery, hierarchy, and affective autonomy. They would also be expected to value intellectual autonomy less than other English-speaking countries.

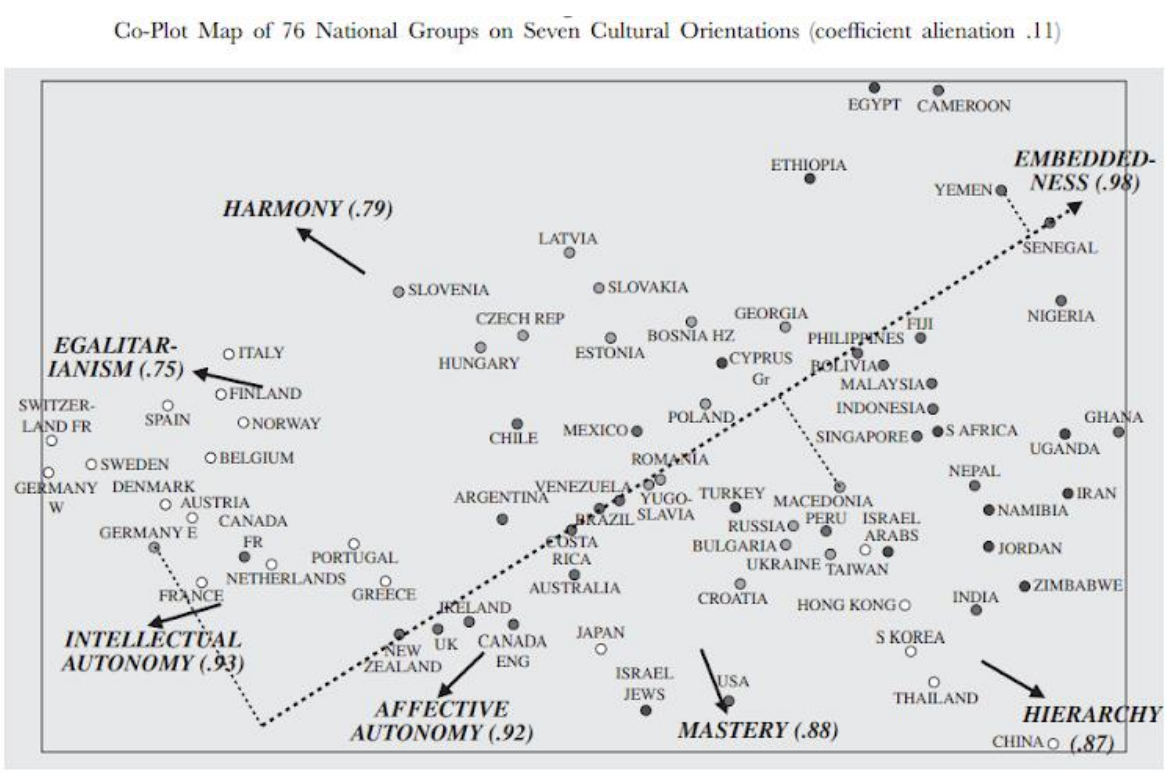


Figure 4: Schwartz (2006) Cultural Value Orientations and Country Placement

Science, therefore publishing culture, is overwhelmingly English (Ramírez-Castañeda 2020, Siverston 2018, Belcher 2007). Over 98% of all publications are in English, many conferences only allow presentations in English, and most journals don't even have an option to publish in a different language (Ramírez-Castañeda 2020). English proficiency is a strong predictor of the likelihood of getting published, and directly correlates with a country's economic status and individual socioeconomic status (Ramírez-Castañeda

2020, Salager-Meyer 2008, Di Bitetti & Ferreras 2017). Therefore, research questions reflect a focus on the privileges experienced by researchers who speak English as a first language (EFL).

Social diversity allows for a diversity in approaches to research and global issues. However, in addition to getting published more often, white males are also cited more often in academic literature (Davies et al. 2021, Morrison & Steltzer 2021, Mott & Cockayne 2017, Hopkins et al. 2013). Citations are impactful for numerous reasons: metrics such as number of citations, impact factors and h-indices can be determining factors in hiring decisions, tenure, research funding, and presumed authority in a field (Davies et al. 2021, Kumar & Karusala 2021, Mott & Cockayne 2017). A meritocratic culture makes career success and reputation dependent on academic production (Bennett 2014). This prioritization of white, male researchers perpetuates sexism and racism in the academic community by limiting ideas, worldviews, and values represented in a field (Kumar & Karusala 2021, Mott & Cockayne 2017). Fully acknowledging the citation gap also requires acknowledging an inevitable consequence that some viewpoints and ideas are missing from ecology and current environmental knowledge. Clearly, there is a large body of research identifying and criticizing the citation gap in academics, but the effect of this phenomena, especially in relation to ecology and the environment, is yet to be quantified.

Within the fields of wildlife conservation, management, and ecology, the growth of indigenous and local knowledge (ILK) demonstrates that researchers are starting to acknowledge the importance of including diverse knowledge systems (Kadykalo et al. 2021, Wheeler & Root-Bernstein 2020). ILK also accepts that individuals can engage in multiple knowledge systems, as Indigenous researchers are Indigenous knowledge holders and scientists. However, despite understanding that ILK has significant benefits for wildlife management and conservation, it is not utilized as often compared to western scientific knowledge processes and experience or opinion-based knowledge (Kadykalo et al. 2021). Traditional Western science operates from an epistemology that focuses on objectivity, existence and prioritization of universal fact, causal reasoning, and conclusions based on controlled systems, while other cultural traditions have different epistemologies (Wheeler & Root-Bernstein 2020). Finally, Wheeler & Root-Bernstein (2020) also stress that collaboration across knowledge systems leads to a more complex and effective knowledge base to inform decision-making.

Science, and knowledge generation, is a cultural process. Morrison & Steltzer (2021) emphasize that ecologists should be making a point to engage with marginalized communities, as they have deep sociocultural resilience, scientific understandings, and cultural wealth in connection to the natural world that is otherwise not realized. Multiple knowledge systems enhance understandings of ecological processes, and introduce methods, theories, and practices for sustainable management that have evolved from experimentation, learning, and adaptation after long periods of time (Tengö et al. 2014). Tengö et al. (2014) also highlights that an enriched picture of ecological issues can only be achieved through integration of knowledge, cross-fertilization of knowledge, and co-production of knowledge. In some areas of conservation, incorporation of multiple knowledge systems is already standard. For example, conservation work that inherently involves co-production of knowledge includes co-management, community-based

management of resources, and community-based participatory research (Tengö et al. 2014). Incorporation of multiple social and cultural groups is also relevant to wildlife policy. Agrawal (1995) notes that leaving out perspectives of different knowledge holders in policy-making processes negatively affects the participation of knowledge holders and their perception of the legitimacy of policy actions.

Ultimately, the wildlife conservation community should be concerned about academic publishing biases because they ultimately restrict intellectual diversity. Addressing global conservation concerns will involve understanding the interactions of people and nature at a global scale, and in an era of a human-dominated landscape these dynamics are ever-evolving. The research and policy community will need to involve numerous research traditions and be open to knowledge that does not fit into traditional frameworks (Tengö et al. 2014). Wildlife conservation is not exempt from a knowledge system that often uses publication counts as a form of currency, which have long been recognized as biases and inaccurate in terms of true scientific contribution and quality.

Research Questions

1. How are differences in intellectual diversity reflected in the social diversity of researchers publishing articles related to wildlife conservation, management, and ecology?
    a. How does intellectual diversity for North America-born (NAB) researchers compare to that of researchers born in all other global regions (NNAB), given where the majority of privilege is experienced?
    b. How does intellectual diversity for researchers who speak English as a first language (EFL) compare to that of researchers who do not speak English as a first language (NEFL)?
2. How can trends in research design (subject, objectives, theories, methods) for studies related to wildlife conservation, management, and ecology be connected to researcher social diversity?
    a. How does research design for domestic U.S.-based authors (DA) compare to that of international authors from all other countries (IA), given where the majority of privilege is experienced?

Terminology

It's important to note that this approach does not capture the full diversity of the authors' backgrounds, as some individuals may have been born in one country but have spent most of their lives in another. Global region of residence was tested in addition to birth, but region of birth was ultimately selected as the primary comparison in order to capture academic migration, the phenomenon where authors leave their home countries to attend school and conduct research in Western countries for better research funding and support. The phrase ‘English as a first language’ refers to individuals who learned English as their first or primary language regardless of whether they were born in an English-speaking country. Additionally, some individuals may not feel that their birthplace, current country of residence, or language is a defining characteristic of their identity. This initial simplified comparison serves the purpose of

identifying future research directions, attaining a baseline representation of the geographic area where privilege is experienced most, and initial exploration into this subject.

Methods

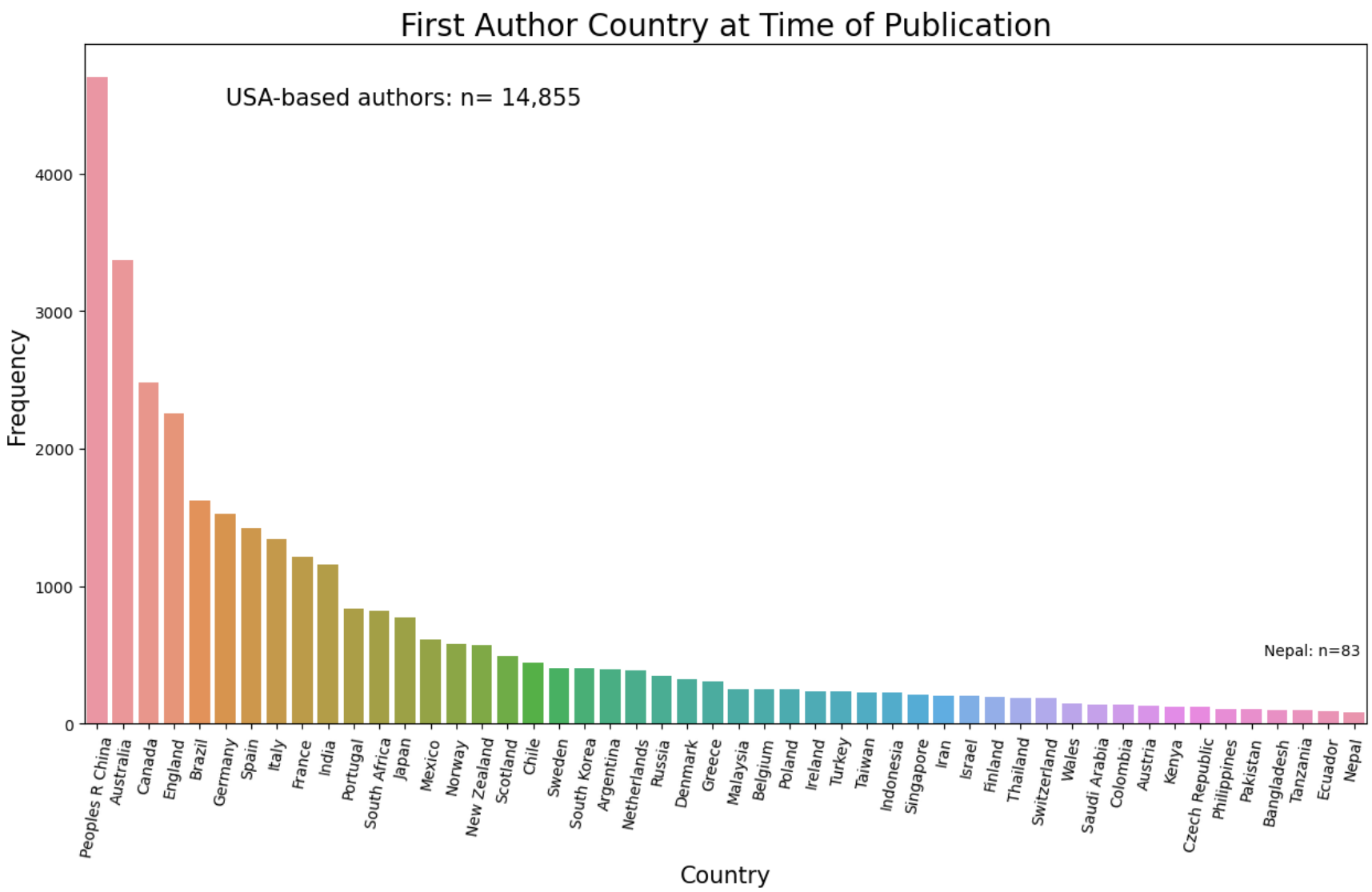
Key Informant Interviews

Key informant interviews were conducted before my proposal was written in order to identify important perspectives that may not be prevalent in the literature and acknowledge my own positionality in relation to this subject. Since I have no publishing experience myself and have privilege in this field as a white person born in the United States, I felt this was important to the formation of a quality proposal. I found individuals who study within the field of conservation and ecology through Gage, a database created by 500 Women Scientists.

Web of Science Sample

The complete sample of publications and authors was collected using the Web of Science database. The sample was based on a 5-year time frame, which included articles published between 2018 and 2022. A shorter time frame was selected because a more current state of conservation, rather than changes over time, is of interest. The following search query was used: (ALL=(ecolog* or conserv*)) AND ALL=(wildlife biology or marine biology or wildlife or marine). 50,000 article records were downloaded, which included the following: authors, article title, source title, keywords, abstract, addresses, email address, times cited, publisher, year, and open access designation. The full dataset was used to answer RQ2, and a randomized sample of the dataset was used to answer RQ1 (described in depth below). The composition of the full sample is shown in Graph 3.

Graph 3



Note. Only the 50 most frequently occurring countries are included in this graph

Intellectual Diversity Survey

The intellectual diversity survey addressed RQ1. It is important to note that the goal of this survey was not to confirm that racial and gender biases exist. A large body of literature already exists that presents thorough research identifying these biases (Davies et al. 2021, Morrison & Steltzer 2021, Kumar & Karusala 2021, Mott & Cockayne 2017, Hopkins et al. 2013). This work focused on demonstrating the connection between social diversity and intellectual diversity, and inevitable gaps in conservation knowledge as a result. The intellectual diversity survey had four primary components: measuring axiology, measuring epistemology, measuring specific publishing culture dynamics, and collecting demographic information.

Intellectual Diversity Survey Sample and Implementation

The target was 250 responses from international authors (IA) and 250 responses from domestic authors (DA). Given a previous response rate of 19.6% in a study that collected demographic information from authors via email (Hopkins et al. 2013), we planned to send the survey to 1,276 researchers from each group. Given multiple emails were likely to no longer exist, the survey sample was rounded up to 1,300 researchers.

Web of Science records contained each author's mailing address and email address at the time of publication. We used regular expressions, a powerful mini-language that allows advanced searching, to extract just the first author's country of residence and email address. 35,145 records had first authors who resided outside the United States at the time of publication, and the remaining 14,855 records all had first authors who had addresses within the United States at the time of publication. Based on these addresses, 1,300 first author email addresses were randomly selected for both international and domestic authors. The intellectual diversity survey was initially sent to this sample of 2,600 first authors. Any authors who had set up automatic replies indicating a new email address (n = 13) received the survey at the suggested email address. For any records selected that had the same first author (n= 55), replacement records were randomly selected. Additionally, replacement records were randomly selected for emails that bounced back or no longer existed (n = 268).

Measures

Axiology

The Environmental Portrait Questionnaire (E-PVQ), developed by Bouman et al. (2018), consists of 17 items with descriptions of situations involving another person, and participants respond on a 7-point Likert scale (1 *not like me* to 7 *very like me*). For example, one item from the E-PVQ is, *It is important to (him/her/them) to prevent environmental pollution*. Values in the survey are grouped into four value dimensions: biospheric, altruistic, hedonic, and egoistic.

Epistemology

The Discipline Focused Epistemic Beliefs Questionnaire (DFEBQ) developed by Hofer (2000) consists of 27 items on a 5-point Likert scale. Since epistemological beliefs differ as a function of field of study, the DFEBQ specifically addresses beliefs within a single discipline (i.e. conservation, ecology). Its goals are to assess source of knowledge, certainty of knowledge, simplicity of knowledge, and justification of knowledge (Schraw 2013). Survey-takers report their agreement with a statement such as, *Experts in this field can ultimately get to the truth,* or *A theory in this field is accepted as true and correct if experts reach consensus* (Schraw 2013).

Publishing Culture Dynamics

The survey created also specifically addresses an author's current experiences with publishing culture. These questions are primarily inspired by the key informant interviews described in the positionality statement and also confirmed current research that peer review processes involve numerous biases, including comments about English fluency and bias against names that are not typically associated with 'English.'

Demographics

Collecting demographic data was central to understanding how intellectual diversity and social diversity connect. Social

diversity proxies being used to answer research questions in this study included global region of birth and whether or not an author's first language is English. Global region of residence was also tested (Appendix 1), but region of birth was used as a primary social diversity proxy in order to capture the phenomenon of academic migration.

Natural Language Processing - Full Sample

Topic modeling is a process that groups documents (a corpus) based on their words or concepts (Callaghan et al. 2020). Topic modeling will determine how many different topics are appearing within the full sample of articles (n = 50,000), and then topics most prevalent in countries and regions around the world can be identified. Of various topic modeling methods, Latent Dirichlet Allocation (LDA) was used, which is very widely used in studies involving topic modeling across many different fields. LDA minimizes the topics assigned to an abstract and defines topics with as few words as possible (Albrecht et al. 2020). Other topic modeling methods that were tested in order to identify the most coherent and comprehensive models included singular value decomposition (SVD) and nonnegative matrix factorization (NMF).

Before analysis and topic modeling began, article abstracts went through a text cleaning and tokenization process. Cleaning text involves removing punctuation, numbers, and commonly occurring words (stopwords). Words were lemmatized and changed into lowercase form for ease of comparison. Natural language processing was a key component in answering RQ2. In order to preserve meaningful words, abstracts were broken into bigrams (pairs of words) and trigrams (trios of words). Most common topics studied, theories used, and methods were identified. For example, groups of words that involved the words 'theory' or 'theories' were stored and further examined, as well as in what context studies mention 'model'. All natural language processing and topic modeling was completed using the Python language in Jupyter Notebook, and a repository of all code is available upon request.

Results

Intellectual Diversity Surveys

After the initial survey invite was sent to sample authors, two additional reminder emails were sent six days apart. After 14 days, the response rate for the international authors (IA) was 11.13%, and the response rate for the domestic authors (DA) was 17.95%. To reach the target response rate, the survey was sent to an additional 1,100 international authors, using the current response rate of 11% instead of the original theoretical response rate of 19.6% (Hopkins et al. 2013). The response rate for the DA sample was high enough that no additional sampling was needed. After additional sampling, the response rate for the IA sample was 12.2%, with a total number of responses of 273. The final count for the DA sample was 243 responses, and a response rate of 19.6% (the original theorized rate).

Seven completed surveys had to be removed from the survey sample, as the authors indicated they did not consent to finishing the survey. Additionally, 91 surveys were only partially complete. Surveys were retained, but during analysis (independent sample t-

tests) cases with missing data were deleted listwise, meaning the entire case was not used in the test if desired data was not present. Since the DFEBQ was at the front end of the survey, it had the least amount of missing data. The survey was administered through Qualtrics, and survey data was exported to SPSS for analysis.

Independent sample t-tests were conducted on the DFEBQ, EPVQ, and publishing biases questions to assess intellectual diversity after organizing respondents based on the following criteria: *Is English your first language?* (Yes / No) and *Were you born in North America?* (Yes / No). This resulted in the following groups: EFL (n=275), NEFL (n=148), NAB (n=227), and NNAB (n=201). For each survey and criteria, mean response, standard deviation, t value, p value, and effect size are shown in the tables 2 through 7 below.

Discipline Focused Epistemic Beliefs Questionnaire (DFEBQ)

There is strong evidence that individuals whose first language was not English (NEFL) have different epistemological beliefs than those whose first language was English (EFL). Most differences in beliefs between the NEFL and EFL groups are in the certainty of truth dimension, however significant differences and mild effect sizes are also found in the three other epistemology dimensions. The largest effect sizes ($d > .30$) are with the beliefs *'Experts in this field can ultimately get to the truth'* and *'All professors in this field would probably come up with the same answers to questions in this field'*. The EFL group believed more strongly that experts could get to the truth, and the NEFL group believed more strongly that everyone in the field would come up with the same answers to questions.

Additionally, three beliefs stand out as having nearly identical responses between groups ($p > .80$). Within the personal justification of knowledge dimension, the belief *'I am more likely to accept the ideas of someone with firsthand experience than the ideas of researchers in this field'* had extremely similar responses ($p = .972$), as well as the belief *'Correct answers in this field are more a matter of opinion than fact'* ($p = .844$). Finally, another belief with a notably high p value ($p=.82$) was *'If scholars try hard enough, they can find the answers to almost anything',* which lies in the same dimension as a belief with one of the larger effect sizes, attainment of truth.

There is strong evidence that NNAB researchers have different epistemological beliefs than NAB researchers. Differences in beliefs between these groups are spread across epistemology dimensions, and no single dimension stands out as contributing most to group differences. However, the greatest effect size ($d = .391$) was found in the attainment of truth dimension with the belief, *'Experts in this field can ultimately get to the truth'*. NAB respondents believed more strongly that there was an attainable truth. The next largest effect size ($d = .296$) was for the belief, *'Sometimes you just have to accept answers from the experts in this field, even if you don't understand them'*, which the NAB group believed most.

Additionally, there were many scale items that both groups tended to agree on, which resulted in high p values and very small effect sizes. The personal justification of knowledge dimension contains the '*First-hand experience is the best way of knowing*

something in this field' belief, which both groups responded to nearly identically (p = .913). Another belief with little difference between groups (p = .866) was '*If scholars try hard enough, they can find the answers to almost anything',* which is interestingly located in the same dimension as the belief with the highest effect size (attainment of truth).

Environmental Portrait Value Questionnaire (EPVQ)

There is strong evidence suggesting a difference in values between NNAB and NAB researchers. While significant differences between groups and mild effect sizes are found in all four value dimensions, many of these differences lie in the egoistic and altruistic value dimensions. The strongest effect sizes ($d > .30$) are found in the values *'work hard and be ambitious'* and *'ensure there is no war or conflict'*. NAB authors tended to value *'work hard and be ambitious'* more, while NNAB authors valued *'ensure there is no war or conflict'* more.

Additionally, there were two values that stand out as being similar between groups (p > .80). In the altruism dimension, both groups valued ensuring everyone had equal opportunities (p = .823). In the biospheric dimension, both groups also valued being in unity with nature (p = .857). The altruism dimension also had the highest effect size for a difference between groups (*'Ensure there is no war or conflict,* $d = .355$), so there is some variation in this dimension.

There is strong evidence that NEFL researchers have different values than EFL researchers. These differences are found in three value dimensions: biospheric, altruistic, and egoistic. The largest effect sizes ($d > .30$) are primarily found in the egoistic dimension, with the values *'have control over others actions'* and *'work hard and be ambitious'*. In the altruistic value dimension, the value *'ensure there is no war or conflict'* also has an effect size slightly greater than .30. Within the egoistic dimension, the EFL group more strongly valued ambition and working hard, while the NEFL group more strongly valued having control over others' actions. Within the altruistic dimension, the NEFL group more strongly valued having no war or conflict.

Additionally, there were several scale items that showed a lot of agreement in values between groups. Two values stand out as having the most agreement between groups: in the hedonic dimension, having fun (p = .973) was valued similarly and in the biospheric dimension being in unity with nature was important to both groups (p = .997). There was another value in the hedonic dimension, enjoying life's pleasures, that was valued similarly by both groups (p = .824). The egoistic dimension had one value, being influential, that had similar responses between groups (p = .831). This is interesting because most values in the egoistic dimension had differences between groups.

Publishing Biases

Almost all scale items in the section specifically measuring publishing biases showed strong evidence that biases are experienced differently between NEFL and EFL researchers. The gender bias item was the only one that did not show evidence of a difference between the groups. There was a very large effect size ($d = .927$) for the item *'Racial biases negatively impact my ability to publish research',* with the NEFL group experiencing this bias more strongly. For all the other scale items with mild to moderate

effect sizes, the NEFL group experienced biases more strongly than the EFL group. There were no scale items where there was significant similarity between groups. Additionally, larger effect sizes for the NEFL researchers than NNAB researchers suggest that first language causes more disparities than the region of birth. On average, NEFL researchers also experienced biases more strongly than NNAB researchers.

Almost all scale items in the section specifically measuring publishing biases showed strong evidence that biases are experienced differently NNAB and NAB researchers. Again, the gender bias question was the only one that did not show evidence of a difference between the groups. The largest effect size (d = .724) was for the item *'Racial biases negatively impact my ability to publish research',* with the NNAB group experiencing this bias more strongly. For all the other scale items with mild to moderate effect sizes, NNAB researchers experienced biases more strongly than the NAB group. There were no scale items where there was a significant similarity between groups.

Table 2

Results of t tests for DFEBQ and First Language

Scale Item	Is English your first language? Yes *M*	Yes *SD*	No *M*	No *SD*	*t*	p	Cohen's *d*
Dimension 1: Certainty of Knowledge							
Answers to questions in this field change as experts gather more information	4.45	0.652	4.33	0.788	1.652	0.099	0.169
All experts in this field understand the field in the same way	2.05	0.977	2.31	1.078	-2.488 [a]	0.013 *	-0.262
Truth is unchanging in this subject	2.12	1.083	2.18	1.194	-0.583	0.560	-0.060
In this subject, most work has only one right answer	1.60	0.796	1.81	1.053	-2.057 [a]	0.041 *	-0.229
Principles in this field are unchanging	2.14	0.994	2.41	1.059	-2.613 [a]	0.009 **	-0.272
All professors in this field would probably come up with the same answers to questions in this field	1.93	0.856	2.23	1.041	-2.963 [a]	0.003 **	-0.321
In this subject, it is good to question the ideas presented	4.55	0.592	4.43	0.800	1.677 [a]	0.095	0.188
Most of what is true in this subject is already known	1.84	0.887	2.05	0.935	-2.361	0.019 *	-0.241
Dimension 2: Personal Justification of Knowledge							
First-hand experience is the best way of knowing something in this field	3.27	1.036	3.44	1.054	-1.625	0.105	-0.166
I am more likely to accept the ideas of someone with firsthand experience than the ideas of researchers in this field	2.74	0.937	2.74	0.997	-0.035	0.972	-0.004
Correct answers in this field are more a matter of opinion than fact	1.94	0.875	1.96	1.122	-0.197 [a]	0.844	-0.022
There is really no way to determine whether someone has the right answer in this field	2.04	0.893	2.26	1.086	-2.091 [a]	0.038 *	-0.227
Dimension 3: Source of Knowledge, Authority							
Sometimes you just have to accept answers from the experts in this field, even if you don't understand them	2.53	1.189	2.26	1.134	2.202	0.028 *	0.227
If you read something in a textbook for this subject, you can be sure it's true	2.31	1.024	2.52	1.044	-1.963	0.050 *	-0.202
If my personal experience conflicts with ideas in the textbook, the book is probably right	2.28	0.786	2.38	0.915	-1.058 [a]	0.291	-0.114
I am most confident that I know something when I know what the experts think	3.33	0.919	3.38	0.996	-0.478	0.633	-0.049
Dimension 4: Attainment of Truth							

Experts in this field can ultimately get to the truth	3.46	0.902	3.13	1.111	3.019	0.003 **	0.331
If scholars try hard enough, they can find the answers to almost anything	3.09	1.120	3.12	1.191	-0.227	0.820	-0.023

Note. The DFEBQ was measured on a scale from 1 - *Strongly disagree* to 5 - *Strongly Agree*. The sample of individuals was composed of N=275 for 'Yes' and N=148 for 'No'. Individuals who did not respond to either question were excluded. *p < .05, **p .01, ***p .001

[a] Levene's test for equality of variances resulted in equal variance not assumed. To reflect this, t is the Welch t test statistic.

Table 3

Results of t tests for DFEBQ and Region of Birth

Scale Item	Were you born in North America? Yes *M*	Yes *SD*	No *M*	No *SD*	*t*	p	Cohen's *d*
Dimension 1: Certainty of Knowledge							
Answers to questions in this field change as experts gather more information	4.44	0.706	4.38	0.692	1.007	0.315	0.093
All experts in this field understand the field in the same way	2.03	0.970	2.26	1.060	-2.466 [a]	0.014 *	-0.228
Truth is unchanging in this subject	2.15	1.089	2.19	1.188	-0.390	0.697	-0.036
In this subject, most work has only one right answer	1.65	0.852	1.73	0.961	-0.948	0.344	-0.088
Principles in this field are unchanging	2.18	1.017	2.25	1.024	-0.768	0.443	-0.071
All professors in this field would probably come up with the same answers to questions in this field	1.97	0.869	2.07	0.976	-1.237 [a]	0.217	-0.114
In this subject, it is good to question the ideas presented	4.59	0.583	4.46	0.733	2.090 [a]	0.037 *	0.195
Most of what is true in this subject is already known	1.85	0.888	1.92	0.912	-0.750	0.454	-0.070
Dimension 2: Personal Justification of Knowledge							
First-hand experience is the best way of knowing something in this field	3.30	1.012	3.29	1.084	0.110	0.913	0.010
I am more likely to accept the ideas of someone with firsthand experience than the ideas of researchers in this field	2.72	0.963	2.68	0.957	0.366	0.715	0.034
Correct answers in this field are more a matter of opinion than fact	1.89	0.875	1.94	1.049	-0.649 [a]	0.516	-0.061
There is really no way to determine whether someone has the right answer in this field	2.00	0.910	2.19	1.013	-2.014 [a]	0.045 *	-0.188
Dimension 3: Source of Knowledge, Authority							
Sometimes you just have to accept answers from the experts in this field, even if you don't understand them	2.60	1.245	2.26	1.096	3.121 [a]	0.002 **	0.296
If you read something in a textbook for this subject, you can be sure it's true	2.36	1.069	2.40	1.006	-0.374	0.709	-0.036
If my personal experience conflicts with ideas in the textbook, the book is probably right	2.31	0.842	2.34	0.870	-0.421	0.674	-0.040

I am most confident that I know something when I know what the experts think	3.39	0.956	3.26	0.954	1.468	0.143	0.140
Dimension 4: Attainment of Truth							
Experts in this field can ultimately get to the truth	3.54	0.915	3.15	1.037	4.095	<.001 ***	0.391
If scholars try hard enough, they can find the answers to almost anything	3.08	1.110	3.10	1.164	-0.169	0.866	-0.016

Note. The DFEBQ was measured on a scale from 1 - *Strongly disagree* to 5 - *Strongly Agree*. The sample of individuals was composed of N=227 for 'Yes' and N=201 for 'No'. Individuals who did not respond to either question were excluded. *p < .05, **p .01, ***p .001

[a] Levene's test for equality of variances resulted in equal variance not assumed. To reflect this, t is the Welch t test statistic.

Table 4

Results of t tests for E-PVQ and Region of Birth

Scale Item	Were you born in North America? Yes		No		*t*	p	Cohen's *d*
It is important to them to…	*M*	*SD*	*M*	*SD*			
Dimension 1: Biospheric							
Protect the environment	6.42	0.808	6.30	0.870	1.554	0.121	0.150
Prevent environmental pollution	6.22	0.966	6.10	1.105	1.255	0.210	0.120
Respect nature	6.58	0.797	6.38	0.949	2.305 [a]	0.022 *	0.223
Be in unity with nature	5.39	1.320	5.41	1.229	-0.180	0.857	-0.017
Dimension 2: Altruistic							
Take care of those who are worse off	5.84	1.112	5.67	1.263	1.451 [a]	0.148	0.140
Ensure every person is treated justly	6.42	0.920	6.22	1.155	2.065 [a]	0.040 *	0.200
Ensure that every person has equal opportunities	6.07	1.183	6.04	1.239	0.224	0.823	0.022
Ensure there is no war or conflict	5.26	1.34	5.74	1.383	-3.668	< .001 ***	-0.355
Be helpful to others	6.14	1.008	5.92	1.114	2.197	0.029 *	0.213
Dimension 3: Hedonic							
Have fun	5.69	1.281	5.52	1.291	1.327	0.185	0.127
Do things they enjoy	6.10	1.057	5.82	1.227	2.553	0.011 *	0.245
Enjoy life's pleasures	5.62	1.253	5.38	1.360	1.851	0.065	0.179
Dimension 4: Egoistic							
Have control over others' actions	2.49	1.446	2.79	1.437	-2.121	0.035 *	-0.206
Have authority over others	2.51	1.355	2.69	1.384	-1.362	0.174	-0.132
Have money and possessions	3.56	1.472	3.69	1.501	-0.918	0.359	-0.089
Work hard and be ambitious	5.60	1.138	5.18	1.375	3.389 [a]	0.001 **	0.331
Be influential	4.18	1.584	4.06	1.488	0.784	0.433	0.076

Note. The E-PVQ was measured on a scale from 1 - *Very unlike me* to 7 - *Very like me*. The sample of individuals was composed of N=227 for 'Yes' and N=201 for 'No'. Individuals who did not respond to either question were excluded. *p < .05, **p .01, ***p .001

[a] Levene's test for equality of variances resulted in equal variance not assumed. To reflect this, t is the Welch t test statistic.

Table 5

Results of t tests for E-PVQ and First Language

Scale Item	Is English your first language? Yes		No		*t*	p	Cohen's *d*
It is important to them to…	*M*	*SD*	*M*	*SD*			
Dimension 1: Biospheric							
Prevent environmental pollution	6.21	0.943	6.10	1.137	1.116	0.265	0.114
Respect nature	6.57	0.777	6.36	0.979	2.254 [a]	0.025 *	0.247
Protect the environment	6.40	0.846	6.29	0.836	1.328	0.185	0.136
Be in unity with nature	5.40	1.272	5.40	1.305	0.004	0.997	< .001
Dimension 2: Altruistic							
Take care of those who are worse off	5.85	1.080	5.64	1.308	1.643 [a]	0.102	0.178
Ensure every person is treated justly	6.42	0.914	6.16	1.222	2.250 [a]	0.025 *	0.251
Ensure every person has equal opportunities	6.07	1.159	6.04	1.303	0.260	0.795	0.027
Ensure there is no war or conflict	5.34	1.337	5.76	1.430	-3.027	0.003 **	-0.309
Be helpful to others	6.12	0.991	5.88	1.173	2.180	0.030 *	0.223
Dimension 3: Hedonic							
Have fun	5.60	1.309	5.61	1.216	-0.034	0.973	-0.004
Do things they enjoy	6.02	1.099	5.87	1.222	1.298	0.195	0.133
Enjoy life's pleasures	5.48	1.308	5.51	1.330	-0.223	0.824	-0.023
Dimension 4: Egoistic							
Have control over others' actions	2.44	1.421	2.98	1.441	-3.676	< .001 ***	-0.377
Have authority over others	2.44	1.332	2.84	1.405	-2.820	0.005 **	-0.289
Have money and possessions	3.55	1.455	3.75	1.503	-1.286	0.199	-0.132
Work hard and be ambitious	5.54	1.218	5.14	1.343	3.117	0.002 **	0.318
Be influential	4.11	1.585	4.14	1.485	-0.213	0.831	-0.022

Note. The E-PVQ was measured on a scale from 1 - *Very unlike me* to 7 - *Very like me*. The sample of individuals was composed of N=275 for 'Yes' and N=148 for 'No'. Individuals who did not respond to either question were excluded. *p < .05, **p .01, ***p .001

[a] Levene's test for equality of variances resulted in equal variance not assumed. To reflect this, t is the Welch t test statistic.

Table 6

Results of t tests for Bias Questionnaire Scale Items and First Language

Scale Item	Is English your first language? Yes		No		*t*	p	Cohen's *d*
	M	*SD*	*M*	*SD*			
Racial biases negatively impact my ability to publish research	1.64	0.986	2.72	1.451	-8.132 [a]	< .001 ***	-0.927
Gender biases negatively impact my ability to publish research	2.27	1.332	2.49	1.412	-1.616	0.107	-0.165
My name negatively affects my ability to publish research	1.91	1.141	2.48	1.416	-4.234 [a]	< .001 ***	-0.462
Financial barriers limit my ability to publish research	2.91	1.414	3.63	1.279	-5.339 [a]	< .001 ***	-0.529
Financial barriers limit my ability to publish open access	3.72	1.406	4.21	1.138	-3.877 [a]	< .001 ***	-0.371
Financial barriers limit my ability to publish in high impact journals	3.04	1.386	3.62	1.317	-4.184	< .001 ***	-0.427
Publishing research in a language other than English is looked down upon in my field	3.61	1.07	4.28	0.968	-6.346	< .001 ***	-0.647

Note. These items were measured on a scale from 1 - *Strongly disagree* to 5 - *Strongly Agree*. The sample of individuals was composed of N=275 for 'Yes' and N=148 for 'No'. Individuals who did not respond to either question were excluded. *p < .05, **p .01, ***p .001

[a] Levene's test for equality of variances resulted in equal variance not assumed. To reflect this, t is the Welch t test statistic.

Table 7

Results of t tests for Bias Questionnaire Scale Items and Region of Birth

Scale Item	Were you born in North America? Yes		No		*t*	p	Cohen's *d*
	M	*SD*	*M*	*SD*			
Racial biases negatively impact my ability to publish research	1.61	0.995	2.49	1.404	-7.343 [a]	< .001 ***	-0.724
Gender biases negatively impact my ability to publish research	2.26	1.366	2.46	1.358	-1.506	0.133	-0.146
My name negatively affects my ability to publish research	1.93	1.175	2.33	1.354	-3.191 [a]	0.002 **	-0.311
Financial barriers limit my ability to publish research	2.86	1.403	3.49	1.333	-4.754	< .001 ***	-0.460
Financial barriers limit my ability to publish open access	3.71	1.377	4.08	1.262	-2.942 [a]	0.003 **	-0.283
Financial barriers limit my ability to publish in high impact journals	3.00	1.379	3.50	1.351	-3.804	< .001 ***	-0.368
Publishing research in a language other than English is looked down upon in my field	3.66	1.058	4.06	1.065	-3.927	< .001 ***	-0.368

Note. These items were measured on a scale from 1 - *Strongly disagree* to 5 - *Strongly Agree*. The sample of individuals was composed of N=227 for 'Yes' and N=201 for 'No'. Individuals who did not respond to either question were excluded. *p < .05, **p .01, ***p .001

[a] Levene's test for equality of variances resulted in equal variance not assumed. To reflect this, t is the Welch t test statistic.

Results

Text Summarization

After removing records that did not contain abstracts (n=564), 34,758 abstracts were classified into the international author (IA) group and 14,678 abstracts were classified into the domestic author (DA) group. Initially, bigrams (pairs of successive words) and trigrams (trios) were investigated to examine any differences between the IA and DA groups. Next, bigrams and trigrams were searched for elements of research design using the following keywords: ‘theory’, ‘model’, and ‘analysis.’ Next, subjects, verbs, and objects were extracted from sentences in the IA and DA abstracts and tested for differences between groups.

Bigrams and Trigrams

The 30 most frequent bigrams and trigrams for each group are shown in Tables 8 and 9 below. Trigrams and bigrams were removed if they were not relevant to understanding the abstract content (i.e. ‘our results suggest’, ‘the study’, etc.).

Table 8

Common Trigrams - IA Sample

Trigram	Frequency
*('marine', 'protected', 'area')	1592
*('sea', 'surface', 'temperature')	571
*('protected', 'area', 'mpas')	526
('south', 'china', 'sea')	387
*('stable', 'isotope', 'analysis')	339
('marine', 'spatial', 'planning')	317
*('specie', 'distribution', 'model')	313
('iucn', 'red', 'list')	305
('marine', 'food', 'web')	273
('great', 'barrier', 'reef')	229
('principal', 'component', 'analysis')	228
('east', 'china', 'sea')	228
('play', 'key', 'role')	227
('protected', 'area', 'mpa')	215
('higher', 'trophic', 'level')	212
('operational', 'taxonomic', 'unit')	208
('potential', 'ecological', 'risk')	205

Common Trigrams - DA Sample

Trigram	Frequency
*('marine', 'protected', 'area')	287
('specie', 'conservation', 'concern')	236
('national', 'wildlife', 'refuge')	216
('endangered', 'specie', 'act')	211
*('sea', 'surface', 'temperature')	180
('fish', 'wildlife', 'service')	175
('population', 'growth', 'rate')	165
*('specie', 'distribution', 'model')	160
('southeastern', 'united', 'state')	145
('western', 'united', 'state')	141
*('home', 'range', 'size')	140
*('stable', 'isotope', 'analysis')	135
('northern', 'gulf', 'mexico')	129
('global', 'positioning', 'system')	119
('black', 'bear', 'ursus')	118
*('spatial', 'temporal', 'scale')	117
*('protected', 'area', 'mpas')	117

('international', 'union', 'conservation')	199	('coyote', 'canis', 'latrans')	117
('union', 'conservation', 'nature')	199	('deer', 'odocoileus', 'virginianus')	115
*('generalized', 'linear', 'model')	194	('bear', 'ursus', 'americanus')	115
*('home', 'range', 'size')	193	*('effective', 'population', 'size')	114
('coral', 'reef', 'ecosystem')	192	('sea', 'level', 'rise')	107
*('effect', 'climate', 'change')	188	('western', 'north', 'america')	100
('impact', 'climate', 'change')	187	*('single', 'nucleotide', 'polymorphism')	99
*('single', 'nucleotide', 'polymorphism')	176	*('effect', 'climate', 'change')	97
('illegal', 'wildlife', 'trade')	175	('linear', 'mixed', 'model')	95
*('effective', 'population', 'size')	169	('wolf', 'canis', 'lupus')	92
*('spatial', 'temporal', 'scale')	168	*('generalized', 'linear', 'model')	90
('marine', 'strategy', 'framework')	167	('generalized', 'linear', 'mixed')	87
('population', 'genetic', 'structure')	166	('resource', 'selection', 'function')	86

Note. *denotes trigrams that appear in both groups

Table 9

Common Bigrams - IA Sample

Bigram	Frequency
*('protected', 'area')	4191
*('climate', 'change')	3763
*('marine', 'ecosystem')	2723
('marine', 'environment')	2322
*('coral', 'reef')	1932
*('specie', 'richness')	1710
*('food', 'web')	1614
('marine', 'protected')	1604
*('genetic', 'diversity')	1460
*('ecosystem', 'service')	1452
('fish', 'specie')	1430
('national', 'park')	1412
*('environmental', 'condition')	1371

Common Bigrams - DA Sample

Bigram	Frequency
*('climate', 'change')	1768
('united', 'state')	1577
*('protected', 'area')	1007
('north', 'america')	886
('life', 'history')	880
*('coral', 'reef')	774
*('specie', 'richness')	767
*('growth', 'rate')	755
('home', 'range')	751
*('habitat', 'use')	725
('spatial', 'scale')	666
*('genetic', 'diversity')	660
*('environmental', 'condition')	647

('human', 'activity')	1358	*('food', 'web')	631
*('conservation', 'management')	1258	('conservation', 'effort')	601
*('case', 'study')	1127	('endangered', 'specie')	600
('community', 'structure')	1073	*('population', 'size')	600
*('microbial', 'community')	1053	('body', 'size')	568
('stable', 'isotope')	1047	('gulf', 'mexico')	563
('significant', 'difference')	1041	*('sea', 'turtle')	559
*('sea', 'turtle')	1026	*('marine', 'ecosystem')	557
('mediterranean', 'sea')	1009	*('conservation', 'management')	549
*('specie', 'distribution')	992	('population', 'dynamic')	546
*('population', 'size')	991	*('ecosystem', 'service')	536
*('habitat', 'use')	979	*('case', 'study')	508
('environmental', 'change')	974	('spatial', 'temporal')	507
('marine', 'mammal')	973	*('specie', 'distribution')	498
*('growth', 'rate')	964	*('microbial', 'community')	496
('organic', 'matter')	959	('habitat', 'selection')	491
('marine', 'specie')	952	('community', 'composition')	477

Note. *denotes bigrams that appear in both groups

For both the IA and DA groups, ‘marine protected area’ appeared as a very frequent trigram. Other frequently mentioned trigrams that occurred in both groups included ‘stable isotope analysis’, ‘specie distribution model’, ‘sea surface temperature’, ‘effective population size’, ‘single nucleotide polymorphism’, ‘effect climate change’, ‘protected area mpa’, ‘home range size’, ‘spatial temporal scale’, and ‘generalized linear model’. While their usage slightly varies between groups, these represent common areas of study between researchers.

Differences in trigrams reflect differences in geographic focus, methods, and models of conservation. For example, the IA group frequently mentioned ‘iucn red list’, ‘international union conservation’, and ‘union conservation nature’, which all reflect the International Union for Conservation of Nature and how they classify at risk species. Conversely, the DA group mentions no IUCN-related trigrams, but mentions ‘endangered specie act’ and ‘specie conservation concern’, specifically how the United States handles at risk species. Additionally, geographic references are common in the DA group, such as ‘southeastern united state’ ‘western united state’, and ‘western north america’. Examining trigram differences also reveals the DA group frequently mentioned these species: black bear, coyote, white-tailed deer, and the grey wolf.

For bigrams, over half (n=17) of the 30 most common were shared between groups. Differences in bigrams are similar to many trigrams, where geographic focus on the United States is seen in the DA group. In the IA group, there are more bigrams related to marine wildlife. Other differences in bigrams reflect some mild differences in subject matter between groups.

Elements of Research Design

After examining the 20 most frequent occurrences of 'analysis', 'model', and 'theory' for each group, the below paragraphs highlight similarities and differences between groups for bigrams and trigrams. Various types of models and analysis were mentioned more than theory in abstracts. As a reminder, the text tokenization and cleaning process includes removing plural versions of words and stopwords (like 'of' or 'the'), so while bigrams and trigrams offer an accurate suggestion to the true phrase, they may not be pictured exactly as they are in the abstracts.

When trigrams were searched for the keyword 'analysis,' for both groups 'stable isotope analysis' and 'principal component analysis' were the two most frequent trigrams. Both groups mentioned analysis in the following contexts: 'canonical correspondence analysis', 'stomach content analysis', 'population viability analysis', 'population genetic analysis', 'social network analysis', and 'analysis molecular variance.' The DA group mentioned the following contexts, while the IA group did not: 'linear regression analysis', 'discriminant function analysis', 'time series analysis', 'resource selection analysis', and 'linear discriminant analysis.' Conversely, the IA group mentioned the following contexts, while the US group did not: 'phylogenetic analysis', 'comparative genomic analysis', 'multivariate statistical analysis', 'redundancy analysis', 'gene expression analysis', 'ecological network analysis', 'hierarchical cluster analysis.' Bigrams ultimately confirmed any analysis mentioned in trigrams above.

When trigrams were searched for 'model,' both groups had the same top four most frequently mentioned models: 'specie distribution model', 'linear mixed model', 'generalized linear model', and 'generalized additive model.' Other than these most frequent four, the following contexts were shared by both groups: 'ecological niche model', 'habitat suitability model', 'hidden markov model', 'logistic regression model', 'food web model', 'spatially explicit model', 'random forest model', and 'structural equation model.' Unique frequent contexts for the DA group included: 'integrated population model', 'hierarchical bayesian model', 'dynamic occupancy model', and 'multispecies occupancy model.' The IA group mentioned 'bayesian mixing model,' while the DA group did not.

Of the abstracts that mentioned 'theory,' 'optimal foraging theory' and 'theory planned behavior' were the most frequently mentioned for both groups. However, theory was not mentioned often in abstracts for either group, so differences and similarities in theory use would be best observed by looking at the full article.

Syntactic Differences

To specifically investigate syntactic differences between the IA and DA groups, subjects, verbs, and objects were extracted from the sentences of abstracts. Then, lists of subjects, verbs, and objects for each group were compared using a chi squared test. The i

tems in the list were organized in the following way: ('villages', 'designating', 'land'), ('heatwave', 'influenced', 'trade-offs'), etc. The chi square test resulted in a very significant p value ($p < .00001$), and Cramer's V, a measure of effect size, was equal to .68. However, the original literature (Cohen 1988) only lists effect sizes out to five degrees of freedom, and Cramer's V is not considered sufficient for t ests with very large degrees of freedom and can overestimate effect sizes (the test on SVOs featured df = 36,577). Cohen (1988) descri bes converting V to Cohen's omega (ω), which resulted in $\omega = .922$. Therefore, there is very strong evidence to suggest that the DA an d IA abstracts were syntactically different.

Topic Modeling

First, LDA was completed with the Python package genism so that coherence scores could be used to identify the optimal model. Twenty-two models were created to identify the number of topics (between 3 and 25) most appropriate for the dataset. The highest coherence score was .46 at 18 topics. Second, NMF models were created using both the sklearn implementation and the gensim implementation. Sklearn produced very clear topics, but the gensim method was also important because it produces coherence scores while the sklearn method does not. The gensim method was used to explore the ideal number of topics: 67 topic models were created for topics 3 through 70 to identify the topic number with the highest coherence score. The greatest coherence score was equal to .53 at 21 topics. Then, the sklearn method was revisited at 21 topics because it still produced the clearest topic/word groupings. Summing individual topic contributions across all abstracts and normalizing them was used as a quality indicator (Albrecht et al. 2020), and the overall distribution of topic contributions was relatively equal. Therefore, the 21-topic NMF model in sklearn fit the data well. Third, SVD models using 10, 15, 18, 21, and 30 topics were created, but yielded topics with no clear meaning behind them.

Given NMF created models with greater coherence than LDA, NMF will be used going forward. Additionally, since the sklearn implementation produced topics that were the easiest to understand, this will be the final model used going forward. Each topic is displayed in table 10 with its top ten contributing keywords, associated weights, and the number of abstracts that were assigned to that topic. The proportion of abstracts from the IA and DA groups for each topic is shown in table 11, which also investigates specific differences in topic study. A randomly selected abstract and its associated topic is shown in table 12.

Table 10

Topics and Associated Keywords

Topic #	Contributing Keywords (weight)	Number of Abstracts
0	community (1.62) communities (1.54) microbial (1.37) diversity (1.24) bacterial (0.89) composition (0.80) functional (0.67) abundance (0.58) structure (0.57) benthic (0.53)	1448
1	conservation (0.98) management (0.81) marine (0.77) social (0.77) ecosystem (0.57) research (0.57) ecological (0.53) development (0.53) governance (0.46) biodiversity (0.45)	4256
2	genetic (4.80) population (2.16) populations (2.05) diversity (1.34) structure (1.13) differentiation (0.85) connectivity (0.74) flow (0.72) dispersal (0.70) gene (0.70)	1844
3	host (1.71) sp (1.56) new (1.05) nov (1.00) parasite (0.97) genus (0.96) infection (0.79) parasites (0.69) disease (0.69) morphological (0.69)	2829
4	genes (1.56) genome (1.06) gene (0.90) expression (0.79) protein (0.69) conserved (0.47) cell (0.45) proteins (0.41) genomic (0.41) marine (0.41)	2529
5	fishing (4.42) fisheries (3.86) fishery (1.73) fishers (1.45) catch (1.31) management (1.22) bycatch (1.16) recreational (0.71) effort (0.69) gear (0.68)	1463
6	coral (7.63) reef (4.66) reefs (3.38) corals (2.04) bleaching (1.27) cover (0.95) colonies (0.57) benthic (0.46) acropora (0.46) restoration (0.45)	2147
7	sharks (4.88) shark (4.51) whale (1.15) white (0.73) movement (0.73) whales (0.66) movements (0.59) carcharhinus (0.57) tiger (0.57) acoustic (0.54)	658
8	concentrations (1.24) sediment (1.02) metals (0.95) sediments (0.91) cd (0.85) pb (0.82) pollution (0.81) cu (0.79) risk (0.78) hg (0.78)	2810
9	prey (2.91) delta (1.94) trophic (1.70) diet (1.58) food (1.25) foraging (1.16) feeding (1.06) predator (0.94) isotope (0.93) predators (0.87)	2378
10	species (7.08) distribution (0.75) native (0.74) richness (0.73) conservation (0.66) threatened (0.56) biodiversity (0.55) invasive (0.53) diversity (0.51) endangered (0.47)	2690
11	data (1.56) model (1.11) models (0.90) detection (0.67) monitoring (0.65) estimates (0.65) methods (0.63) method (0.56) spatial (0.55) sampling (0.51)	4040

12	deer (8.48) hunting (1.57) red (1.42) roe (1.19) tailed (1.09) white (1.04) density (0.74) wild (0.72) mule (0.69) wolf (0.64)	576
13	habitat (4.38) habitats (1.19) use (0.99) selection (0.86) areas (0.82) landscape (0.81) connectivity (0.75) spatial (0.66) suitable (0.58) suitability (0.56)	2313
14	wildlife (2.26) human (1.44) wild (0.89) livestock (0.81) urban (0.64) animals (0.60) trade (0.55) conflict (0.54) humans (0.51) conservation (0.47)	3467
15	forest (3.41) fire (1.49) forests (1.18) cover (1.01) vegetation (0.91) tree (0.69) plant (0.69) land (0.67) trees (0.59) native (0.57)	2138
16	fish (7.85) river (1.32) fishes (1.31) freshwater (0.82) spawning (0.68) salmon (0.68) assemblages (0.68) abundance (0.61) biomass (0.61) reef (0.60)	2147
17	sea (4.25) turtles (2.05) turtle (1.15) marine (1.09) ice (0.89) mediterranean (0.77) deep (0.75) green (0.71) nesting (0.67) coastal (0.60)	2215
18	population (1.19) females (1.05) survival (1.02) breeding (0.94) size (0.90) males (0.87) reproductive (0.82) growth (0.79) age (0.72) sex (0.61)	3706
19	mpas (4.94) protected (4.06) areas (4.02) mpa (3.28) marine (1.74) area (1.69) protection (1.52) conservation (1.02) biodiversity (0.87) network (0.64)	1468
20	climate (2.12) temperature (1.76) change (1.59) degrees (1.10) warming (0.95) temperatures (0.85) thermal (0.84) changes (0.77) conditions (0.72) effects (0.68)	3107

Note. Weights associated with each word indicate the percent contribution of that word to the overall topic, and words are listed in order of relevance to the topic.

Table 11

Proportion of Abstracts Assigned to Topics

Topic	Proportion of Abstracts	
	Classification	
	DA	IA
0	0.021 ***	0.033 **
1	0.073 ***	0.092 **
2	0.04	0.036
3	0.055	0.058
4	0.027 ***	0.061 ***
5	0.024 ***	0.032 *
6	0.03	0.027
7	0.012	0.014
8	0.025 ***	0.07 ***
9	0.047	0.05
10	0.045 ***	0.058 **
11	0.102 ***	0.073 ***
12	0.016 ***	0.01 **
13	0.075 ***	0.035 ***
14	0.06 ***	0.075 **
15	0.067 ***	0.033 ***
16	0.051 ***	0.04 *
17	0.033 ***	0.05 ***
18	0.11 ***	0.06 ***
19	0.016 ***	0.035 ***
20	0.068	0.061

Note. Proportions were rounded from six decimal places and do not exactly equal one. * Indicates standardized residuals (r) with an absolute value greater than 2, ** r > |3|, *** > |4|

Table 12

Sample Assignment

Abstract	Assignment
'A study was conducted to investigate the seroprevalence and associated risk factors of Rift Valley fever (RVF) infection in cattle and some selected wildlife species at selected interface areas at the periphery of the Great Limpopo Transfrontier Conservation Area in Zimbabwe. Three study sites were selected based on the type of livestock-wildlife interface: porous livestock-wildlife interface (unrestricted); non-porous livestock-wildlife interface (restricted by fencing) and livestock-wildlife non-interface…'	14: wildlife (2.26) human (1.44) wild (0.89) livestock (0.81) urban (0.64) animals (0.60) trade (0.55) conflict (0.54) humans (0.51) conservation (0.47)

Now that a topic model was selected, the next task in assessing differences in research design was to identify whether or not there were differences in dominant topics in abstracts between IA and DA groups. A chi squared test was conducted, and Cramer's V, a measure of effect size for nominal data, was used to further investigate differences (V = .208). Similar to the calculation on syntactic differences, Cramer's V was converted to Cohen's omega (ω) (Cohen 1988). This resulted in ω = .925, which confirms a large effect size and strong evidence of a difference in topic use between the IA and DA groups.

After concluding that there were differences in the distribution of topics between the researcher groups, standardized residuals were used to identify which topics were demonstrating the strongest differences between groups. Standardized residuals can be used to investigate differences in chi-squared tests because they measure the extent to which observed counts differ from expected counts, assuming the null hypothesis that there is no difference in groups is true. For example, a standardized residual greater than the absolute value of two indicates a strong difference because the observed frequency of a particular topic is two standard deviations above the expected frequency for that topic. The topics with the largest deviations from what would be expected if there were no differences between author groups are topics 4, 8, 11, 13, 15, 17, 18, 19. Topics that were studied similarly between groups include topics 2, 3, 6, 7, 9, and 20. These similar topics are related to: genetics at a population level, host/parasite dynamics, coral reefs/loss, sharks/whales, trophic level dynamics, and climate change.

Standardized residuals were also used to identify what topics the DA authors published more than the IA authors. Generally, these differences can also be seen in Table 11. Very large, positive residuals for a group ($r > 4$) indicates they published that topic more. Topics published much more by the DA group include topics 11, 12, 13, 15, 16, and 18. Broadly, these topics relate to: data/model emphasis, deer/hunting, habitat use/selection, forest fires, fisheries- freshwater, and reproductive success/dynamics. Therefore, the topics that the IA group published a lot more ($r > 4$) include 4, 8, 17, and 19. Broadly, these topics relate to: genetics at a smaller genomic level, sediment concentration/pollution, sea turtles/nesting, and marine protected areas.

Discussion

DFEBQ

For the EFL vs. NEFL groups, the largest effect sizes indicated the EFL group believed experts could ultimately get to the truth, while the NEFL group believed professors in the field would all come up with the same answers. The NAB group also strongly believed both that experts could ultimately get to the truth and that sometimes answers from experts must be accepted even if you do not understand them. Belief in a single scientific truth is linked to a desire for monolingualism (Gajo & Berthoud 2020) and limits the diversity of scientific cultures. Multilingual approaches to science allow for language mediating the transmission of knowledge and recognize that there are many ways to interpret reality (Gajo & Berthoud 2020, Gobbo & Russo 2020). Gobbo & Russo (2020) extensively discuss the use of English as the 'Lingua Franca' in science and inevitable impacts on epistemic diversity. Arguments for retaining English as the language of science include mutual comprehension, unification, efficiency, fairness, impartiality, and simplicity (Curry & Lillis 2022, Gajo & Berthroud 2020). However, English is not ethnically or epistemologically neutral (Gobbo & Russo 2020).

EFL and NEFL researchers had similar epistemological beliefs in the personal justification of knowledge dimension. Personally, researchers justify knowledge in similar ways, but have different overarching views of 'the truth.' Some of this could also be seen in the elements of research design results: methods were very similar between IA and DA groups. While there was a lack of literature studying this phenomenon, this highlights that while tested and validated *methods* (practical steps that gather evidence to address research questions and hypotheses) may be more global, *methodology* (underlying assumptions, principals, and logic that direct choice of research questions or hypotheses) is much more diverse.

Interestingly, the EFL and NEFL group had different results for the attainment of truth dimension, where there was a difference in beliefs for the belief that experts could ultimately get to the truth, but no difference in the belief that if scholars try hard enough, they can find the answers to anything. This phenomenon also occurred for the global region of birth comparison. In the creation of the DFEBQ (Hofer 2000), a four-factor solution was forced, and this could explain some of this DFEBQ's variation in dimensions. When exploratory factor analysis (using Principal Components Analysis with varimax rotation) was performed with these results, a six-factor solution was best, and still resulted in the attainment of truth dimension components loading together. When a four-factor solution was forced with these results, the attainment of truth dimension broke up and *'Correct answers in this field are more a matter of opinion than fact'* no longer loaded on the fourth factor with *'I am more likely to accept the ideas of someone with firsthand experience than the ideas of researchers in this field.'*

Theories of knowledge that reflect positivism and empiricism are built into the scientific process and the language used in scientific communication, and the idea that knowledge is a justified true belief is still dominant today (Gobbo & Russo 2020, Bennett 2014). Epistemicide, or the systematic eradication of Third World knowledge systems by Western science, results in a global scientific

monoculture (Bennett 2014, de Sousa Santos 2001). Additionally, identities emerge from intellectual and epistemological communities, traditions, and commitments (Curry & Lillis 2022). This highlights the importance of continuing to study epistemological diversity, and privileging certain epistemological beliefs is a complex equality issue.

EPVQ

Findings suggest that both the NEFL and NNAB groups valued no war or conflict more (altruism), while both the EFL and NAB groups valued working hard and being ambitious. Both groups also valued unity with nature (biospheric). Overall, findings follow two themes presented in literature: a tendency for the United States and English-speaking countries to value hierarchy/mastery (Schwartz 2006) and a global shift from domination of nature to mutualism (Teel & Manfredo 2010, Teel et al. 2007).

Manfredo et al. (2016) specifically connect wildlife value orientations to the Schwartz cultural value orientations. One wildlife value orientation is domination, which focuses on wildlife being managed for human benefit, prioritizing human needs, and utilitarianism (Teel & Manfredo 2010). Teel & Manfredo (2010) reference Schwartz (2006) in stating domination has historically been the predominant wildlife value in the United States. This connects to materialism in the U.S., or the emphasis of wildlife as a resource for meeting human needs. Overall, a shift from domination to mutualism has been observed not only in the United States, but also cross-culturally as a result of modernization (Teel & Manfredo 2010, Teel et al. 2007). This shift is seen in some of the mixed results for the altruism dimension, and many commonalities in the biospheric dimension (i.e. ‘unity with nature’). Despite those mixed results, exploratory factor analysis (using Principal Components Analysis with varimax rotation) demonstrated that a four-factor solution was appropriate, which confirmed the original authors’ four value dimensions (biospheric, altruistic, egoistic, hedonistic).

Schwartz (2006) identifies various cultural value orientations and placement of 76 nations along these orientations. The United States scored highly for mastery and hierarchy, which value control of the environment and ambition (mastery), as well as unequal distributions of power and authority in social structures (hierarchy). The United States also tended to value affective autonomy, or pursuing pleasing or positive experiences. For the EPVQ (based on the Schwartz Portrait Value Questionnaire), these values relate to the egoistic, altruistic, and hedonic value dimensions. Overall, findings from this study suggested that groups valued hedonism similarly.

Interestingly, the NEFL group valued having control over others’ actions, which conflicts with expectations based on original cultural value orientations identified by Schwartz (2006). Schwartz (2006) also notes that English-speaking countries represented a cultural grouping when all 76 nations were grouped together (Figure 4). While English-speaking countries are not the same as examining researchers who speak English as a first language, Schwartz’s grouping shows that these countries emphasize affective autonomy, mastery, and intellectual autonomy. The United States differs from all other English-speaking countries by focusing more

on mastery and hierarchy and less on intellectual autonomy, harmony, and egalitarianism. Egalitarianism and harmony were seen in the NEFL and NNAB groups valuing no war or conflict.

For all comparisons, the largest effect sizes indicated most differences in the egoistic value dimension, which closely connects to concepts of domination, materialism, and utilitarianism. Diversity in values is important to wildlife conservation, management, and ecology. Teel & Manfredo (2010) assert that "individual behavior toward wildlife is driven by specific attitudes and that these attitudes are directed by wildlife value orientations, which are ideologically shaped beliefs that orient and provide personal meaning to one's more basic values in relation to wildlife" (130). Axiological diversity is also therefore relevant to differences in cognitive hierarchies and ideologies, which in turn connects to diversity in wildlife-related behavior, attitudes, and actions.

Publishing Biases

Overall, the NEFL group experienced all publishing biases more strongly. The belief that there should be a standard language of science ('lingua academica') assumes that language is only a vehicle in communication: neutral, transparent, and universal (Gajo & Berthoud 2020). However, discourse analysis, an entire field of study, methods, and analytical framework, operates under the assumption that language is non-neutral, and motivated by culture, societal structures, and power structures (Bennett 2014). Monolingual culture in academia ultimately limits knowledge production and does not reflect the realities of science (Gobbo & Russo 2020). English, and knowledge-building as a whole, is not an impartial, unbiased practice. According to Bennett (2014),

> "On the contrary, it is firmly embedded in the network of economic relations that structures the Western world and therefore tightly bound up with issues of power and wealth. Hence, all the players in the system, from the policy makers at the top to the individual researchers at the bottom, have to be committed to the same broad goals; otherwise they put their very academic survival at risk" (20).

Additionally, throughout the translation and peer review process, NEFL authors experience a loss of their own voice as well as more mental and financial costs (Curry & Ellis 2022, Gobbo & Russo 2020, Ramírez-Castañeda 2020). Prioritizing one standard language ultimately results in a loss of cultural specificity, which has repercussions on collective and individual identity (Bennett 2014). Finding ways to address monolingualism in academic publishing therefore has deep cultural implications for not only the wildlife field, but science as a whole.

For publishing biases questions there were differences in responses for both the EFL vs. NEFL tests and NNAB vs. NAB tests for all scale items except for the gender bias item. While gender was not involved in specific research questions, this phenomenon was further explored by conducting an independent sample t test using male-identifying respondents versus all other respondents for the publishing biases scale items. Interestingly, this results in differences between groups for all but the racial bias and language bias items. The gender bias item had a Cohen's *d* greater than 1, the largest of the study, while the very strong effects of racial and language bias were no longer present. However, these biases are widely discussed in this study's findings and current literature

(Davies et al. 2021, Kumar & Karusala 2021, Hopkins et al. 2013, Mott & Cockayne 2017). Therefore, gender has an interesting interaction with both first language status and global region of birth that affects experiences with academic publishing biases. Future research should consider the potentially confounding impacts of various social diversity proxies on values and beliefs. After investigating this interaction, t tests were also run for the DFEBQ and EPVQ, but there were no effect sizes to suggest strong differences between groups ($d < .3$ for all comparisons).

Text Analysis Discussion

Differences in bigrams and trigrams suggested differences in topic of study between IA and DA groups, which is further investigated with topic modeling. Some differences included geographic emphasis on the United States by the DA group, which could be expected by authors based in the United States. Similarly, species emphasis was only observed with the DA group, and included game species, which are typically recognized as benefiting greatly from current funding systems in the United States (Vaughan Branch et al. 2022, Mangun & Shaw 1984). Additionally, the DA group often reflected their own systems of natural resources management and governance, including the Endangered Species Act and the Fish and Wildlife Service. While some of these differences would be expected of U.S.-based authors, it is also important to note that research questions emphasize the United States because it is where privilege is experienced very often, and researchers from the United States are likely to be cited and published more often. Common areas of study included many methods-based keywords, climate change, and protected areas. Commonalities for some subjects, like climate change, would also be expected (good, even), given its widespread global impacts.

Very significant differences were identified between groups based on syntax and abstract topics. Differences in topics, syntax, and bigrams/trigrams are reflective of epistemology. According to Gajo & Berthoud (2020), “terminological choices are matched by epistemological choices” (295). Investigating differences in language between IA and DA authors was also important because language serves a mediating role in knowledge transmission (Gobbo & Russo 2020). DA-dominant topics included: data/model emphasis, deer/hunting, habitat use/selection, forest fires, fisheries- freshwater, and reproductive success/dynamics. Interestingly, the deer/hunting topic reflects bigrams and trigrams found in the DA group that emphasized game species management. IA-dominant topics included: genetics – smaller, genomic level, sediment concentration/pollution, sea turtles/nesting, and marine protected areas. These are also reflected in the bigram/trigram results because the IA group had frequent bigrams/trigrams that emphasized marine ecosystems and ecology. The topics that were studied similarly between groups included: genetics- population level, host/parasite dynamics, coral reefs/loss, sharks/whales, trophic dynamics, and climate change. Climate change was involved in numerous bigrams/trigrams for both groups as well and is clearly a common area of study.

While it is important to note that elements of research design are limited by what appears in an abstract, models and analysis were ultimately mentioned more than theories for both groups. Additionally, while topics and bigrams/trigrams were very different between groups, research design was relatively similar. The same top four models were mentioned for both groups, and analyses were

similar as well. Out of the elements of research design tested, analysis had the most differences between groups. Ultimately, theory is not mentioned often in abstracts and further examination of articles would be needed for better understanding. Interestingly, these results demonstrate that while differences in values, epistemology, syntax, and research subjects exist between both NEFL vs. EFL, NNAB vs. NAB, and IA vs. DA groups, the ways in which each group conducts research are relatively similar. As mentioned in the DFEBQ discussion, this suggests global commonalities in *methods*; what researchers spend time testing, validating, and building. Differences lie in *methodology*, the broader framework and epistemology that inform a researcher's decisions when conducting research.

Conclusion

Overall, differences in epistemology, axiology, and research design across demographic groups highlight the need for intellectual diversity in science. A text-mining approach to this issue allows for a massive accumulation of language and scientific processes, and a survey component investigates specific knowledge and value dimensions globally. Language is intertwined with epistemology and will need to serve a central role when considering strategies for supporting epistemological diversity. NEFL researchers ultimately experienced publishing biases most strongly, so future work will ideally center on multilingualism in science. Monolingualism leads to a scientific monoculture, and as researchers start tackling massive global issues a monoculture will have less capacity for complex and messy problems. Belief in a single attainable truth reflects a positivist epistemology, and NAB and EFL groups reflected positivist values. Again, epistemology is deeply connected to language: positivism-centric views of knowledge are also connected to strong beliefs in 'Lingua Academica', or a standard language of science for ease of knowledge transmission. Values identified in the EPVQ reflect previous cultural value orientation studies, as well as shifts in wildlife value orientations towards mutualism. In conclusion, this study effectively established a baseline for future work that examines intellectual diversity in further detail and suggests a future emphasis on multilingualism and language bias in science.

Limitations / Future Directions

The comparisons in this study and survey design are admittedly US-centric, but in no way do I believe the current groups being compared (NEFL/EFL and NNAB/NAB) portray a full picture of differences in cultures and beliefs. Current comparisons are flawed because they do not allow for the intricacies of cultural differences. However, the goal of this initial study is to get a baseline idea of intellectual diversity where privilege in publishing is experienced most, the United States. Once a baseline is established with this study, more complex analyses can be completed that more fully capture global demographic characteristics. More complex data gathered from the survey include items like ethnicity, languages spoken, current field of study, motivations for publishing research, and age. This data has enormous potential and has the capacity to answer more intricate inquiries surrounding intellectual diversity. Additionally, this abstract data will be used to explore the capacity of artificial intelligence language models like OpenAI's ChatGPT to work with large amounts of text data and produce accurate topic models.

It is also important to note that only the first author's demographic information was collected, which will inevitably miss important perspectives from other authors. Additionally, the author sample and abstract sample entirely depend on the Web of Science records, which are the result of keywords that were very (intentionally) broad. These keywords have a direct impact on the voices included in this study, however. Survey instruments used included the DFEBQ and EPVQ, and mixed results for knowledge dimensions in the DFEBQ merit further study of scale items and how well they represent theorized dimensions. During the text mining process, only scientific abstracts were analyzed, which limits the amount of information captured.

Language emerged as a theme in this study, given NEFL researchers experienced biases more strongly. While language was already acknowledged as a barrier in academic publishing, this study emphasized the need for continued research in scientific multilingualism. Survey respondents also confirmed this barrier in open-ended responses, and voiced frustrations with peer review processes. This study was conducted in English, and analyzed only English scientific abstracts. As previously discussed, the English language limits knowledge transmission and does not allow for cultural specificity.

Finally, there are so many aspects of publishing culture that are not addressed in this study, but present an interesting avenue for future work. For example, a majority of knowledge is owned by a select few companies, and the commodification of knowledge and knowledge capitalism would make an interesting field of study. While the intellectual diversity survey briefly addresses financial barriers and open access dynamics, a more in-depth study on open access science and its unequal burdens on researchers is also warranted.

Chapter 3: Advances in theory, methods, and application

The axiology portion of the intellectual diversity survey specifically adds to current understandings of cultural value orientations as well as wildlife value orientations. Wildlife value orientations are understood to be changing from dominance to mutualism, and this is reflected in some many similarities in the egoistic, altruistic, and biospheric value dimensions. Values for the domestic author group also match well with the cultural value orientations associated with the United States: mastery, hierarchy, and affective autonomy. Future work will further investigate more demographic characteristics like ethnicity, gender, and age to further add to wildlife-related values literature.

This study also represents a unique application of epistemology to wildlife conservation, ecology, and management. Values are emphasized much more in literature due to their connections to wildlife-related attitudes and behavior. Applications of epistemology and epistemological diversity are primarily centered on understanding indigenous ways of knowing compared to traditional Western ways of knowing. In the field of education, epistemology is often studied in the context of understanding how to connect to students and convey information. In wildlife conservation, ecology, and management, epistemology could be used in a similar way to understand how the public and key decision-makers interpret knowledge and justify what is true.

Natural language processing and text mining allowed for an emphasis on language and served to very quickly summarize a large number of abstracts. The summarization of domestic authors demonstrated the subjects and concepts in the wildlife field that are being published by researchers who benefit from publishing culture biases, while the summarization of international authors demonstrates the perspectives that are typically cited and published less often. Discourse analysis operates under the assumption that language is not neutral and impacted by social and cultural contexts. When viewed from this perspective, the word data that results from text mining is socially constructed. Emphasis on text data has so much potential for studying social science issues in conservation, and scientific abstracts are just a small example of its applications.

The goal of this study was not only to get an initial perspective on intellectual diversity in the field of wildlife conservation, management, and ecology, but also to challenge colleagues to think about publishing in a new way and acknowledge the barriers other researchers face. Students, colleagues, and other researchers should view citations as an active engagement with an author, their worldview, and perspectives. They are encouraged to think about the aspects of publishing they may take for granted and understand that current merit-based standards privilege Western researchers and science. Many researchers based in the United States will never have to publish or conduct research in a second or even third language to be deemed credible. However, it is a reality that researchers across the world face and have come used to navigating. Additionally, journals should be more open (and encouraging) when it comes to publishing at least abstracts in multiple languages. Multilingualism in science would pose a challenge to privileged researchers, and

the prospect of needing to comprehend languages other than English to maintain prestigious academic positions is likely to create a significant obstacle to multilingualism efforts.

Merit-based and 'publish or perish' scientific culture has led to publications being an indicator of scientific success and academic credibility. Future work should not only look towards moving away from scientometric-based tenure, promotions, and hiring processes, but also look at different ways of measuring scientific 'capital'. For example, a substantial publication count or h-index does not speak towards a researcher's ability to work with others, engage with the public, conduct 'good' science, or support the instruction of young researchers. Therefore, as researchers choose which articles to cite and review, they should be less aware of the 'cited by' numbers, institutions, or established names they cite and focus more attention on the quality of the science presented and how well-supported findings are. This relates to the concept of scientific reflexivity, which involves a researcher being aware of how their values, biases, assumptions, and positionality influences not only research processes and findings, but also how they engage with scientific research in general. This fundamental concept in social science asks researchers to be self-reflective and self-critical, and assumes that an individual can not be an objective observer, and they are actually an active participant in research. Reflexivity improves validity of scientific work because a reflexive researcher can identify where biases and assumptions exist in science.

This work has multiple implications for individuals who are involved in the peer review process, which has been widely studied by other researchers and journals themselves. First of all, quality of science should be judged not on the intricacies of English grammar, but on the methods, justifications, and conclusions provided. When selecting journals to publish in, researchers should be aware of whether or not peer review processes offer a double-blind option to authors. Double-blind review processes, where the reviewer is unknown to the author and the author is unknown to the reviewer, help prevent reviewer biases pertaining to well-established names, institutions, race, or presumed gender. Journals related to conservation that currently utilize a double-blind peer review process include *Human Dimensions of Wildlife*, *Conservation Biology*, *and Biological Diversity and Conservation*. Two very recent studies, Smith et al. (2023) and Fox et al. (2023), specifically address peer review processes in ecology and biological sciences. Fox et al. (2023) found that when the journal *Functional Ecology* switched to double-blind review in 2019, average success of manuscripts overall was reduced, but so were the biases experienced by authors from countries with lower human development indexes and English proficiency. Smith et al. (2023) found that review outcomes differed by author demographics and identified current efforts by ecology and evolution journals to reduce publishing biases.

Other potential actions moving forward include diversifying editorial boards and reviewers, providing mentorship and support for authors from underrepresented groups, and increasing transparency about diversity, equity, and inclusion efforts. This transparency can include publishing reviewer comments to authors, author rebuttals, and editorial decision letters, which is a part of many *Nature*-branded journals' optional transparent peer review processes. Actions such as diversity boards and initiatives are also becoming more common. Since international researchers and individuals who do not speak English as their first language experience more financial

and mental burdens that other researchers, quality mentorship that looks to reduce the effects of these burdens is also a way to make academic publishing more inclusive.

The Declaration on Research Assessment (DORA) is a declaration created by a group of publishers and editors that recommends journal-based metrics be eliminated, assessing research on the quality of science and not the journal it is published in, and avoiding using scientometrics as a way to measure an individual's scientific contribution in hiring, promotion, or funding decisions. This movement looks to encourage institutions, scientists, publishers, and funders to ignore publication metrics and assess research based on value and impact of research output. Additionally, a variety of 'qualitative indicators' like influence on policy and practice should be considered more important that publication numbers or journal titles. Overall, this declaration summarizes the need to re-evaluate research assessment across all scales of the scientific process.

Overall, this work had demonstrated that differences in axiology, epistemology, and research design exist across demographic groups. Biases in academic publishing limit social diversity, which directly connects to cultural capital and intellectual diversity. Therefore, the current body of wildlife conservation, management, and policy research should be acknowledged as lacking diverse perspectives. Efforts to specifically address publishing biases would diversify the field and prepare it for future global challenges. Language emerged as a primary theme throughout this study, and particular attention should be placed on advancing multilingualism in science. Since scientific inquiry is cultural, and wildlife researchers and decision makers worldwide are trying to address the same ecological problems, complex issues will require a multicultural approach to finding solutions. There is a large body of research identifying academic publishing biases, and this work sought to begin quantifying intellectual diversity in order to demonstrate the differences in privileged researchers compared to other researchers. There were indeed differences in values and beliefs about knowledge based on geographic location and language status, which should alert wildlife researchers to where intellectual diversity is limited in the field, and unlikely to change unless more direct attention is given to amplifying the perspectives of underrepresented researchers. Approaches to wildlife conservation and management around the world are incredibly diverse, but the lower visibility of this work due to academic publishing processes has a significant impact on scientific 'capital' in the field.

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Appendix 1

Results of t tests for Bias Questionnaire Scale Items and Region of Residence

Scale Item	Do you currently reside in North America? Yes		No		*t*	p	Cohen's *d*
	M	*SD*	*M*	*SD*			
Racial biases negatively impact my ability to publish research	1.77	1.123	2.34	1.393	-4.597 [a]	< .001 ***	-0.458
Gender biases negatively impact my ability to publish research	2.33	1.395	2.38	1.328	-0.319	0.750	-0.031
My name negatively affects my ability to publish research	1.99	1.211	2.28	1.339	-2.379 [a]	0.018 *	-0.234
Financial barriers limit my ability to publish research	2.97	1.412	3.40	1.361	-3.165	0.002 **	-0.308
Financial barriers limit my ability to publish open access	3.80	1.342	3.99	1.324	-1.511	0.132	-0.147
Financial barriers limit my ability to publish in high impact journals	3.07	1.389	3.45	1.360	-2.866	0.004 **	-0.278
Publishing research in a language other than English is looked down upon in my field	3.71	1.055	4.02	1.088	-2.931	0.004 **	-0.284

Note. These items were measured on a scale from 1 - *Strongly disagree* to 5 - *Strongly Agree*. The sample of individuals was composed of N=239 for 'Yes' and N=228 for 'No'. Individuals who did not respond to either question were excluded. *p < .05, **p .01, ***p .001

[a] Levene's test for equality of variances resulted in equal variance not assumed. To reflect this, t is the Welch t test statistic.

Results of t tests for DFEBQ and Region of Residence

Scale Item	Do you currently reside in North America? Yes *M*	Yes *SD*	No *M*	No *SD*	*t*	p	Cohen's *d*
Dimension 1: Certainty of Knowledge							
Answers to questions in this field change as experts gather more information	4.44	0.696	4.38	0.701	1.016	0.310	0.094
All experts in this field understand the field in the same way	2.01	0.974	2.30	1.053	-3.084 [a]	0.002 **	-0.286
Truth is unchanging in this subject	2.16	1.098	2.18	1.184	-0.232	0.817	-0.022
In this subject, most work has only one right answer	1.65	0.862	1.73	0.957	-0.978	0.329	-0.091
Principles in this field are unchanging	2.19	1.015	2.24	1.027	-0.552	0.581	-0.051
All professors in this field would probably come up with the same answers to questions in this field	1.95	0.875	2.10	0.972	-1.863	0.063	-0.172
In this subject, it is good to question the ideas presented	4.57	0.610	4.48	0.720	1.466 [a]	0.143	0.138
Most of what is true in this subject is already known	1.88	0.902	1.89	0.900	-0.194	0.847	-0.018
Dimension 2: Personal Justification of Knowledge							
First-hand experience is the best way of knowing something in this field	3.27	1.014	3.32	1.086	-0.561	0.575	-0.052
I am more likely to accept the ideas of someone with firsthand experience than the ideas of researchers in this field	2.70	0.990	2.69	0.927	0.133	0.894	0.012
Correct answers in this field are more a matter of opinion than fact	1.86	0.853	1.98	1.075	-1.313 [a]	0.190	-0.124
There is really no way to determine whether someone has the right answer in this field	2.02	0.944	2.18	0.986	-1.830 [a]	0.068	-0.171
Dimension 3: Source of Knowledge, Authority							
Sometimes you just have to accept answers from the experts in this field, even if you don't understand them	2.54	1.233	2.31	1.120	2.035 [a]	0.042 *	0.193
If you read something in a textbook for this subject, you can be sure it's true	2.33	1.066	2.44	1.004	-1.090	0.276	-0.104
If my personal experience conflicts with ideas in the textbook, the book is probably right	2.31	0.860	2.34	0.851	-0.449	0.653	-0.043
I am most confident that I know something when I know what the experts think	3.43	0.954	3.20	0.948	2.457	0.014 *	0.235
Dimension 4: Attainment of Truth							
Experts in this field can ultimately get to the truth	3.53	0.920	3.14	1.036	4.134 [a]	< .001 ***	0.398
If scholars try hard enough, they can find the answers to almost anything	3.09	1.111	3.09	1.166	0.005	0.996	< .001

Note. The DFEBQ was measured on a scale from 1 - *Strongly disagree* to 5 - *Strongly Agree*. The sample of individuals was composed of N=239 for 'Yes' and N=228 for 'No'. Individuals who did not respond to either question were excluded. *p < .05, **p .01, ***p .001
[a] Levene's test for equality of variances resulted in equal variance not assumed. To reflect this, t is the Welch t test statistic.

Results of t tests for E-PVQ and Region of Residence

	Do you currently reside in North America?						
Scale Item	Yes		No		*t*	p	Cohen's *d*
It is important to them to…	*M*	*SD*	*M*	*SD*			
Dimension 1: Biospheric							
Prevent environmental pollution	6.24	0.948	6.07	1.129	1.655	0.099	0.159
Respect nature	6.57	0.797	6.38	0.958	2.146 [a]	0.033 *	0.210
Protect the environment	6.43	0.802	6.28	0.877	1.911	0.057	0.186
Be in unity with nature	5.38	1.334	5.42	1.203	-0.362	0.717	-0.035
Dimension 2: Altruistic							
Take care of those who are worse off	5.81	1.138	5.70	1.246	1.026	0.306	0.099
Ensure every person is treated justly	6.41	0.936	6.22	1.154	1.817 [a]	0.070	0.178
Ensure every person has equal opportunities	6.07	1.191	6.05	1.232	0.173	0.862	0.017
Ensure that there is no war or conflict	5.26	1.354	5.76	1.366	-3.785	< .001 ***	-0.368
To be helpful to others	6.08	1.061	5.98	1.069	0.883	0.377	0.086
Dimension 3: Hedonic							
Have fun	5.70	1.257	5.50	1.317	1.610	0.108	0.155
Do things they enjoy	6.07	1.077	5.85	1.222	1.995	0.047 *	0.192
Enjoy life's pleasures	5.60	1.263	5.38	1.355	1.743	0.082	0.169
Dimension 4: Egoistic							
Have control over others' actions	2.52	1.452	2.78	1.434	-1.855	0.064	-0.181
Have authority over others	2.54	1.349	2.67	1.396	-0.98	0.328	-0.095
Have money and possessions	3.54	1.48	3.72	1.491	-1.239	0.216	-0.121
Work hard and be ambitious	5.56	1.199	5.21	1.333	2.854	0.005 **	0.277
Be influential	4.11	1.598	4.14	1.466	-0.180	0.858	-0.017

Note. The E-PVQ was measured on a scale from 1 - *Very unlike me* to 7 - *Very like me*. The sample of individuals was composed of N=239 for 'Yes' and N=228 for 'No'. Individuals who did not respond to either question were excluded. *p < .05, **p .01, ***p .001
[a] Levene's test for equality of variances resulted in equal variance not assumed. To reflect this, t is the Welch t test statistic.

Appendix 2

Key Informant Interview Protocol:

- Thank you
- Point of interview
- Tell me about your background and how you ended up at _____
- How you'd describe self as researcher
- In what ways (good/bad) do you feel your gender, ethnicity, and personal experiences have influenced your career?
- In what ways do you feel like your background gives you an advantage over other researchers? (if no good things)
- Experience with racial and gender biases in general
    - Specifically related to research and publishing processes
- Are there any ways that you feel your values and motivations in relation to education and research differ from your colleagues?
- Are there any questions you'd want to see on a survey sent out to researchers inside and outside the U.S.
- Anything else you'd like to mention that you feel you haven't been able to speak to yet?
- Can I mention your name as one of the key informants used
- If you can think of any resources or studies related to this work, I'd love to see them
- Thanks again