Is there really such a thing as ***Tropical*** Biology?[1]

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[1] Inspired by the provocative title of M. H. Robinson's 1978 essay in the journal *Tropical Ecology*.

Abstract

The ecosystems of The Tropics comprise a majority of the planet's biodiversity, approximately 40% of its terrestrial surface area, and half the human population. Depsite this, Tropical Biology has historically been conceptualized as a specialized subdiscipline of the Biological Sciences. I assessed the validity of this assumption, and conclude that it depends on the framework and evidence used to evaluate it. I suggest that the way forward as a discipline is not for Tropical Biologists to drop the geographic adjective that unites them, but to recenter The Tropics as the foundation of ecology and evolutionary biology.

Keywords: bibliometrics, collaboration, colonialism, Global South, scholarly societies, scientometrics, temperate, text-mining

1. INTRODUCTION

> *"This is an interesting and useful study, but I feel the manuscript is better suited to a specialized journal focusing on tropical ecosystems."*
>
> Subject Editor *(name and journal redacted)*

This decision regarding my submission to one of our field's well-known journals is likely familiar to many members of the Association for Tropical Biology & Conservation (ATBC). All three reviews were positive, with none of the referees identifying significant shortcomings or requesting major changes. So why had the manuscript been rejected? My only clue was in the Editor's conclusion, from which I gathered that they felt studies done *in* the tropics were of limited relevance to researchers working *outside* the tropics. After all, that's for whom a specialized journal is published – a smaller community of subject-matter experts – while the journal to which we submitted our study sought to publish "broad conceptual advances". In short, the Subject Editor was drawing a distinction between Biology and *Tropical* Biology, with the latter a specialized subdiscipline of the former.

This provincial view of research done in the tropics is not new. In 1963, P. W. Richards felt it necessary to use his Presidential Address to the British Ecological Society to explain "what the Tropics can contribute to ecology", advocate for financial investment in tropical research and field stations, and encourage students to visit and dedicate study "the most [biologically] exciting part of the world" (Richards 1963). His justification for this topic was self-deprecating but pointed — he was concerned that a talk summarizing recent advances in tropical ecology, including his studies of forest structure and diversity in Borneo and Guyana, "would probably bore the large part of my audience who have never been to the tropics and never intend to do so" (Richards 1963). That he felt this advocacy was still necessary despite decades of effort (Richards 1946, 1964) must have been extremely frustrating.

Sixty years on many of us find ourselves similarly frustrated. Tropical field stations continue to be underfunded (Chapman *et al.* 1945, Corner 1946, Eppley *et al.* 2024). Financial support for research in the tropics is relatively low and declining (Chapman *et al.*

1945, Sohmer 1980, Stegmann *et al.* 2024). And while tropical ecosystems comprise the majority of the planet's biodiversity (Gaston 2000), approximately 40% of its terrestrial surface area, and are home to half the human population (Hoornweg & Pope 2017), their study is still considered by many to be a scientific subdsicipline. My objective here is not to review the biological validity (Robinson 1978, Moles & Ollerton 2016) or scientific implications (Zuk 2016) of this generalization, nor to summarize the history, status, and direction of tropical research (*e.g.,* Buechner & Fosberg 1967, Janzen 1972, Janzen 1986, Chazdon & Whitmore 2001, Bawa *et al.* 2004). Instead, I will attempt to assess the fundamental assumption behind the Editor's summary that motivated this essay: Is there really such a thing as *Tropical* Biology?[2]

1. Why the answer is *'No'*.

> *"...in the case of biology, a major part of the accumulated biological knowledge is concerned with a rather minor part of the world's fauna and flora, because of the chance development of biology in the temperate zones."*
>
> S. D. Ripley (1967)

One means of assessing if *Tropical* Biology is a distinct academic discipline is by considering the communities into which scientists self-organize. Scholarly societies are one such community; their establishment requires both an intellectual pursuit with which individuals identify and a critical mass of like-minded individuals in search of community. Some of these communities coalesce around broad conceptual domains (e.g., *Evolutionary* Biology, *Conservation* Biology, *Integrative* Biology; Figure 1A). Still others bring together individuals from different conceptual domains that share an interest in a particular system (e.g., *Avian* Biology, *Island* Biology; Figure 1B). Finally, some scholarly societies comprise individuals using a common methodological framework to study disparate systems or address questions from distinct conceptual domains (e.g., *Molecular* Biology, *Mathematical* Biology,

[2] Biology *sensu lato*: the study of living organisms, including their morphology and physiology, behavior, ecology, evolution, and conservation.

Experimental Biology; Figure 1C).

Tropical Biology fails to align with any of these constructs. Its practitioners investigate fundamental questions across conceptual domains with a broad range of methodological approaches and study systems. This intellectual diversity was cogently summarized by the historian Megan Raby: “The work that tropical biologists do is nearly as diverse as the ecosystems they study” (Raby 2017, p.5). Moreover, the “geographic pigeonhole” (*sensu* Raby 2017) that presumably unites this community of scientists — the adjective ‘tropical’ — is itself challenging to operationalize. Formally, *The Tropics* are the band of the Earth’s surface receiving at least one day of direct overhead sunlight per year; this region is delineated by the Tropics of Capricorn and Cancer (23°26’10.4” S and N, respectively). However, the ranges of many ‘tropical’ species and ecosystems extend far beyond these boundaries[3], which is in part why Feeley and Stroud (2018) identified no less than eight distinct criteria by which authors to define ‘tropical’ systems. How then is it that *Tropical* Biology - whose practitioners conduct research in habitats ranging from rain forests to savannas - came to be seen as a specialized subdicipline despite the lack the sharp boundaries around which scientific groups typically coalesce?

This contemporary perception of ‘The Tropics’ as distant and special is the result of centuries of historical and cultural reinforcement (Arnold 1996, Driver & Yeoh 2000, Stepan 2001, Miller & Reill 2011). The first Europeans to visit the tropics returned with vivid, captivating, and frequently pejorative descriptions of the places and people they encountered (Putz & Holbrook 1988). Their stories and images established and inculcated several persistent and often contradictory tropes about tropical regions and people that were then repeated and reinterpreted by subsequent visitors (Smith 1950, Stepan 2001). The historian David Arnold (1996) has argued that these narratives of “Tropicality” (*sensu* Gourou 1947) allowed Europeans to justify colonial expansion by defining the region as environmentally

[3] Perhaps the most extreme examples are migratory birds such as the northern wheatear (*Oenanthe oenanthe*), which fly over 14,000 km from sub-Saharan Africa to their breeding grounds in the Arctic (Bairlein *et al.* 2012)

and culturally distinct while simultaneously superimposing on its remarkable diversity a generic and simplified identity: *The Tropics*.

The narratives of naturalists such as von Humboldt, Darwin, and Wallace were both informed by and reinforced these conceptions of the tropics as ‘distant’ and ‘other’ (Raby 2017). Their writing and ideas then inspired many of the scientists central to the coalescing sciences of ecology and evolutionary biology, who were themselves immersed in a cultural milieu that viewed *The Tropics* as ‘distant’ and ‘exotic’. However, as Raby (2017) elegantly demonstrates, the scientific frameworks these disciplinary pioneers put forward, including the unique status of *Tropical* Biology, were not simply distillations of prevailing cultural and environmental tropes. Instead they emerged from the complex interplay of European colonialism, the expansion of US hegemony in Latin America and the Caribbean at the turn of the twentieth century, and the construction of tropical field stations for use by North American scientists that accompanied this expansion. The role of this scientific colonialism at such a pivotal moment of scientific consolidation cannot be overstated. As Richards (1963) explains, “the science of ecology developed first in central Europe, Scandinavia and Britain and very slightly later in the United States. The ideas and concepts with which it started were therefore inevitably based on the conditions in a temperate climate” (see also Webb 1960, Buechner & Fosberg 1967, Ripley 1967). The same would be true of subsequent studies testing and refining these fundamental concepts, further reinforcing the “temperate bias” (*sensu* Zuk 2016) in the leading journals of the day. While engagement with the burgeoning community of field biologists in tropical countries could have expanded the prevailing theories to make them more general, these scientists were rarely to work at the new US-run field stations (Raby 2017). Their exclusion from the scientific discourse and literature, coupled with the temperate-centered focus of the early theory, suggests that the distinction between Biology and *Tropical* Biology is a historical legacy and largely artificial.

2. Why the answer is *'Maybe'*.

> *"...to this day ecology is biased by concepts and ideas appropriate mainly to the study of vegetation in temperate climate and areas where a very large proportion of the land has long been modified by agriculture and other more or less intensive forms of land usage."*
>
> P. W. Richards (1963)

Even if *The Tropics* are a historical construct, *Tropical* Biology could still be conceptually distinct field of study if the scientific community has identified or converged on a suite of topics that are either unique to or best studied in tropical systems. To assess this possibility, I used a text-mining approach to compare the research foci of N = 11,327 studies conducted in the tropics with those of N = 26,419 studies conducted in other parts of the world. Specifically, I extracted and summarized the information from two structural components used by authors to describe the subject of their articles: the title and keywords. These provide distinct but complementary information, and so they are often analyzed both independently and in unison. For simplicity I present here results based on pooling each article's title and keywords, which were qualitatively similar to those for analyzing titles and keywords independently. The results for all analyses can be found in the *Supporting Information*, where one can also find a complete description of the methods used to gather and process the data.

Briefly, I download the bibliographic record from SCOPUS or the Web of Science 'Core Collection' for every article published from 1990-2022 in one of N = 10 journals (*Journal of Evolutionary Biology, Ecology, Journal of Applied Ecology, Evolution, Biotropica, Journal of Ecology, Tropical Conservation Science, American Naturalist, Tropical Ecology, Journal of Tropical Ecology*). I then used the `refsplitr` package (Fournier *et al.* 2020) and code written in the `R` programming language (R Core Team 2023) to process the records, extract, process, combine the terms extracted from each article's title and keywords, and assign the article to its respective geographic category. Collectively this resulted in N = 141,009 terms, of which I identified and ranked the 50 terms most frequently used in articles from each geographic category.

Two major patterns emerge from this analysis. The first is that 26% of the most frequently used terms from 'tropical' articles reflected geographic locations (e.g., *Costa Rica*, *Amazon*, *Panama*, *tropical*). In contrast, all of the top-50 terms from non-tropical articles were conceptual (e.g., *phenotypic plasticity*, *food web*, *sexual selection*; Table 1). The second is that after removing the system- and location-specific terms, there is ample conceptual overlap between tropical and non-tropical studies (Table 2) and that the topics studied are broadly consistent with disciplinary trends (Carmel *et al.* 2013, McCallen *et al.* 2019, Anderson *et al.* 2021). That said, the most common research topics within each article category often differ dramatically in their relative rankings (Figure S2), and there are notable areas of topical divergence (Table 2).

One interpretation of these results is that Tropical Biology is in fact a subdiscipline focused on problems and topics of particular relevance in tropical locations. While there are subjects for which this is undoubtedly true, the observed differences could also indicate that some topics are extensively studied in over-represented research sites (Stocks *et al.* 2008) or the historical relegation of certain subjects to the tropics (Zuk 2016). While preliminary, these results are consistent with those of Castro Torres and Alburez-Gutierrez (2022), who analyzed of over half a million articles from the social sciences. They found a far greater prevalence of geographic markers in the titles of articles by authors in the Global South, which they argue both indicates and perpetuates "an unwarranted claim on universality" by scholars from North America and Europe. This parallel evidence from a different field is compelling, and biases in the types of research conducted in the tropics – regardless of the underlying mechanism – could shape the development of theory and determine what data are used to test it (Raby 2017). Without more (and more sophisticated) tests of alternative hypotheses for the patterns presented here, it seems premature to conclude that Tropical Biology is a conceptually distinct field.

3. Why the answer is *'Yes'*.

> *"No education is complete without a trip to the Tropics."*
>
> J. E. Webb (1960)

Finally, I believe an argument can be made for treating *Tropical* Biology as a unique discipline, but not one based on the reasons typically put forward by others. What sets the field apart is not the biology *per se* (*sensu* Robinson 1978). Rather, what Tropical Biologists have in common is the broader context in which their scholarship is embedded and carried out. Research anywhere is challenging, but for tropical biologists the precarious infrastructure, economic volatility, limited resources, and political instability can make the challenges feel insurmountable. These struggles can be compounded by having to communicate one's results in a foreign language (Amano *et al.* 2016) to the potentially biased reviewers and readers (Smith *et al.* 2023) of journals that are increasingly charging publications fees equivalent to several months salary (Smith *et al.* 2021). When added to the physical and emotional toll of disease, crime, working in isolation, the destruction of their field sites, and the potential for professional retribution or physical violence (Clancy *et al.* 2014, Ellwanger *et al.* 2020, Palinkas & Wong 2020), research in the tropics can be uniquely stressful, dangerous — even deadly. Lamentably, this is also true for the heroic conservationists, indigenous leaders, and journalists with whom we work (Cavalcanti *et al.* 2023).

4. The Future of (Tropical) Biology

> *"There are few things more presumptuous than a US scientist holding forth on the future of tropical ecology"*
>
> D. H. Janzen (1972)

In 1945 the President of the Ecological Society of America (ESA), Orlando Park, encouraged its members to establish a "full scale program in tropical ecology", including "a new journal. . . dealing with tropical biology in its broadest aspects" (Park 1945). How would the field be different if the ESA had done so? What if the scientific community had paid heed to Richards (1946) and properly centered the tropics when drawing biological generalizations? Or if UNESCO's International Hylean Amazon Institute, the ambitious international consortium proposed in 1946 by Brazilian biochemist and diplomat Paulo Carneiro (Dresser 1948, Maio & Sá 2000), had come to fruition? Perhaps universities in Europe and North America would offer elective courses in *Temperate* Biology. The instructors of these courses might present their research at the annual meeting of the *Association for Temperate Biology & Conservation* (Figure 2) and publish papers in specialized journals, with article titles that — in contrast to the broader conceptual advances from the tropics — emphasize the specific temperate systems or locations the work was done (Figure 3).

I prefer instead to consider what the ambiguity of my conclusions implies for how we should move forward. I suggest that the future lies in neither dropping the geographic adjective that motivates so many of us, nor keeping it and accepting status as as specialization. Instead, I call on ATBC members to continue taking pride in and elevating what makes biology in the tropics distinct and important — the places and context in which we work — while working to recenter tropical ecosystems as the biological foundation and conceptual focus of Ecology and Evolutionary Biology. Below are six actions with which I propose anyone can help us *reclaim and reshape the Tropical Narrative*.

Cite with purpose. Citation is a powerful and political act; it conveys legitimacy on the scholarship in the article being cited as well as its author, helps elevate the profile of the author and study system, and those reading your work will cite these articles when writing their own. For many scientists it also plays an important role in their professional advancement. Be mindful of this impact and the opportunity it presents when choosing whom to cite. Cite scientists whose work or approach you feel is undervalued or overlooked. Cite scientists from countries or institutions that have been ignored by the broader scientific community. Cite scientists whose approach to research you feel others should emulate. Cite studies conducted in the tropics.

Teach with Purpose. All tropical biologists are teachers, whether it be in a classroom or in a meeting with policy makers, and teaching also provides an opportunity to elevate the scholarship of others. Be mindful of whose papers are assigned as readings, the studies and systems used to illustrate concepts, and the scientists highlighted in presentations. Use your syllabus as a tool to recast the narrative about the tropics and the scientific community that studies them. Train students in the skills needed when working in tropical systems — collaboration, facilitation, conflict resolution, and communication to diverse audiences (Kainer *et al.* 2006). Teach collaboratively and cross-nationally (Russell *et al.* 2022).

Collaborate with Purpose. International collaboration can be challenging, but personally and professionally rewarding (Smith *et al.* 2014). Be mindful of global scientific inequities, laws, and 'parachute science' (Gómez-Pompa 2004, Asase *et al.* 2022, Ramírez-Castañeda *et al.* 2022). Partner with communities to identify research priorities and return the results of research to them (Duchelle *et al.* 2009, Kainer *et al.* 2009). Push for organizations and universities to strengthen collaborations with — and especially within — the Global South (Kainer *et al.* 2006, Ocampo-Ariza *et al.* 2023). Treat the parataxonomists, field technicians, and station staff that make our work possible with the respect they deserve (Basset *et al.* 2004); that includes recognizing their contributions with coauthorship the way one would other essential contributors (e.g., Bruna *et al.* 2004). Review submissions for and submit articles to national journals. Make an effort to learn the local language.

Engage the Public. Public fascination with the tropics and their charismatic species (Albert *et al.* 2018) provides unparalleled opportunities for outreach and education (Moreira & Robles 2017). Take advantage of global sporting events (Melo *et al.* 2014), teams with tropical species as mascots (Sartore-Baldwin & McCullough 2019), movies set in the tropics (Yong *et al.* 2011), tropical images in fashion (Kutesko 2014), or other connections between people's interests and tropical biodiversity. Leverage this universal appeal into support for tropical research and conservation (but beware of philanthropic paternalism and the risk of perpetuating stereotypes).

Get in the Game. Help make the process of publishing fairer by serving as a reviewer or subject editor for *Biotropica* (Powers *et al.* 2024). Contribute to capacity building efforts by reviewing student seed grants proposals or serving as a judge for student presentations at the ATBC's Annual Meeting. Join a committee or chapter and organize a webinar, workshop, hackathon, or reading group. What should the ATBC be doing differently? Communicate your ideas to the leadership or stand for election and push for change as a Councilor or Chapter Officer.

Support and celebrate one another. Finally, remember that the work done by tropical biologists addresses the "neglected problems that afflict most of the world's people" (Annan 2003). Conducting research — regardless of the subject — advances the socioeconomic condition of the country in which it's conducted. It is difficult, frustrating, and not without risk. Take a moment to thank, congratulate, and support each other (Rudzki *et al.* 2022, Nordseth *et al.* 2023) for your contributions and the effort and resilience that they required. There is no more important a time to be a *Tropical* Biologist.

Table 1
The top N = 50 terms used in keywords and titles of tropical articles, non-tropical articles, and the terms that the two categories have in common. The term's rank in a category is in parentheses. Terms in bold refer to geographic locations.

Tropical: Unique Top Terms (rank)	Non-Tropical: Unique Top Terms (rank)	Shared Top Terms (rank in Tropical, Non-Tropical)
tropical forest (1)	sexual selection (1)	diversity (4, 8)
tropical rainforest (2)	phenotypic plasticity (5)	fragmentation (5, 46)
seed dispersal (3)	natural selection (9)	climate change (6, 3)
tree species (8)	tradeoff (12)	species richness (7, 18)
costa rica (10)	adaptation (13)	herbivory (9, 14)
atlantic forest (11)	local adaptation (15)	disturbance (13, 38)
brazil (12)	gene flow (17)	life history (17, 2)
conservation (14)	quantitative genetic (20)	competition (21, 4)
rainforest (15)	drosophila melanogaster (21)	community structure (29, 44)
seed germination (16)	food web (22)	speciation (30, 7)
panama (18)	reproductive isolation (23)	predation (31, 19)
dry forest (19)	sex ratio (24)	body size (34, 10)
seed predation (20)	fitness (25)	population dynamic (36, 6)
tropical tree (22)	coevolution (26)	dispersal (40, 11)
functional trait (23)	experimental evolution (27)	density dependence (50, 16)
savanna (24)	genetic variation (28)	
mexico (25)	inbreeding depression (29)	
species diversity (26)	maternal effect (30)	
puerto rico (27)	evolution (31)	
frugivory (28)	mate choice (32)	
phenology (32)	phylogeny (33)	
neotropic (33)	ecosystem function (34)	
tropical dry (35)	sexual conflict (35)	
cloud forest (37)	mating system (36)	
pollination (38)	heritability (37)	
tropical dryforest (39)	sperm competition (39)	
nitrogen (41)	coexistence (40)	
amazon (42)	hybridization (41)	
seasonality (43)	plant community (42)	
secondary forest (44)	reproductive success (43)	
mutualism (45)	sexual dimorphism (45)	
phosphorus (46)	selection (47)	
beta diversity (47)	metaanalysis (48)	
fire (48)	genetic correlation (49)	
succession (49)	community assembly (50)	

Table 2

The top N = 50 terms used in the keywords and titles of tropical and non-tropical articles that are unique to each of these categories once system-specific terms have been excluded. This is followed by the top terms from each category that they have in common.

Tropical: Unique Top Terms (rank)	Non-Tropical: Unique Top Terms (rank)	Shared Top Terms (rank in Tropical, Non-Tropical)
seed dispersal (1)	natural selection (1)	diversity (2,8)
tree species (6)	tradeoff (6)	fragmentation (3,46)
conservation (9)	adaptation (9)	climate change (4,3)
rainforest (10)	local adaptation (10)	species richness (5,18)
seed germination (11)	gene flow (11)	herbivory (7,14)
dry forest (13)	quantitative genetic (13)	disturbance (8,38)
seed predation (14)	drosophila melanogaster (14)	life history (12,2)
functional trait (16)	food web (16)	competition (15,4)
species diversity (17)	reproductive isolation (17)	community structure (20,44)
savanna (18)	sex ratio (18)	speciation (21,7)
frugivory (19)	fitness (19)	predation (22,19)
phenology (23)	coevolution (23)	body size (24,10)
cloud forest (26)	experimental evolution (26)	population dynamic (25,6)
pollination (27)	genetic variation (27)	dispersal (28,11)
nitrogen (29)	inbreeding depression (29)	density dependence (37,16)
seasonality (30)	maternal effect (30)	community assembly (42,50)
secondary forest (31)	evolution (31)	sexual selection (43,1)
mutualism (32)	mate choice (32)	phenotypic plasticity (47,5)
phosphorus (33)	phylogeny (33)	
fire (34)	ecosystem function (34)	
beta diversity (35)	sexual conflict (35)	
succession (36)	mating system (36)	
bird (38)	heritability (38)	
biomass (39)	sperm competition (39)	
montane forest (40)	coexistence (40)	
biogeography (41)	hybridization (41)	
regeneration (44)	plant community (44)	
species composition (45)	reproductive success (45)	
remote sensing (46)	sexual dimorphism (46)	
litter (48)	selection (48)	
temperature (49)	metaanalysis (49)	
forest structure (50)	genetic correlation (50)	

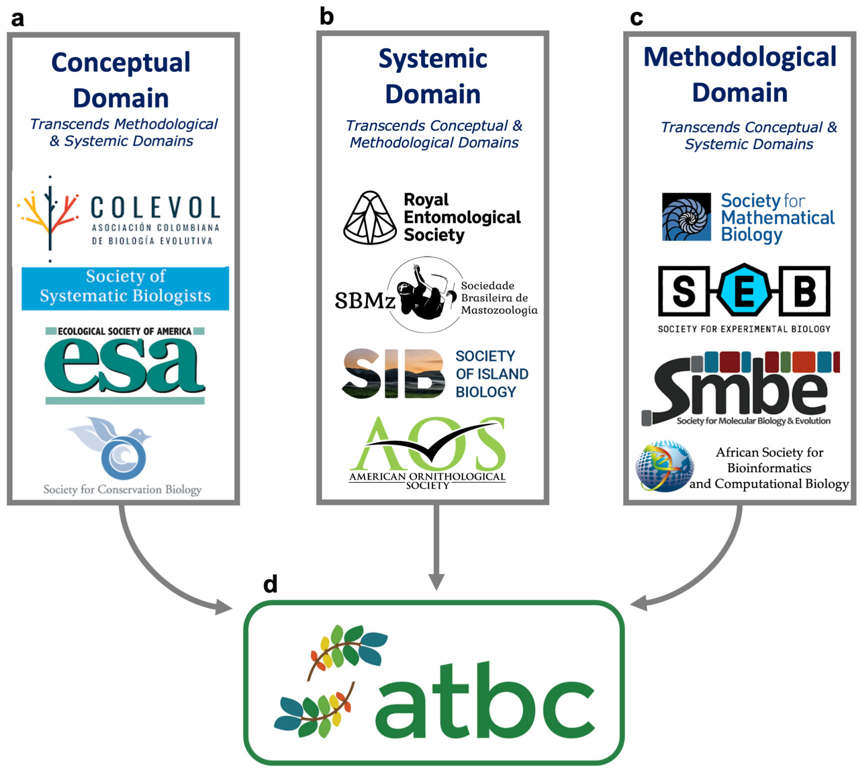

Figure 1. Alternative ways in which researchers self-organize in scholarly societies: (a) Conceptual Domain, (b) Systemic Domain, or (c) Methodological Domain. The Association for Tropical Biology & Conservation (i.e., ATBC) is unique in that transcends the three domains: its members use a broad diversity of species, ecosystems, and methods to address questions grounded in – or even transcending – multiple distinct conceptual domains.

Figure 2. The logo for a proposed new scholarly society for researchers specializing on temperate ecosystems and species.

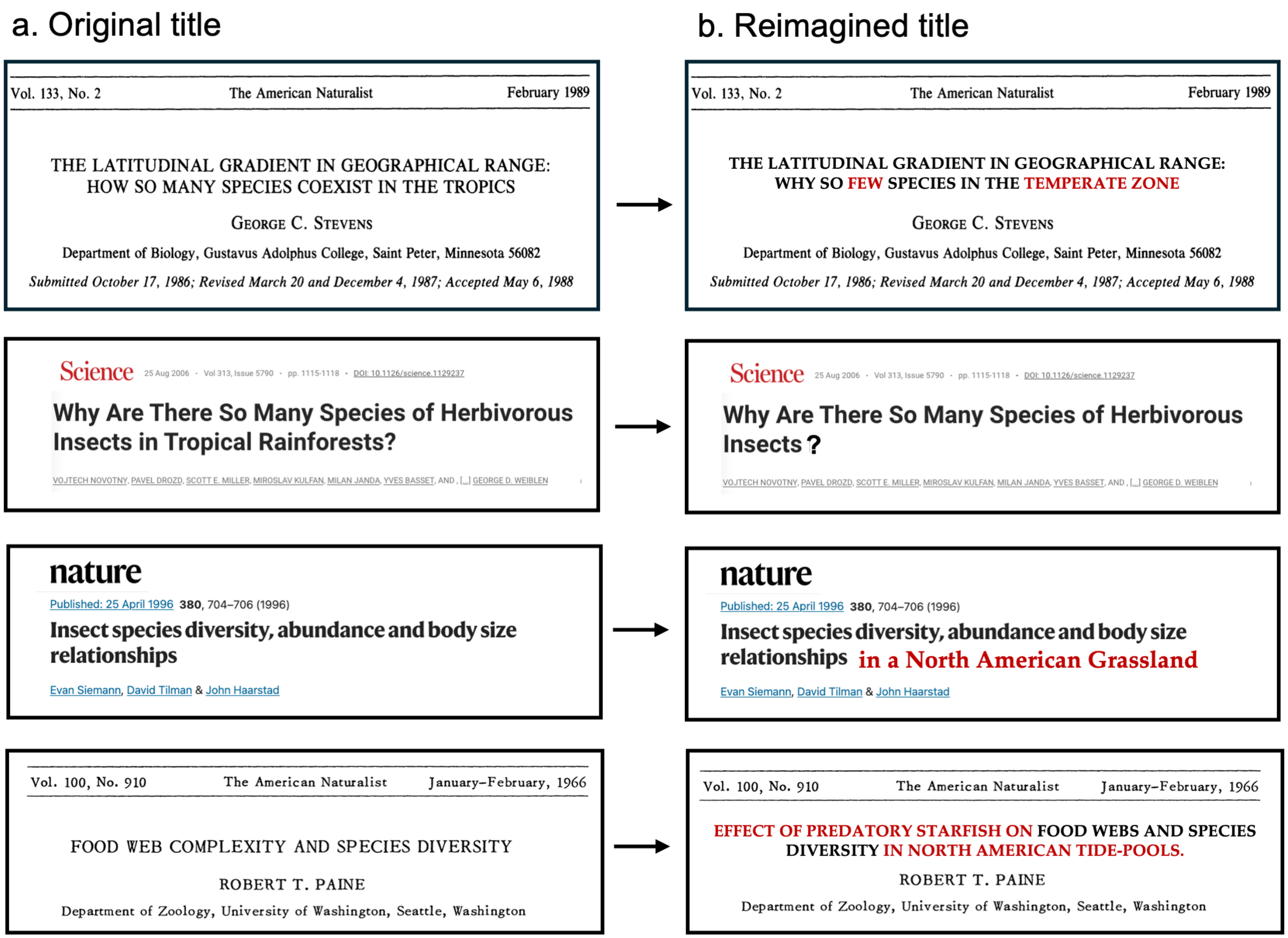

Figure 3. The (a) original and (b) reimagined titles of four high-profile research articles. Comparing these emphasizes how the original titles reflect and reinforce the idea that 'reference' or 'default ecosystems are found in the Temperate Zone.

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DATA AVAILABILITY STATEMENT

The data used in this publication, the code used to import, organize, and analyze these data, and the code used to prepare the manuscript are available at Zenodo <*DOI added at proof stage*> and Github https://github.com/BrunaLab/bruna_biotropica_plenary_ms.

The data used in this paper are part of a larger dataset collected for a longitudinal study of research in the tropics; those data, and the code used to harvest, clean, and organize them, are available at Github https://github.com/BrunaLab/tropical_bibliometrics. Questions regarding the data or code, or suggestions for improvement should be posted as Issues on that repository or referred to E. M. Bruna.

DISCLOSURE STATEMENT

The author confirms that there have been no involvements that might raise the question of bias in the work reported or in the conclusions, implications, or opinions stated.

AUTHOR CONTRIBUTION STATEMENT

E.M.B conceived the study and is responsible for the methodology, data collection, data curation, formal analysis, validation, visualization, software, and writing.

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SUPPORTING INFORMATION

Is there really such a thing as ***Tropical*** Biology?

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1. Collection, processing, and visualization of bibliometric data

To identify the conceptual domains studied by researchers working in 'Tropical' and "non-Tropical' locations, I used information extracted from the bibliographic records of articles published from 1990-2022 in N = 10 journals (*Journal of Evolutionary Biology, Ecology, Journal of Applied Ecology, Evolution, Biotropica, Journal of Ecology, Tropical Conservation Science, American Naturalist, Tropical Ecology, Journal of Tropical Ecology*). Specifically, I extracted and summarized the information from two structural components used by authors to describe the subject of their articles: the title and keywords. These provide distinct but complementary information, and so they are often analyzed both independently and in unison. Below I describe how the article records were identified, downloaded, processed, and assigned to the 'Tropical' and"non-Tropical' categories using code written in the `R` programming language (R Core Team 2023).

On 8 February 2023, I downloaded all bibliographic data available in SCOPUS and the Web of Science 'Core Collection' for all articles published in the focal journals; both SCOPUS and the Web of Science were queried because they differ in the years indexed for each journal. I then used the `refsplitr` package (Fournier *et al.* 2020) to process the records and remove any duplicates. After removing all stopwords (Benoit *et al.* 2021) from article titles and keywords, I spell-checked, stemmed, and lemmatized all of the keywords and title words and extracted the bigrams (i.e., pairs of sequential words, e.g., *seed predation*, *species diversity*) from titles with the `tidytext` library (Silge & Robinson 2016). Finally, I identified each article as either 'Tropical' or 'non-Tropical'; all articles published in (*Journal of Evolutionary Biology, Ecology, Journal of Applied Ecology, Evolution, Biotropica, Journal of Ecology, Tropical Conservation Science, American Naturalist, Tropical Ecology, Journal of Tropical Ecology*) were assigned to the 'Tropical' category, while articles published in the other journals were assigned to one of these categories based on a search of the titles, keywords, or abstracts for a list of domain-specific terms (e.g., tropical: *amazon*, *andes*, *congo*, *bci*, *chamela*; non-tropical: *finland*, *boreal*, *eastern decid*, *arctic*, *polar*). These procedures resulted in N = 37,807 total articles published, of which N = 11,210 reported research conducted in the tropics and N = 26,597 were based on work conducted in other locations. Collectively, the N = 41,219 contained a total of N = 126,713 bigrams. Not all of the articles included keywords, however; from the the N = 37,807 that did I was able to extract a total of N = 62,883. There were N = 37,746 articles from which I was able to extract both title bigrams and keywords. I used these sets of articles to conduct three geographic comparisons: (1) title bigrams, (2) keywords, and (3) title bigrams + keywords (hereafter, 'terms'). The number of articles varies widely between journals, as does the number of keywords per article or title length. Comparing counts of keyword, bigram, or term frequency in tropical and non-tropical articles could therefore bias results towards the content published a journals allowing more keywords or journals publishing more articles. To correct for this, I calculated the percentage of articles in each geographic category that used each keyword, title bigram, or term. I then selected the N = 50 most frequently used in each geographic category, and identified (a) any keywords, bigrams, or terms that 'tropical' and 'non-tropical' articles had in common, and (b) any keywords, bigrams, or terms that were unique to each article category.

2. Data and Code

The data used in this publication, the code used to import, organize, and analyze these data, and the code used to prepare the manuscript are available at Zenodo <*DOI added at proof stage*> and Github https://github.com/BrunaLab/bruna_biotropica_plenary_ms.

The data used in this paper are part of a larger dataset collected for a longitudinal study of research in the tropics; those data, and the code used to harvest, clean, and organize them, are available at Github https://github.com/BrunaLab/tropical_bibliometrics. Questions regarding the data or code, or suggestions for improvement should be posted as Issues on that repository or referred to E. M. Bruna.

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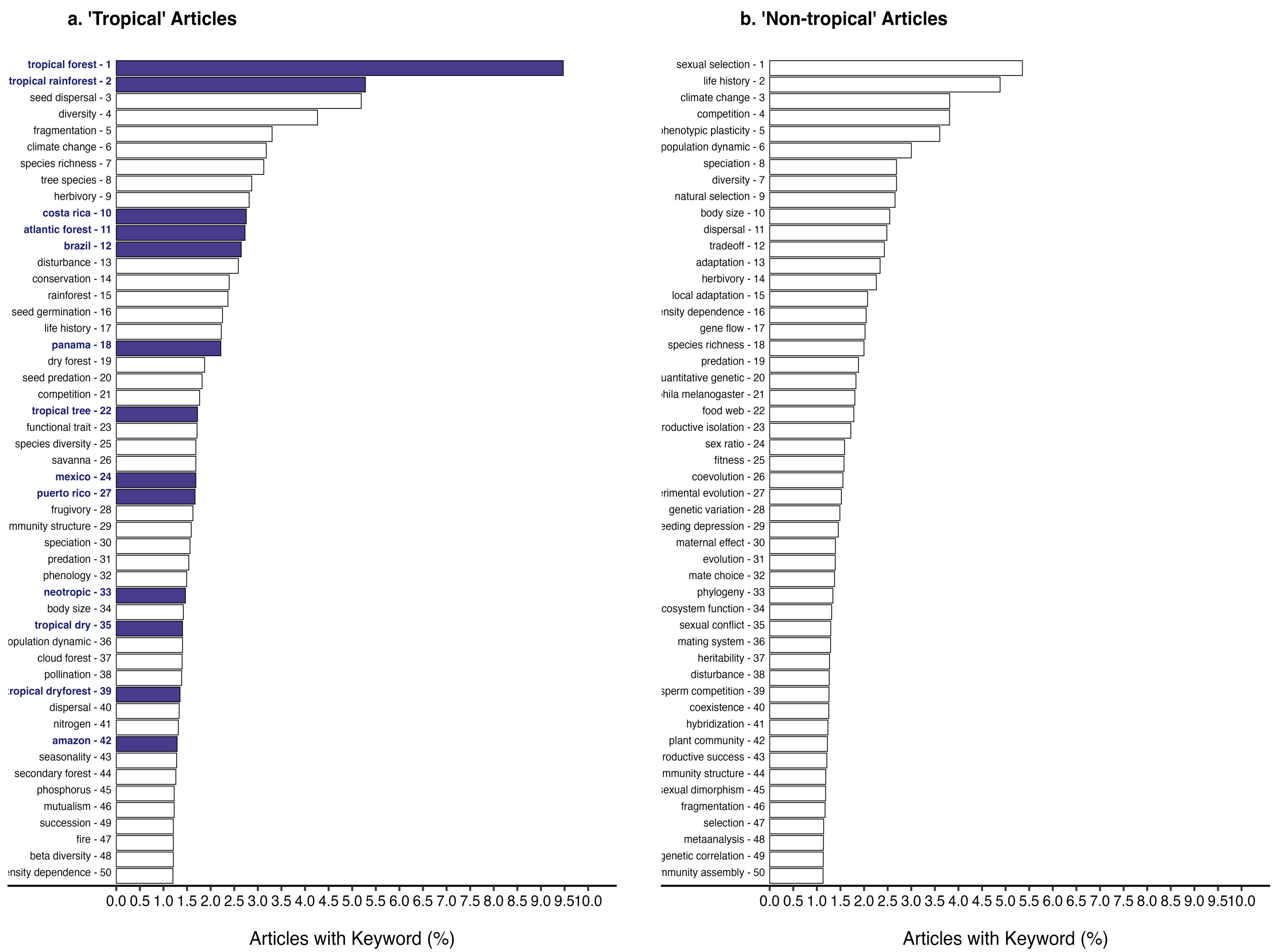

Figure S1. The N = 50 most common terms (keywords + title bigrams) from articles based on research conducted in (a) the tropics and (b) non-tropical regions. The rank of these words is based on the percentage of articles in each category that included them. Terms reflecting geography (e.g., *tropics, Peru, Southern*) are indicated in bold and with filled bars.

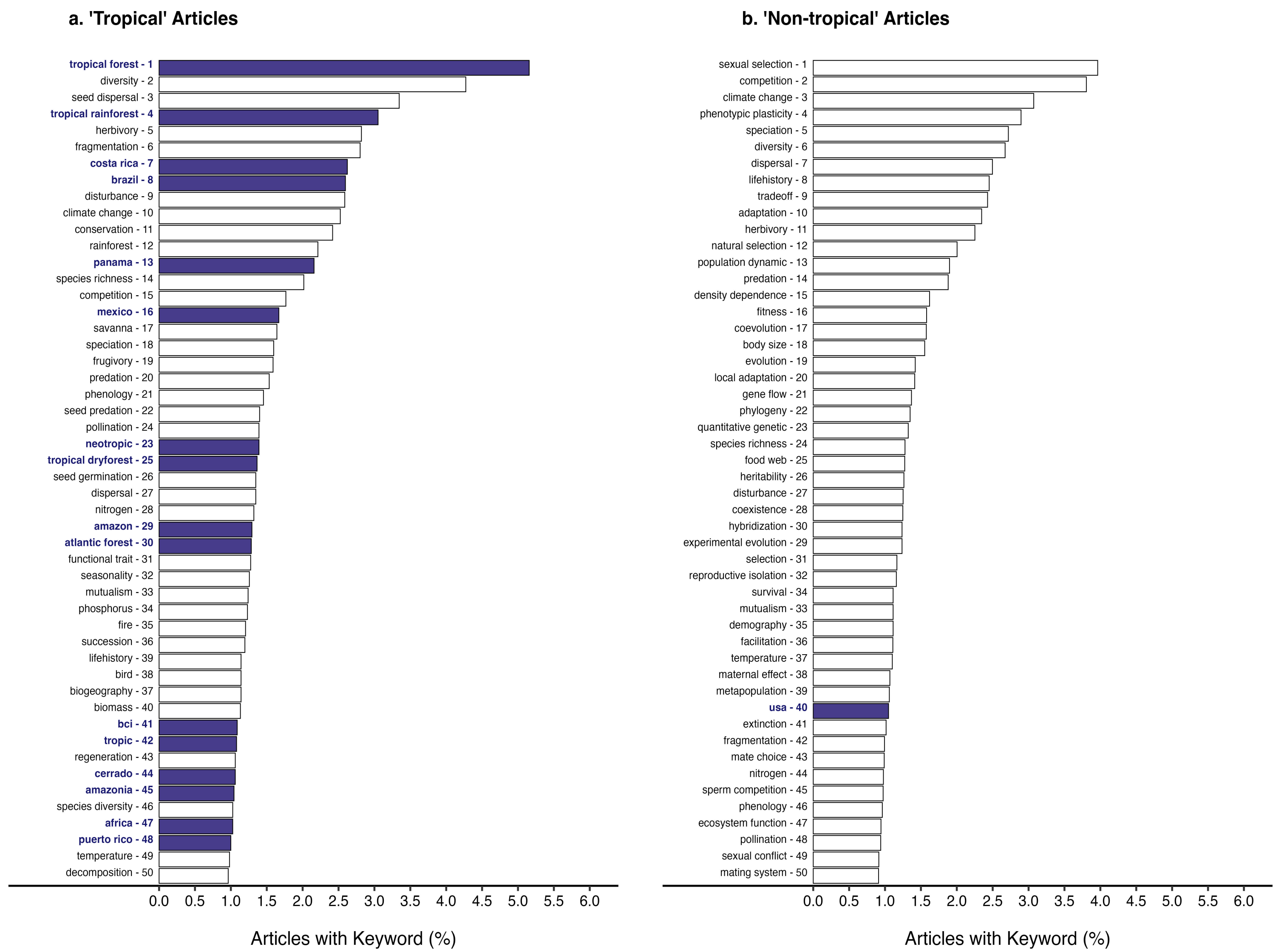

Figure S2. The N = 50 most common keywords from articles based on research conducted in (a) the tropics and (b) non-tropical regions. The rank of these words is based on the percentage of articles in each category that included them. Terms reflecting geography (e.g., *tropics, Peru, Southern*) are indicated in bold and with filled bars.

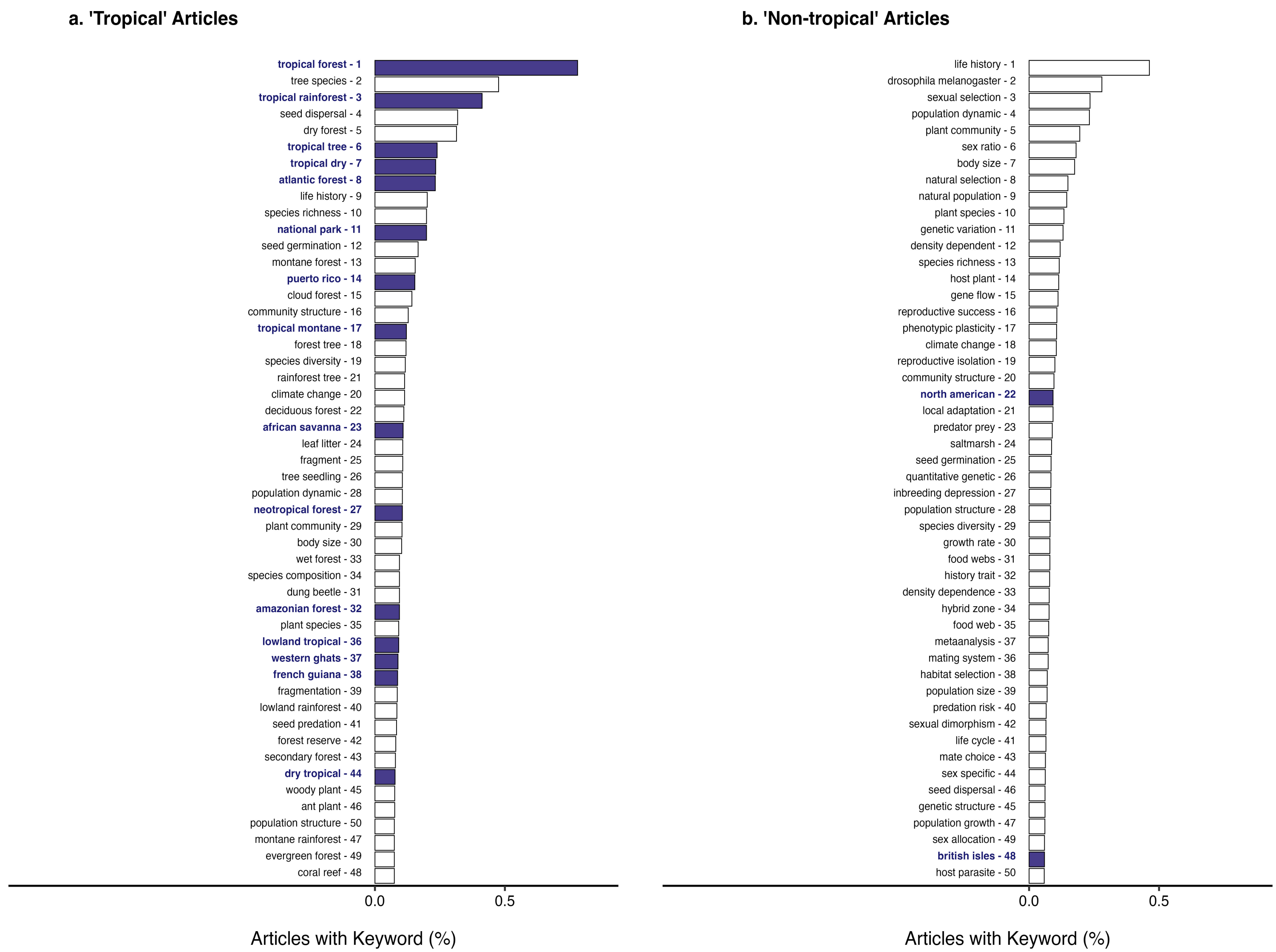

Figure S3. The N = 50 most common bigrams in titles of articles based on research conducted in (a) the tropics and (b) non-tropical regions. The rank of these words is based on the percentage of article titles in each category that included those words. Bigrams reflecting geography (e.g., *tropics, Peru, Atlantic Forest*) are indicated in bold and with filled bars.

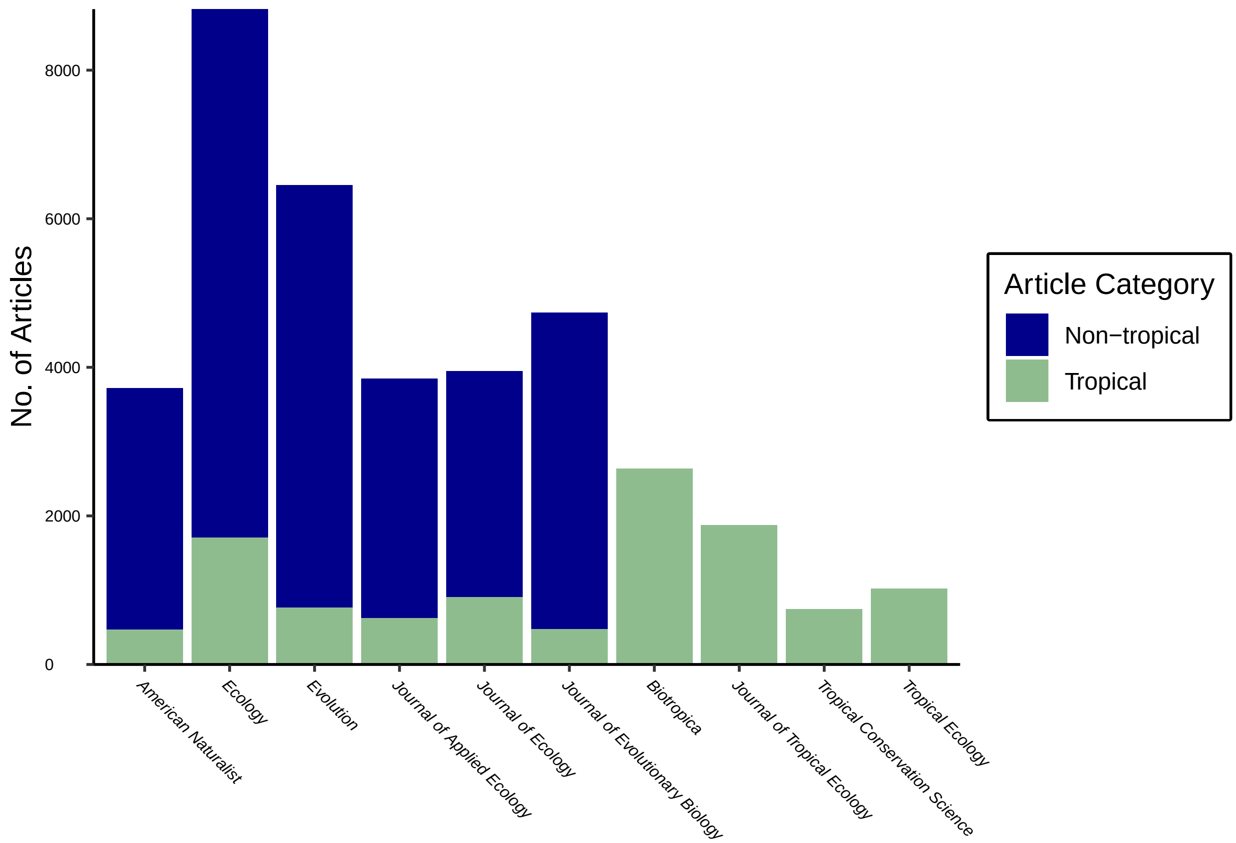

Figure S4. The number of articles from each journal and geographic category that were used in used the analysis of keywords.

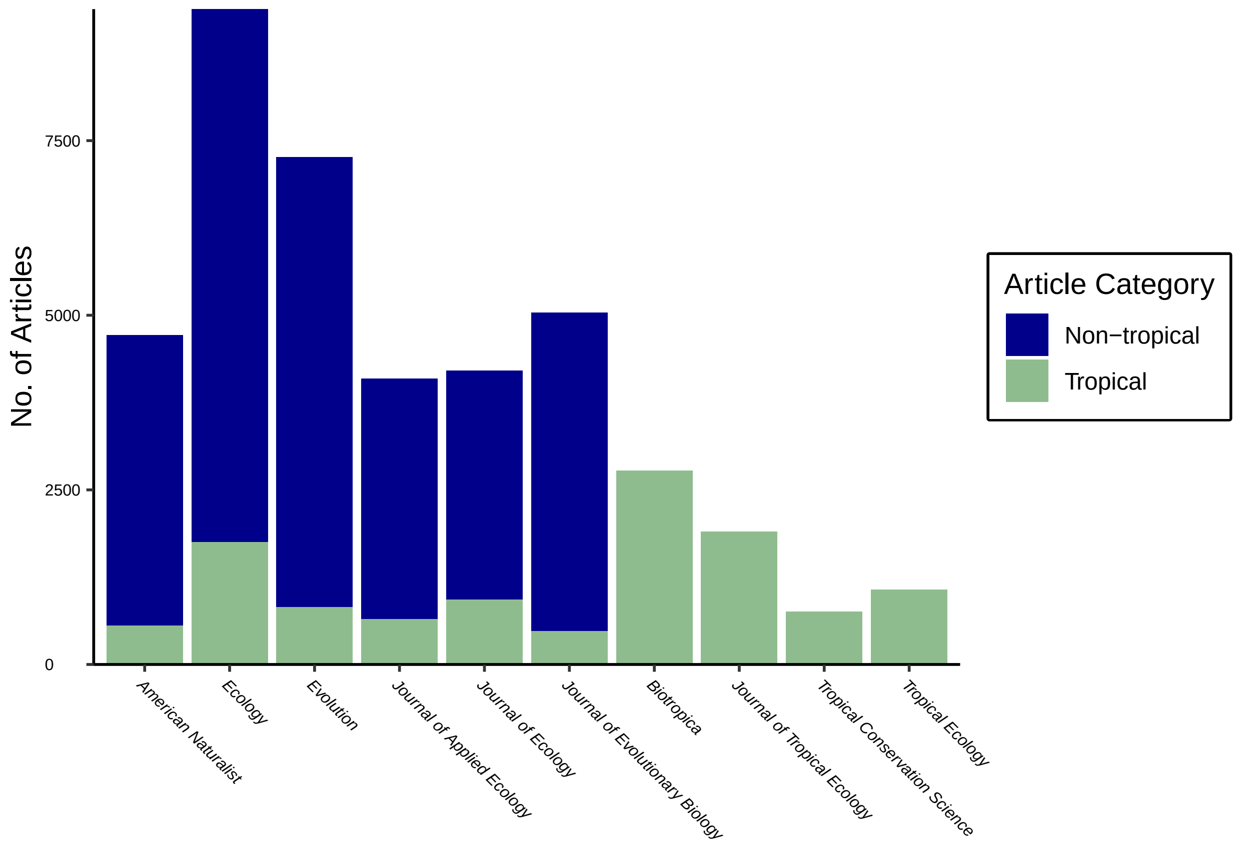

Figure S5. The number of articles from each journal and geographic category that were used in the analysis of title words and title bigrams.