

¹ 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*.

9

Abstract

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

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

¹⁹ 1. INTRODUCTION

²⁰ “This is an interesting and useful study, but I feel the manuscript is better suited
²¹ to a specialized journal focusing on tropical ecosystems.”

²² Subject Editor (*name and journal redacted*)

²³ This decision regarding my submission to one of our field’s well-known journals is likely
²⁴ familiar to many members of the Association for Tropical Biology & Conservation (ATBC).
²⁵ All three reviews were positive, with none of the referees identifying significant shortcomings
²⁶ or requesting major changes. So why had the manuscript been rejected? My only clue was in
²⁷ the Editor’s conclusion, from which I gathered they felt studies done *in* the tropics were of
²⁸ limited relevance to researchers working *outside* the tropics. That’s for whom a specialized
²⁹ journal is published, after all – a smaller community of subject-matter experts – and the
³⁰ journal to which we had submitted our study sought to publish “broad conceptual advances”.
³¹ In short, the Subject Editor was drawing a distinction between Biology and *Tropical Biology*,
³² with the latter a specialized subdiscipline of the former.

³³ This provincial view of research done in the tropics is not new. In 1963, P. W.
³⁴ Richards felt it necessary to use his Presidential Address to the British Ecological Society to
³⁵ explain “what the Tropics can contribute to ecology”, advocate for financial investment in
³⁶ tropical research and field stations, and encourage students to visit and dedicate study “the
³⁷ most [biologically] exciting part of the world” (Richards 1963). His justification for this topic
³⁸ was self-deprecating but pointed — he was concerned that a talk summarizing recent
³⁹ advances in tropical ecology “would probably bore the large part of my audience who have
⁴⁰ never been to the tropics and never intend to do so” (Richards 1963). That he felt this
⁴¹ advocacy was necessary despite decades of effort (Richards 1946, 1964) must have been
⁴² extremely frustrating.

⁴³ Sixty years on many of us find ourselves similarly frustrated. Field stations in the
⁴⁴ tropics remain underfunded (Chapman *et al.* 1945, Corner 1946, Eppley *et al.* 2024).
⁴⁵ Financial support for tropical research continues to decline (Chapman *et al.* 1945, Sohmer

46 1980, Stegmann *et al.* 2024). And despite tropical ecosystems comprising the majority of the
47 planet's biodiversity (Gaston 2000), approximately 40% of its terrestrial surface area, and
48 half the human population (Hoornweg & Pope 2017), their study continues to be seen by
49 many as a scientific specialization. My objective here is not to review the biological validity
50 (Robinson 1978, Moles & Ollerton 2016) or scientific implications (Zuk 2016) of this
51 generalization, nor to summarize the history, status, and direction of tropical research (*e.g.*,
52 Buechner & Fosberg 1967, Janzen 1972, Janzen 1986, Chazdon & Whitmore 2001, Bawa *et*
53 *al.* 2004). Instead, I will attempt to assess the fundamental assumption behind the Editor's
54 summary that motivated this essay: Is there really such a thing as *Tropical Biology*?

55 **1. Why the answer is ‘No’:**

56 “...in the case of biology, a major part of the accumulated biological knowledge is
57 concerned with a rather minor part of the world’s fauna and flora, because of the
58 chance development of biology in the temperate zones.”

59 S. D. Ripley (1967)

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

71 *Tropical Biology* fails to align with any of these constructs. Its practitioners investigate

72 fundamental questions across conceptual domains with a broad range of methodological
73 approaches and study systems. Put another way, “The work that tropical biologists do is
74 nearly as diverse as the ecosystems they study” (Raby (2017a); p. 5). Moreover, the
75 “geographic pigeonhole” (Raby 2017a) that would seem to unite this community of scientists
76 — the adjective ‘tropical’ — is itself difficult to operationalize. Formally, *The Tropics* are the
77 band of the Earth’s surface receiving at least one day of direct overhead sunlight per year;
78 this region is delineated by the Tropics of Capricorn and Cancer ($23^{\circ}26'10.4''$ S and N,
79 respectively). However, the ranges of many ‘tropical’ species and ecosystems extend far
80 beyond these boundaries², however, which is in part why feeleyWhereEarthAre2018
81 identified no less than eight distinct criteria by which authors to define ‘tropical’ systems.
82 How then is it that *Tropical Biology* came to be seen as a distinct subdiscipline, despite the
83 lack the sharp boundaries around which scientific groups typically coalesce?

84 These contemporary perceptions of ‘The Tropics’ as distant and different are the result
85 of centuries of historical and cultural reinforcement (Arnold 1996, Driver & Yeoh 2000,
86 Stepan 2001, Miller & Reill 2011). The first Europeans to visit the tropics returned with
87 vivid, captivating, and frequently pejorative descriptions of the places and people they
88 encountered (Putz & Holbrook 1988). Their stories and images established a series of
89 persistent, often contradictory tropes about tropical regions and people that were repeated
90 and reinterpreted by subsequent visitors and inculcated by colonial expansion (Smith 1950,
91 Stepan 2001). The historian David Arnold (1996) has argued that these narratives of
92 *Tropicality* (*sensu* Gourou 1947), or even using the collective term *The Tropics*, allowed
93 Europeans simultaneously define the region as environmentally and culturally distinct while
94 also superimposing a common identity on culturally distinct parts of the tropical world.

95 The narratives of naturalists such as von Humboldt, Darwin, and Wallace were both
96 informed by and reinforced these conceptions of the tropics as ‘distant’ and ‘other’ (Raby

² 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)

97 2017a); their writing inspired many of the scientists central to the coalescing sciences of
98 ecology and evolutionary biology. Another historian, Megan Raby, has elegantly
99 demonstrated how the resulting scientific narratives, including the unique status of *Tropical*
100 Biology, were not simply distillations of prevailing cultural tropes. Instead they emerged
101 from the complex interplay of the European colonialism, the expansion of US hegemony in
102 Latin America and the Caribbean at the turn of the twentieth century, and the establishment
103 of new field stations as tropical outposts for North American scientists that accompanied
104 this political and economic expansion (Raby 2017a). The role of this scientific colonialism at
105 such a pivotal moment of scientific consolidation cannot be overstated. As Richards (1963)
106 explains, “the science of ecology developed first in central Europe, Scandinavia and Britain
107 and very slightly later in the United States. The ideas and concepts with which it started
108 were therefore inevitably based on the conditions in a temperate climate” (see also Webb
109 1960, Buechner & Fosberg 1967, Ripley 1967) The same would be true of subsequent studies
110 testing and refining these fundamental concepts, further reinforcing the “temperate bias”
111 (*sensu* Zuk 2016) in the leading journals of the day. While engagement with the burgeoning
112 community of field biologists in tropical countries (Raby 2017b) could have expanded the
113 prevailing theories to make them more general, these scientists were rarely to work at the
114 new US-run field stations (Raby 2017a). Their exclusion from the scientific discourse and
115 literature, coupled with the temperate-centered focus of the early theory, suggests that the
116 distinction between Biology and *Tropical* Biology is a historical legacy and largely artificial.

117 **2. Why the answer is ‘*Maybe*’:**

118 “... to this day ecology is biased by concepts and ideas appropriate mainly to the
119 study of vegetation in temperate climate and areas where a very large proportion
120 of the land has long been modified by agriculture and other more or less intensive
121 forms of land usage.”

122 P. W. Richards (1963)

Even if *The Tropics* are a historical construct, *Tropical Biology* could still be conceptually distinct field of study if, over time, the scientific community converged on a suite of topics either unique to or best studied in tropical systems. To assess this possibility, I used text-mining tools to compare the content of 15,417 articles reporting research from the tropics with 26,597 studies conducted in other parts of the world. These studies were published from 1990-2022 in N = 11 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*, *Revista de Biología Tropical*). A complete description of the methods used to gather and process these data are in the *Supporting Information*. Briefly, I began by extracting all keywords, title words (e.g., *seed*, *species*), and title bigrams (i.e., pairs of sequential words, e.g., *seed predation*, *species diversity*) from the entire collection of articles; this resulted in N = 69,919 keywords, N = 25,207 title words, and N = 126,796 bigrams. I then calculated the percentage of articles in each category using each of those terms. The results below are based on the top N = 50 terms in each article category. Two major patterns emerge from this analysis. The first is that 28% of the most frequently used keywords from ‘tropical’ articles reflected geographic locations (e.g., *Costa Rica*, *Amazonia*, *BCI*). In contrast, the overwhelming majority of keywords from non-tropical articles (98%) were conceptual (e.g., *competition*, *ecosystem function*, *sexual selection*; Table 1). The second is that after removing the system- and location-specific keywords, there is ample conceptual overlap between tropical and non-tropical studies (Table 2) that is consistent with broader trends in ecological research (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 S1), and there are notable areas of topical divergence (Table 2). Similar patterns emerge when comparing individual title words and title word bi-grams (Figure S2, Figure S3).

One interpretation of these results is that *Tropical Biology* is in fact a subdiscipline

150 focused on problems and topics of particular relevance in tropical locations. While there are
151 subjects for which this is undoubtedly true, the observed differences could also reflect the
152 historical relegation of certain subjects to the tropics (Zuk 2016) or the over-representation
153 of certain research sites (Stocks *et al.* 2008). Both of these can shape the development of
154 theory and determine what data are used to test it (Raby 2017a). A similar argument has
155 been put forward for the social sciences by Castro Torres and Alburez-Gutierrez (2022), who
156 argue that the far greater prevalence of geographic markers in the titles of articles by authors
157 in the Global South both indicates and perpetuates “an unwarranted claim on universality”
158 by scholars from North America and Europe. This parallel evidence from a different field is
159 compelling; nevertheless, the patterns presented here are insufficient for affirming the
160 intellectual independence of *Tropical Biology*.

161 **3. Why the answer is ‘Yes’**

162 “No education is complete without a trip to the Tropics.”

163 J. E. Webb (1960)

164 Finally, I believe an argument can be made for treating *Tropical Biology* as a unique
165 discipline, but not one based on the reasons typically put forward by others. What sets
166 *Tropical Biology* apart is not the biology *per se* (*sensu* Robinson 1978). Rather, what
167 Tropical Biologists have in common is the broader context in which their scholarship is
168 embedded and carried out. Research anywhere is challenging, but for tropical biologists the
169 precarious infrastructure, economic volatility, limited resources, and political instability can
170 make the challenges feel insurmountable. These struggles can be compounded by having to
171 communicate one’s results in a foreign language (Amano *et al.* 2016) to the potentially
172 biased reviewers and readers (Smith *et al.* 2023) of journals that are increasingly charging
173 publications fees equivalent to several months salary (Smith *et al.* 2021). When added to the
174 physical and emotional toll of disease, crime, working in isolation, habitat loss, and the
175 potential for professional retribution or physical violence (Clancy *et al.* 2014, Ellwanger *et al.*

176 2020, Palinkas & Wong 2020), tropical biology and conservation can be uniquely dangerous —
177 even deadly. Lamentably, this is also true for the heroic conservationists, indigenous leaders,
178 and journalists with whom we work (Cavalcanti *et al.* 2023).

179 **4. The Future of (Tropical) Biology**

180 “*There are few things more presumptuous than a US scientist holding forth on the*
181 *future of tropical ecology*”

182 D. H. Janzen (1972)

183 In 1945 the President of the Ecological Society of America (ESA), Orlando Park, encouraged
184 its members to establish a “full scale program in tropical ecology”, including “a new
185 journal... dealing with tropical biology in its broadest aspects” (Park 1945). How would the
186 field be different if the ESA had done so? What if the scientific community had paid heed to
187 Richards (1946) and properly centered the tropics when drawing biological generalizations?
188 Or if UNESCO’s International Hylean Amazon Institute, the ambitious international
189 consortium proposed in 1946 by Brazilian biochemist and diplomat Paulo Carneiro (van
190 Dresser 1948, Unesco 2006), had come to fruition? Perhaps universities in Europe and North
191 America would offer elective courses in *Temperate Biology*. The instructors of these courses
192 might present their research at the annual meeting of the *Association for Temperate Biology*
193 & *Conservation* (Figure 2) and publish papers in specialized journals, with article titles that
194 — in contrast to the more broadly relevant research from the tropics — emphasize the
195 temperate systems or locations the work was done (Figure 3).

196 I prefer instead to consider what the ambiguity of my conclusions implies for how we
197 should move forward. I suggest that the future of lies in neither dropping the adjective that
198 motivates so many of us, nor keeping it and accepting status as as specialization. Instead, I
199 call on ATBC members to continue taking pride in and elevating what makes biology in the
200 tropics distinct and important — the places and context in which we work — while working
201 to recenter tropical ecosystems as the biological foundation and conceptual focus of Ecology

202 and Evolutionary Biology. Below are six actions with which I propose anyone can help us
203 *reclaim and reshape the Tropical Narrative.*

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

213 **Teach with Purpose.** All tropical biologists are teachers, whether it be in a
214 classroom or in a meeting with policy makers, and teaching also provides an opportunity to
215 elevate the scholarship of others. Be mindful of whose papers are assigned as readings, the
216 studies and systems used to illustrate concepts, and the scientists highlighted in
217 presentations. Use your syllabus as a tool to recast the narrative about the tropics and the
218 scientific community that studies them. Train students in the skills needed when working in
219 tropical systems — collaboration, facilitation, conflict resolution, and communication to
220 diverse audiences (Kainer *et al.* 2006, Duchelle *et al.* 2009). Teach collaboratively and
221 cross-nationally (Russell *et al.* 2022).

222 **Collaborate with Purpose.** International collaboration can be challenging, but
223 personally and professionally rewarding (Smith *et al.* 2014). Be mindful of global scientific
224 inequities, laws, and ‘parachute science’ (Gómez-Pompa 2004, Asase *et al.* 2022,
225 Ramírez-Castañeda *et al.* 2022). Allow community members to guide the development of
226 research priorities and questions (Kainer *et al.* 2009). Push for organizations to strengthen
227 collaborations with — and especially within — the Global South (Ocampo-Ariza *et al.*
228 2023). Partner with communities to identify research questions and return the results of

229 research (Kainer *et al.* 2006). Treat the parataxonomists, field technicians, and station staff
230 that make our work possible with the respect they deserve (Basset *et al.* 2004). Publish in
231 national journals (Bruna *et al.* 2004).

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

240 ***Get in the Game.*** Help make the process of publishing more fair by serving as a
241 review or subject editor for *Biotropica*. Contribute to capacity building efforts by reviewing
242 student seed grants proposals or serving as a judge for student presentations at the ATBC's
243 Annual Meeting. Join a committee or chapter and organize a webinar, workshop, hackathon,
244 or reading group. What should the ATBC be doing differently? Communicate your ideas to
245 the leadership or stand for election and push for change as a Councilor.

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

Table 1

Top keywords in tropical articles, non-tropical articles, and keywords that the categories have in common. Keywords in bold refer to species, geographic locations, or systems.

Tropical: Unique Top Keywords (rank)	Non-Tropical: Unique Top Keywords (rank)	Shared Top Keywords (rank in Tropical, Non-Tropical)
costa rica (1)	sexual selection (1)	diversity (2, 6)
tropical forest (3)	phenotypic plasticity (4)	fragmentation (8, 42)
mexico (4)	tradeoff (9)	herbivory (10, 11)
seed dispersal (5)	adaptation (10)	disturbance (11, 27)
tropical rainforest (6)	natural selection (12)	climate change (12, 3)
conservation (7)	population dynamic (13)	species richness (13, 24)
brazil (9)	density dependence (15)	competition (16, 2)
panama (14)	fitness (16)	phenology (21, 46)
rainforest (15)	coevolution (17)	predation (22, 14)
neotropic (17)	body size (18)	speciation (24, 5)
savanna (18)	evolution (19)	pollination (28, 48)
growth (19)	local adaptation (20)	dispersal (36, 7)
seed germination (20)	gene flow (21)	nitrogen (38, 44)
frugivory (23)	phylogeny (22)	temperature (41, 37)
tropical dryforest (25)	quantitative genetic (23)	mutualism (45, 34)
reproduction (26)	food web (25)	lifehistory (49, 8)
seasonality (27)	heritability (26)	
distribution (29)	coexistence (28)	
caribbean (30)	experimental evolution (29)	
venezuela (31)	hybridization (30)	
abundance (32)	selection (31)	
biogeography (33)	reproductive isolation (32)	
biomass (34)	survival (33)	
seed predation (35)	demography (35)	
taxonomy (37)	facilitation (36)	
atlantic forest (39)	maternal effect (38)	
amazon (40)	metapopulation (39)	
functional trait (42)	usa (40)	
colombia (43)	extinction (41)	
succession (44)	mate choice (43)	
phosphorus (46)	sperm competition (45)	
tropic (47)	ecosystem function (47)	
mortality (48)	sexual conflict (49)	
coral reef (50)	migration (50)	

Table 2

Top keywords from tropical and non-tropical articles that are unique to each category once system-specific keywords have been excluded, followed by the top keywords from each category that they have in common. Keywords in bold refer to species, geographic locations, or systems.

Tropical: Unique Top Keywords (rank)	Non-Tropical: Unique Top Keywords (rank)	Shared Top Keywords (rank in Tropical, Non-Tropical)
seed dispersal (2)	sexual selection (2)	diversity (1,6)
conservation (3)	phenotypic plasticity (3)	fragmentation (4,41)
rainforest (9)	tradeoff (9)	herbivory (5,11)
savanna (11)	adaptation (11)	disturbance (6,27)
growth (12)	natural selection (12)	climate change (7,3)
seed germination (13)	density dependence (13)	species richness (8,24)
frugivory (16)	fitness (16)	competition (10,2)
reproduction (18)	coevolution (18)	phenology (14,45)
seasonality (19)	body size (19)	predation (15,14)
distribution (21)	evolution (21)	speciation (17,5)
biomass (22)	local adaptation (22)	pollination (20,47)
abundance (23)	gene flow (23)	dispersal (26,7)
biogeography (24)	quantitative genetic (24)	nitrogen (28,43)
seed predation (25)	food web (25)	temperature (29,37)
taxonomy (27)	heritability (27)	mutualism (32,35)
functional trait (30)	coexistence (30)	lifehistory (35,8)
succession (31)	hybridization (31)	population dynamic (45,13)
phosphorus (33)	experimental evolution (33)	demography (48,34)
mortality (34)	selection (34)	phylogeny (49,22)
fire (36)	reproductive isolation (36)	
coral reef (37)	survival (37)	
bird (38)	facilitation (38)	
mangrove (39)	maternal effect (39)	
diet (40)	metapopulation (40)	
recruitment (41)	extinction (41)	
regeneration (42)	mate choice (42)	
species diversity (43)	sperm competition (43)	
community structure (44)	ecosystem function (44)	
ecology (46)	sexual conflict (46)	
litter (47)	migration (47)	
decomposition (50)	mating system (50)	

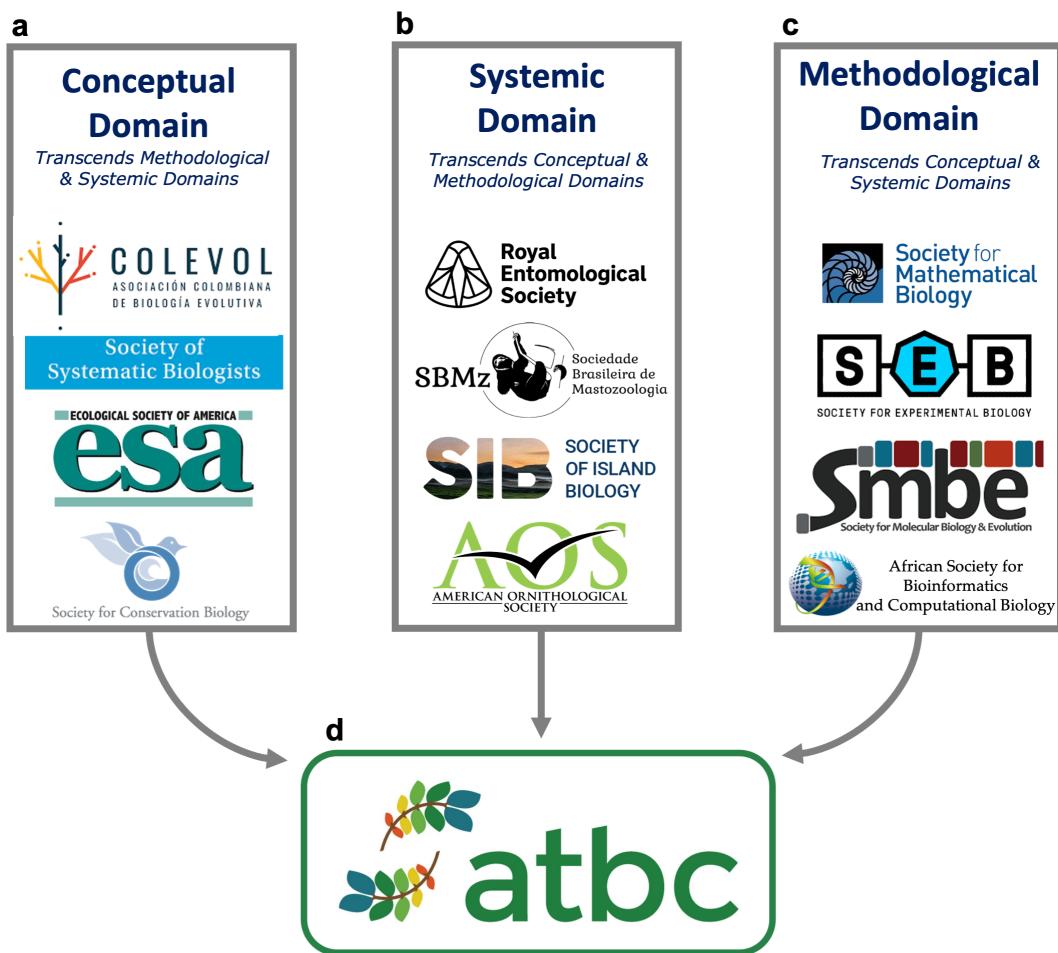


Figure 1. Alternative ways in which researchers self-organize in scholarly societies: (a) Conceptual Domain, (b) Systemic Domain, or (c) Methodological Domain. The Association for Tropical Biology & Conservation (i.e., ATBC) is unique in that transcends the three domains: its members use a broad diversity 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.

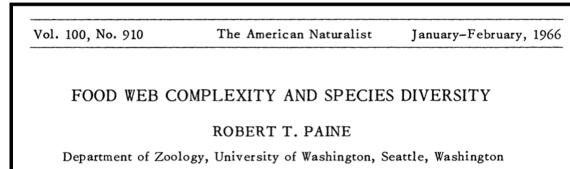
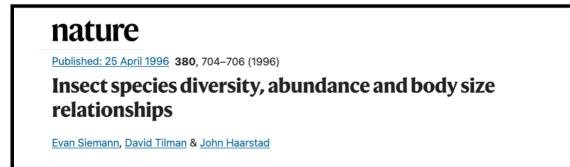
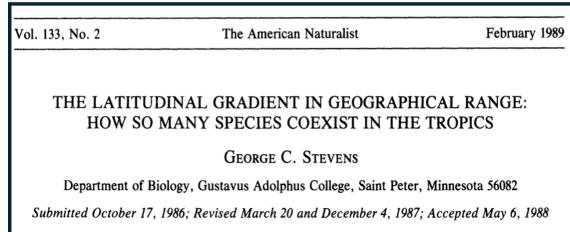
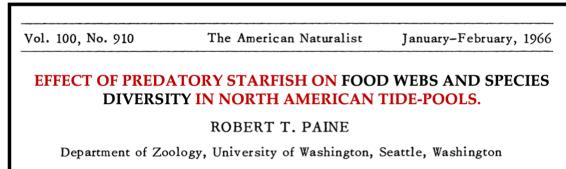
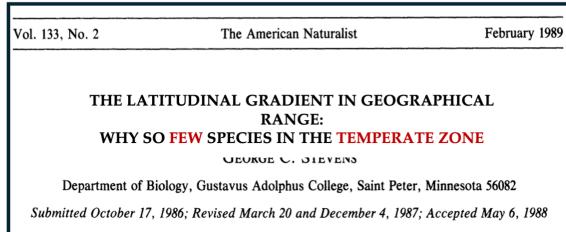
a. Original title**b. Reimagined title**

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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259 DATA AVAILABILITY STATEMENT

260 The data used in this publication are available at Dryad <DOI added upon
261 acceptance>. The code used to import, organize, and analyze these data, along with the
262 code for preparing the figures, tables, and manuscript, are available at Zenodo <DOI added
263 upon acceptance>.

264 The data used in this paper are part of a larger dataset collected for a longitudinal
265 study of research in the tropics. That data set, and the code used to harvest, clean, and
266 organize it, are available at Github https://github.com/BrunaLab/tropical_bibliometrics.
267 Questions regarding the data or code, or suggestions for improvement should be posted as
268 Issues on that repository or referred to E. M. Bruna. That repository also includes a
269 NEWS.md file summarizing any post-publication updates.

270 DISCLOSURE STATEMENT

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

273 AUTHOR CONTRIBUTION STATEMENT

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

276

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SUPPORTING INFORMATION

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

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¹ **1. Collection, processing, and visualization of bibliometric data**

² To identify the conceptual domains studied by researchers working in ‘Tropical’ and
³ “non-Tropical” locations, I used information extracted from the bibliographic records of
⁴ articles published These studies were published from 1990-2022 in N = 11 journals (*Journal*
⁵ *of Evolutionary Biology*, *Ecology*, *Journal of Applied Ecology*, *Evolution*, *Biotropica*, *Journal*
⁶ *of Ecology*, *Tropical Conservation Science*, *American Naturalist*, *Tropical Ecology*, *Journal of*
⁷ *Tropical Ecology*, *Revista de Biología Tropical*). Specifically, I compared (1) article keywords,
⁸ (2) individual words in article titles (e.g., *seed*, *species*), and (3) title bigrams (i.e., pairs of
⁹ sequential words in titles, e.g., *seed predation*, *species diversity*). Below I describe how the
¹⁰ article records were identified, downloaded, processed, and assigned to the ‘Tropical’
¹¹ and “non-Tropical” categories using code written in the R programming language (R Core
¹² Team 2023).

¹³ On 8 February 2023, I downloaded all bibliographic data available in SCOPUS and the
¹⁴ Web of Science ‘Core Collection’ for all articles published in the focal journals; both
¹⁵ SCOPUS and the Web of Science were queried because they differ in the years indexed for
¹⁶ each journal. I then used the `refsplitr` package (Fournier *et al.* 2020) to process the
¹⁷ records and remove any duplicates. After removing all stopwords (Benoit *et al.* 2021) from
¹⁸ article titles and keywords, I spell-checked, stemmed, and lemmatized all of the keywords
¹⁹ and title words. I also extracted bigrams from titles with the `tidytext` library (Silge &
²⁰ Robinson 2016). Finally, I identified each article as either ‘Tropical’ or ‘non-Tropical’; all
²¹ articles published in (*Journal of Evolutionary Biology*, *Ecology*, *Journal of Applied Ecology*,
²² *Evolution*, *Biotropica*, *Journal of Ecology*, *Tropical Conservation Science*, *American*
²³ *Naturalist*, *Tropical Ecology*, *Journal of Tropical Ecology*, *Revista de Biología Tropical*) were
²⁴ assigned to the ‘Tropical’ category, while articles published in the other journals were
²⁵ assigned to one of these categories based on a search of the titles, keywords, or abstracts for
²⁶ a list of domain-specific terms (e.g., tropical: *amazon*, *andes*, *congo*, *bci*, *chamela*;
²⁷ non-tropical: *finland*, *boreal*, *eastern decid*, *arctic*, *polar*). These procedures resulted in N =

28 42,014 total articles published, of which N = 15,417 reported research conducted in the
29 tropics and N = 26,597 were based on work conducted in other locations. Collectively, these
30 articles used N = 69,919, N = 25,207 unique title words, and N = 126,796 title bigrams.

31 The number of articles varies widely between journals, as does the number of keywords
32 per article. Comparing counts of keyword frequency in tropical and non-tropical articles
33 could therefore bias results towards the content published a small number of journals. To
34 correct for this, I calculated the percentage of articles in each geographic category that uising
35 each keyword, title word, or bigram. I then selected the N = 50 most frequently used terms
36 in each geographic category, and identified (a) any terms that ‘tropical’ and ‘non-tropical’
37 articles had in common, and (b) any terms that were unique to each article category.

38 **2. Data and Code**

39 The data used in this publication are available at Dryad <*DOI added upon acceptance*>.
40 The code used to import, organize, and analyze these data, along with the code for preparing
41 the figures, tables, and manuscript, are available at Zenodo <*DOI added upon acceptance*>.

42 The data used in this paper are part of a larger dataset collected for a longitudinal
43 study of research in the tropics. That data set, and the code used to harvest, clean, and
44 organize it, are available at Github https://github.com/BrunaLab/tropical_bibliometrics.
45 Questions regarding the data or code, or suggestions for improvement should be posted as
46 Issues on that repository or referred to E. M. Bruna. That respository also includes a
47 NEWS.md file summarizing any post-publication updates.

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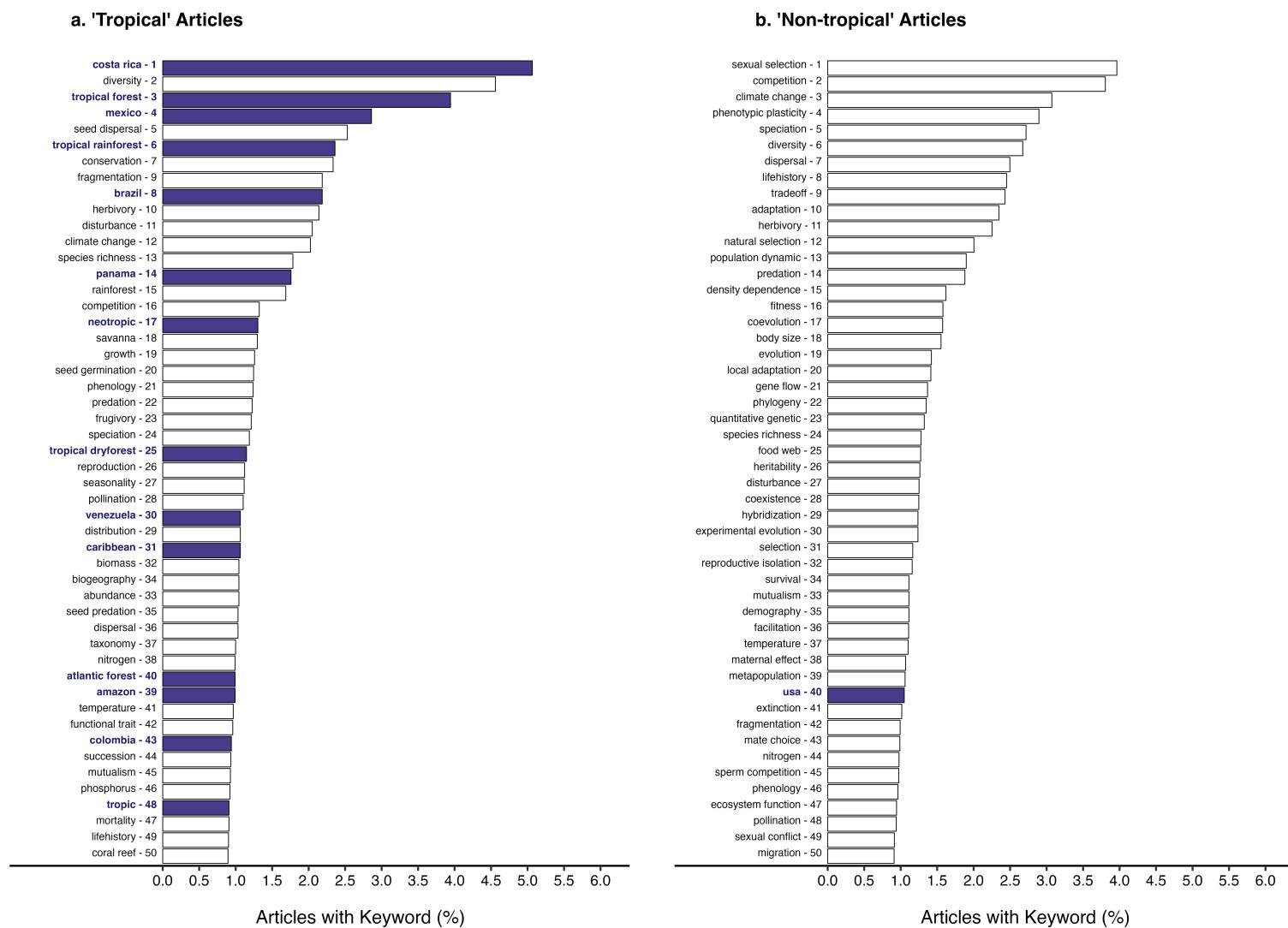


Figure S1. The N = 'r cutoff' most common keywords from articles based on research conducted in (a) the tropics and (b) non-tropical regions. The rank of these words is based on the percentage of articles in each category that included them. Terms reflecting geography (e.g., *tropics*, *Peru*, *Southern*)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

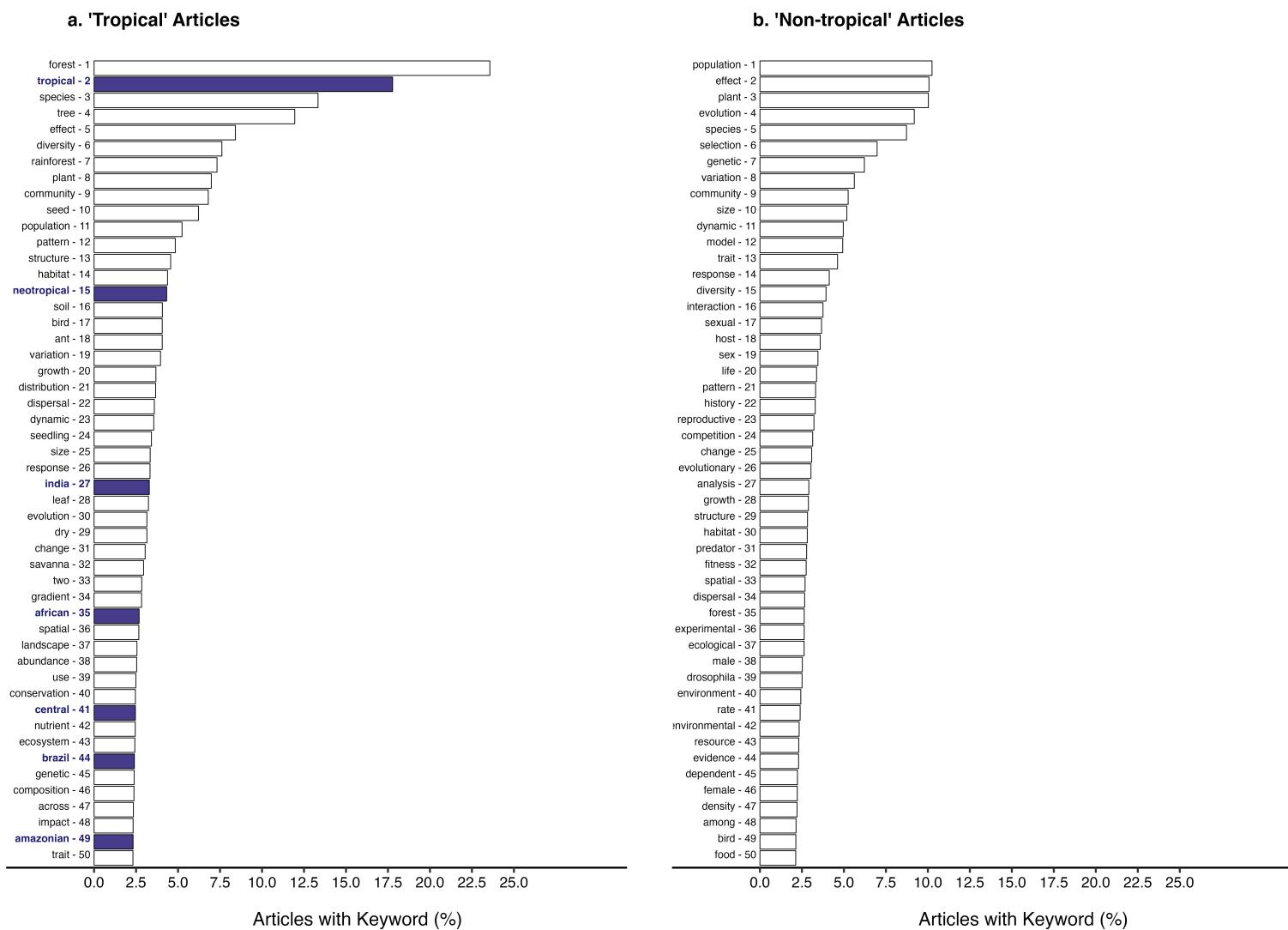


Figure S2. The N = 'r cutoff' most common words in the titles of articles based on research conducted in (a) the tropics and (b) non-tropical regions. The rank of these words is based on the percentage of article titles in each category that included those words. Terms reflecting geography (e.g., *tropics*,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

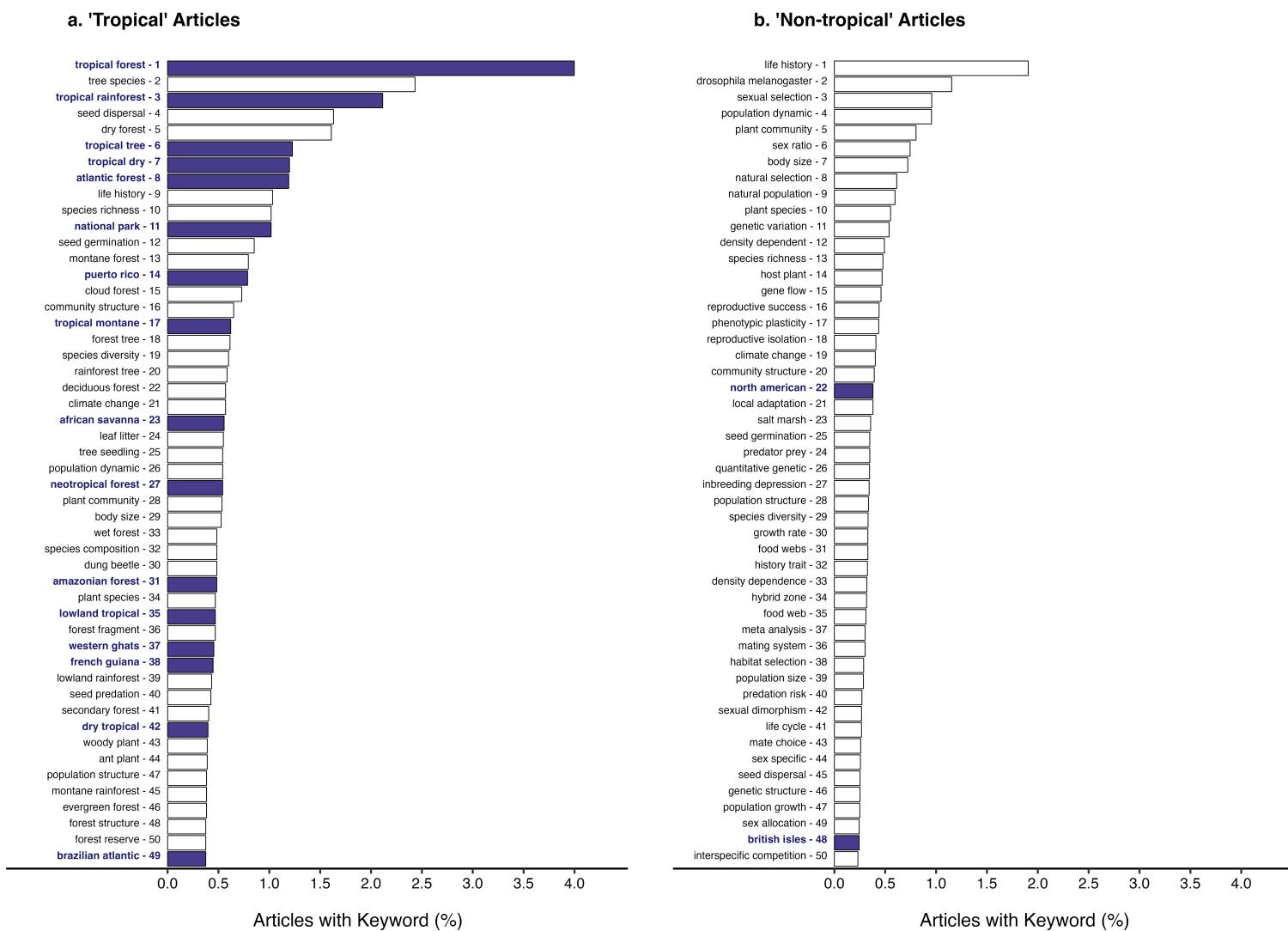


Figure S3. The N = 'r cutoff' most common bigrams in titles of articles based on research conducted in (a) the tropics and (b) non-tropical regions. The rank of these words is based on the percentage of article titles in each category that included those words. Bigrams reflecting geography (e.g., *tropics*,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

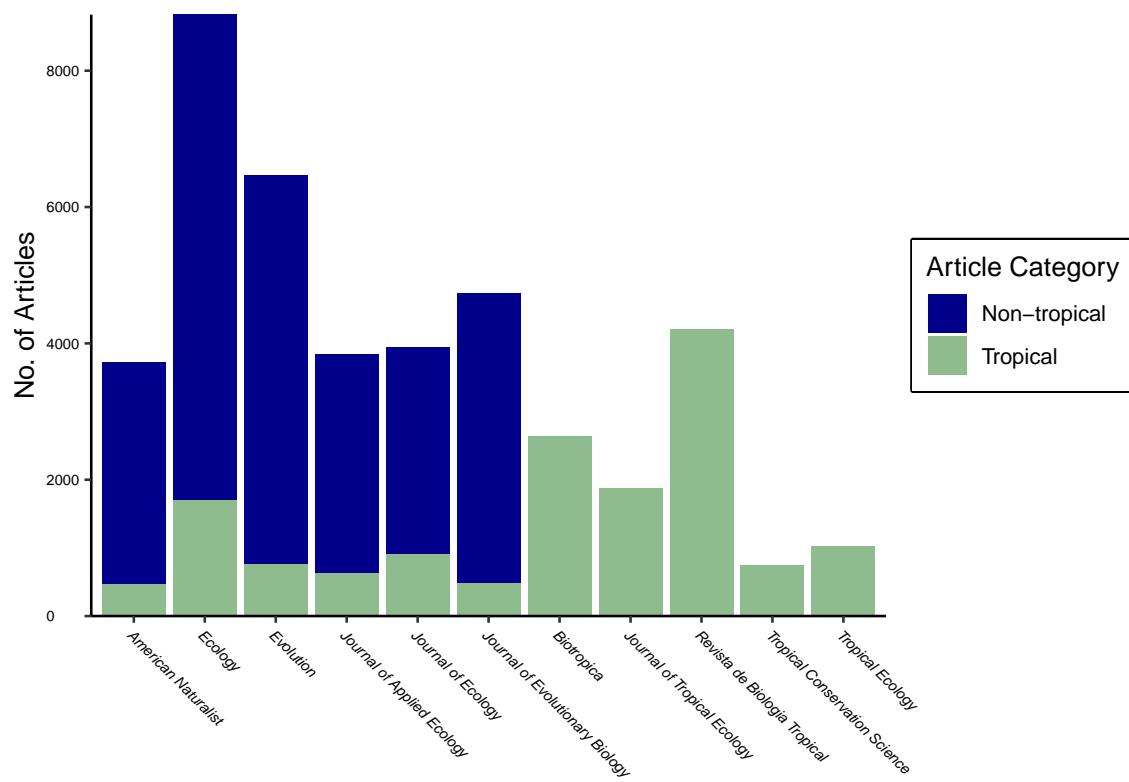


Figure S4. The number of articles from each journal and geographic category that were used in used the analysis of keywords.

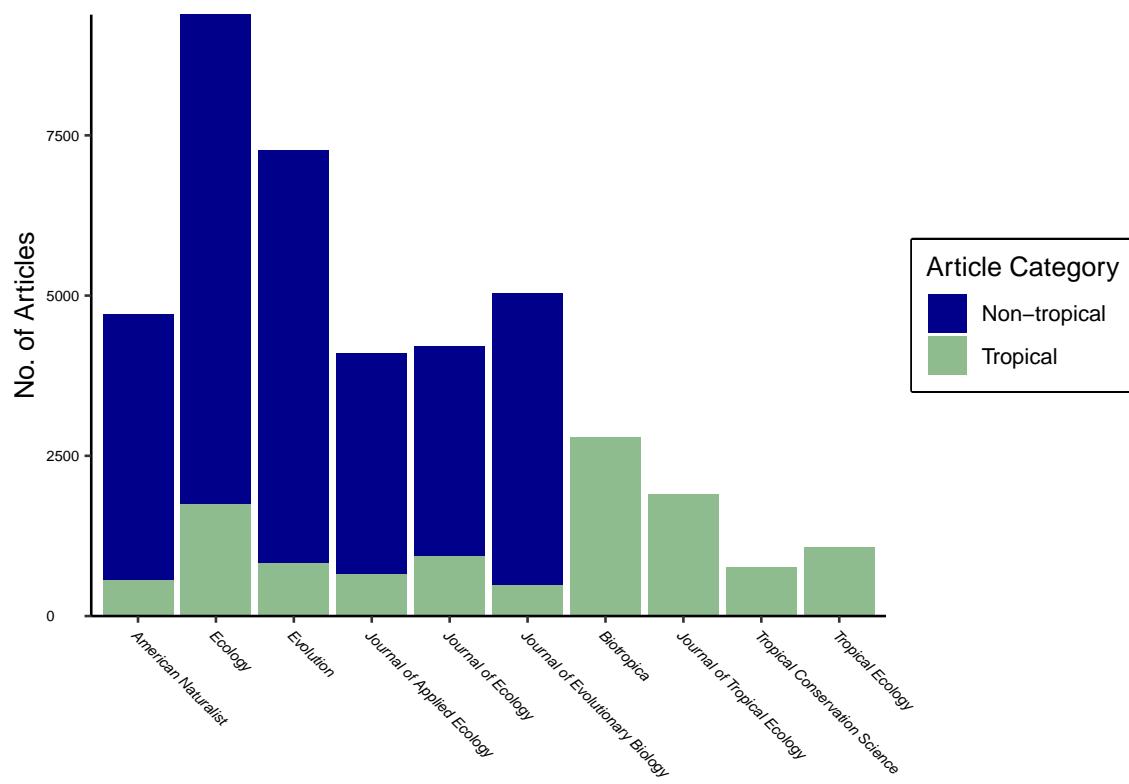


Figure S5. The number of articles from each journal and geographic category that were used in the analysis of title words and title bigrams.