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OPINION

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Steps towards decolonising biogeography

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Abstract

Biogeography has its origins in European colonialism. The legacies of colonial relations are evident in the distribution of practicing biogeographers, the direction of flow of biogeographical data, and the language used when describing and interpreting our studies. Biogeographers can address these legacies through increasing access to research data and publication outlets, improved recognition of collaborative relationships, and critically reflecting upon how our assumptions and perspectives might perpetuate colonial attitudes. Achieving these goals will improve not only inclusivity and equity within our field but also increase the diversity of insights and validity of our findings. If biogeography is to be a truly global science then decolonisation is a collective responsibility.

Highlights

- Biogeography emerged from research with colonial objectives
- The majority of authors publishing in international biogeography journals are based in the Global North, with only 11% in the tropics
- Greater equality in collaboration, access to data repositories, and a reframing of the language used in biogeographical works can all contribute towards increasing representation and equity
- Biogeographers have a responsibility to overcome the legacies of colonialism and work towards an inclusive research practice

Keywords: biogeographical practice, co-creation, collaboration, engaged research, ethics, objectivity, positionality, postcolonialism

Introduction

In common with many fields of inquiry that seek to increase our understanding of the earth and its people, biogeography has its roots in European colonialism. The exploitative role of (bio)geographical knowledge is evident, for example, in the records made during Alexander the Great's campaigns as new territories were acquired; in Walter Raleigh's South American quests in search of the mythical El Dorado; and Heinz Ellenberg's mapping of European vegetation during the Second World War. Even in more (supposedly) disinterested scientific endeavours, where biogeography did not directly map onto colonial geography, such as in the expeditions of von Humboldt, Darwin and Wallace, knowledge was constructed by incorporating tropical data into frameworks and narratives that had been developed exclusively in temperate countries (Driver 2000). In these and countless other contexts, documenting the distribution of natural resources was central to the organisation and resource management of people and space, and contributed to the objective of making the colonies productive of capital for Europe's imperial powers (Godlewska & Smith 1994; Livingstone 1992). This legacy persists in the modern pursuit of medicinal plants in tropical rain forests, invariably in search of profitable cures for predominantly First World maladies such as cancer or obesity (Voeks 2018).

Even the taxonomy of life itself originates from the work of European scholars such as Carl Linnaeus and John Ray who depended upon international collectors to source material from overseas, returning it to Europe for its formal naming (in Latin, Europe's first colonial language) and placement within European systems of knowledge. There is a trace of such histories in contemporary narratives of, for instance, 'discovering' and naming new species that have long since been known and named by local and indigenous groups whose knowledges and taxonomic practices are disregarded. This is indicative of our discipline's broader colonial trajectory - what David Livingstone famously termed 'the Geographical Tradition' - in which geographical inquiry constitutes 'the science of imperialism par excellence' and whose focus on 'exploration, topographic and social survey, cartographic representation and regional inventory – the craft practices of the emerging geographical professional – were entirely suited to the colonial project' (Livingstone 1992, 170). Given this history, there is a need to consider our contemporary

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practices in biogeography in the context of uneven colonial-era power relations and the ways that we can work towards a more decolonised research paradigm.

Modern biogeographers may feel that predominantly desk-based research programmes isolate them from the colonial origins of the discipline. Biogeographers frequently share buildings with human geographers but often assume that their own work does not share the same concerns. Yet there remain at least three ways in which the legacies of colonial relations persist in contemporary biogeographical studies: 1) the skewed geographical distribution of biogeographical researchers; 2) the direction of flow of biogeographical data; and 3) the representational practices of biogeographical studies. Below we discuss each of these points with the objective of fomenting debate towards decolonising biogeographical practice.

Distribution of biogeographical researchers

Where are the biogeographers? There are relatively few institutes or departments explicitly devoted to biogeography, although it forms an element of the research and teaching programmes of many university departments (mainly in geography and biology), natural history museums and herbaria. For this reason alone, its major centres of activity are either in European countries or their historical settler colonies (USA, Canada, South Africa, Australia). This is evident in the affiliations of practitioners as measured by papers in the leading journals in the field (*Global Ecology & Biogeography, Journal of Biogeography, Diversity and Distributions*), original analysis of which we present here.

We chose these three journals because they are the highest-profile international outlets in the field, and they aspire to generality in the work they present, rather than regionally-limited findings. *Journal of Biogeography* states that it "seeks to be representative of the discipline of biogeography, to be global in scope". *Global Ecology and Biogeography* embeds this principle in its very name, and "welcomes studies that... arrive at general, conceptual conclusions", and moreover states that while studies "need not be global in spatial extent... the conclusions and implications of the study must be relevant to ecologists and biogeographers globally, rather than being limited to local areas". Finally, papers in *Diversity and Distributions* "must have clear and important implications for our understanding of biogeography and must be of potential broad interest of the readership." Based on these statements there is no reason why the global extent of authorship should not match the geographical inclusiveness of the work published.

Publication records were downloaded from Web of Knowledge covering all articles published in the three journals over the period from 2014 to 2018 (five years). This comprises a total of 2427 items (*Journal of Biogeography* 1126, *Diversity & Distributions* 640, *Global Ecology & Biogeography* 661). These were parsed using the refsplitr package (Fournier et al. 2019) in R3.6.1 (R Core Team, 2019). All contributions were considered equally (papers, comments, letters, editorial) as reflecting published voices within biogeography. A total of 7031 distinct authors were identified, from which accurate geographical localities could be obtained for 6935 individuals (99%). While this may include a small number of cases in which the same individual was counted more than once, or multiple authors merged into a single name, this does not confound our findings because the focus was on institutional addresses rather than individual identities.

In Figure 1 we show the map locations of all published author addresses. Notably the institutions where biogeographical research is carried out (or at least published) are predominantly located in Europe and North America. While there are some concentrations of activity outside these regions, particularly in southeast Australia and Brazil, large parts of the world have extremely low densities of coverage. This is particularly true of the entirety of Africa, the Middle East, Asia and Southeast Asia. In total only 11% of authors declared an institutional address in the tropics (defined as 23.4 degrees above and below the equator; 751 authors). The remainder were predominantly in the northern hemisphere (73%; 5060 authors), and even the relatively small land area in the southern hemisphere provided more authors than the tropics (16%; 1124 authors). While similar patterns would likely be obtained if the same approach were taken with other, unrelated academic disciplines, we contend that this reveals the dependence of biogeographical research on the same colonial legacies of knowledge creation and dissemination.

In interpreting these data there are several caveats to bear in mind. An author's affiliation does not imply origin or educational background, nor does it make clear dual affiliations (and thus important platforms) held by Global South scholars. Nevertheless, even these potential confounding effects highlight further concerns, for example where scientists from poorer parts of the Global South need to relocate to the Global North for training, employment, and access to publishing.

These data take no account of the seniority of authorship, and therefore the additional prestige that might be attached to being first or corresponding author on a publication. Such data are harder to parse, but an indication of further biases can be assumed based on the first authorship of 1074 papers in *Journal of Biogeography* alone (Table 1). Even these broad categorisations obscure important differences; only 6/29 corresponding authors in Africa provided an address outside South Africa, while all but one of the 19 Central American corresponding authors were based in Mexico. Overall the indication is that leadership of research projects, as represented by primacy of authorship, mainly resides with researchers based in the Global North. A more detailed analysis of collaboration networks across Amazonia revealed a similar pattern (Malhado et al. 2014).

It is perhaps misleading to focus on outputs in prestigious journals published in the Global North when scientists in other countries might choose to

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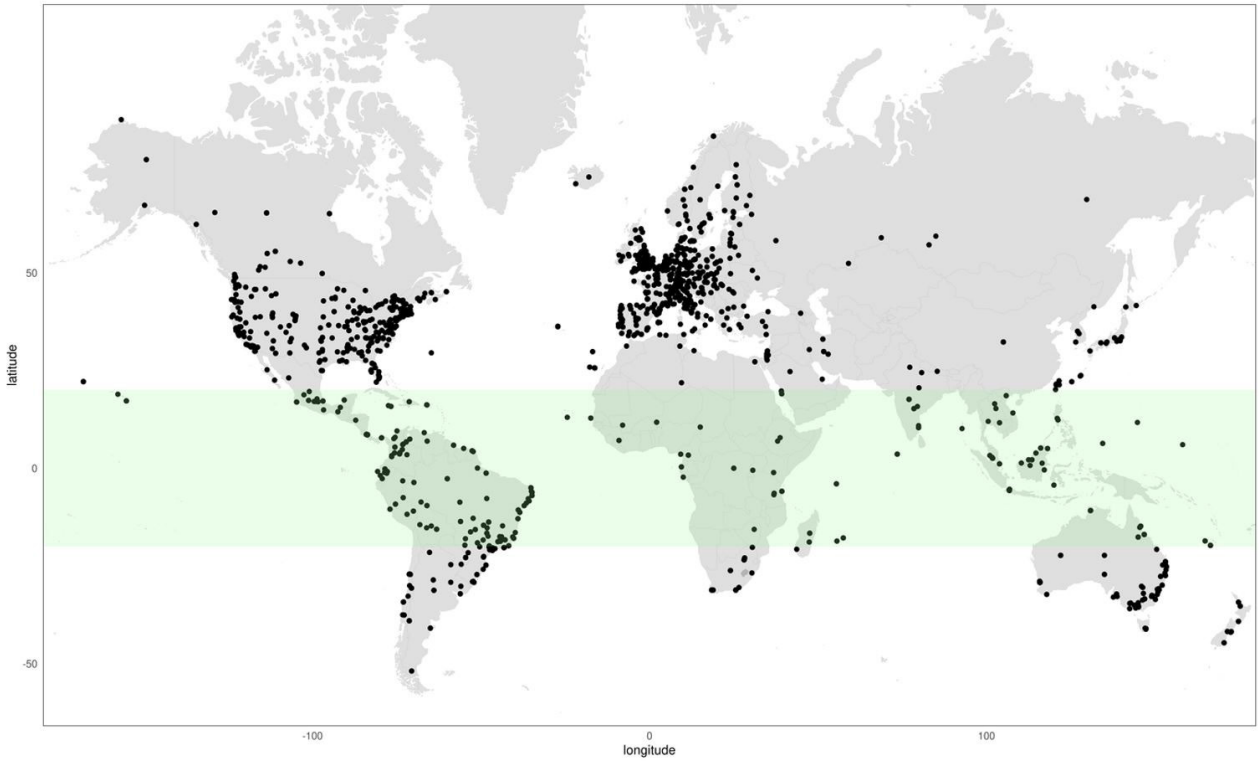

Figure 1. Locations of all authors of papers in three leading biogeography journals (*Journal of Biogeography, Diversity & Distributions, Global Ecology & Biogeography*) over the period from 2014–2018. The geographical tropics are shaded in green for comparison (23.4 degrees above and below the equator).

Table 1. Region of primary affiliation of first and corresponding authors of papers published in *Journal of Biogeography* from 2014–2018. Data provided by the journal and used with permission.

Region	First author	Corresponding author
Europe	443	447
North America (USA, Canada)	269	262
Australia & New Zealand	105	105
South America	92	91
East Asia (China, Japan, Hong Kong, Taiwan)	89	92
Africa	27	29
Central America	20	19
Middle East (including Turkey)	19	19
Southeast Asia	7	7
South Asia (India)	1	1
Oceania	1	1
Russia	1	1
Total	1074	1074

publish in local outlets. Nevertheless, the highest profile international journals aspire to global reach and influence, and hence cover studies from across the entire world. The patterns mirror those seen in other fields, for example, the majority of papers in tropical ecology have lead authors outside the country where the study was conducted (Stocks et al. 2008). A comparable study of publication trends in biogeography noted that while the number of countries represented through authorship was growing, this was accompanied by an increased concentration of publications in a small number of research institutions (Ladle et al. 2015). This leads on to our second contention, which is that the transfer of biogeographical data is highly asymmetrical.

Direction of flow of biogeographical data

A second way in which the legacies of colonial relations persist in biogeography is evident in the geographies of data itself, where poorer areas of the

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world are deemed data-deficient (e.g., Kier et al., 2005) while the uneven and unjust distribution of research resources is retained in richer parts from where research agendas are set and data are ordered, owned and monetised. In this process, because the sampling deficit is greatest in poorer areas, biogeographers frequently project understandings based on temperate data. One notable example is Rapoport's rule, which states that species should have larger ranges in temperate zones. Although a positive relationship between range sizes and latitude holds for European birds, this breaks down at global scales (Orme et al. 2006). A biased geographical spread of data has led to particular errors within Africa, where the sampling deficit is greatest; see for example the 'discovery' of massive peat bogs in the Congo basin, which only came as a surprise because their existence had not been anticipated by models based on predominantly temperate sampling (Dargie et al. 2017). Likewise the failure until recently to realise that much of what we see of modern Amazonian forest composition reflects pre-Columbian agriculture and legacies of the rubber boom (McMichael et al. 2017). The problem is therefore one of both poor science and poor ethics as local knowledges are continually written out of research processes (see Baker et al. 2019). Where non-temperate frameworks are deployed they inevitably derive from the tropical sites that are well-studied due to colonial histories or where field stations exist as legacies of colonial enterprises.

The conduct of exploratory and survey expeditions has improved markedly — most major organisations now include capacity-building as an essential element of any project. Nevertheless, when local scientists are formally included, they very rarely direct programmes of research (Malhado 2011); participation is usually seen as a reward in itself. If we are serious about a more decolonised research practice, then we must recognise that co-creating and co-developing research with local actors (be that in Dartmoor or the Amazon) is an ethical imperative that also has the potential to significantly increase the impact and legacy of research. Such approaches are embedded in the core principles of some funding initiatives such as the Global Challenges Research Fund[1] .

Western science provides a form of knowledge that, when applied indiscriminately, can be ill-equipped to provide knowledge on areas where indigenous ways of knowing have developed over many generations and are based on collective or individual learnt experiences of the world (Toomey, 2016). Harding (2006) suggests that it is not helpful to see science as separate from local knowledges, cultures and politics, and decision making. There is a challenge of linking all of these together, but Toomey (2016) suggests that this should be seen as something positive, and these areas should be seen as 'space' rather than a 'gap'. There is a need to investigate what is already in the spaces (i.e., between the science and decision making) which would enable a more holistic approach to be taken considering the local community, history, present day socio-cultural relations, and political situation. Researchers working abroad need to reconsider who is being included or excluded from the science and decision making and for what purposes (Harding 2006).

Capacity building takes time to build trust and understanding, especially when there are multiple stakeholders. This makes it difficult when researchers from overseas have grants that are time-limited or constrained by the fixed terms of PhD programmes. Nevertheless, embedding such intentions into programmes from the very outset enables benefits to accrue gradually rather than being brought in as an afterthought. There are funding frameworks that require an outline of the engagement and impact strategy at the application process, such as the 'Pathways to Impact' statement (UK Research and Innovation, 2019). However, for meaningful engagement to happen, the projects need to be interdisciplinary. Social scientists and engagement practitioners have the skill sets to ensure that the research is of interest to the communities in the host countries. A crucial element of this is learning to present findings in a manner that is inclusive and respectful, rather than embedded in frameworks and assumptions which perpetuate colonial legacies. This applies both to sharing of findings with local audiences and how we repurpose them for international publications.

The representational practices of biogeographical studies

Why are the tropics so species-rich? This question is connected to the latitudinal diversity gradient, one of the most striking and consistent patterns in global biogeography (Hillebrand 2004). A consideration of this puzzle forms part of most undergraduate courses and textbooks in the field (e.g., Eichhorn 2016). Yet the question contains an often-unrecognised assumption that the tropics are both easily definable (Feeley and Stroud 2018) and somehow unusual or aberrant. Why do we not ask instead why the temperate zones are so species-poor? The Euro-centrism is obvious and serves as an illustrative example of the ways we might rethink the representational practices of our discipline.

There is a precedent for such a reconsideration. The original mapping of 867 global ecoregions was largely fictional as it showed the divisions in the natural world that would be present in the absence of humans (Olson et al. 2001). This has been remedied through the recognition of 'anthromes', showing the actual habitats rather than an idealised human-free version of the world (Ellis et al. 2010). The conception of ecoregions, which are a foundation of conservation policy-making, reflects an implicit belief in the value of 'virgin' nature over the coupled human-natural systems that dominate the planet. While we accept such modified landscapes as normal in developed countries, they are still seen at a subconscious level as somehow inappropriate in tropical countries. Often

1 https://www.ukri.org/research/global-challenges-research-fund/

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without realising it we apply different standards to describing and interpreting biogeographical patterns in the Global South, in the process occluding the presence and importance of local people.

The legacy of scientific colonialism lingers in the way our papers are written. This may appear a relatively benign problem, but its cumulative effect across a research literature is to perpetuate a worldview in which the tropics are described by observers in First World countries and, when they fail to fit within *our* worldview, are seen as a problem requiring *our* explication. Authors from the Global North typically write with an assumption of generality, whereas those from elsewhere restrict their emphasis to specific localities (Ergin and Alkan 2019), reinforcing a dynamic in which scholars from the Global South are seen as producing data or case studies for theorists in more privileged institutions. Publications from some developing countries also contain a disproportionate fraction of within-country citations; this might arise from differing scientific cultures or research agendas, which makes it a complex pattern to interpret (Ladle et al. 2012). Reflecting on how we choose to describe our world – and indeed what we mean by 'our' – and finding more inclusive means of expression is a challenging but wholly necessary action. This includes ensuring that the language we use in our work is intelligible and accessible, which will benefit both readers and those seeking to contribute towards the literature in future.

Ways to decolonise biogeographical practice

Each of the three signals of colonialism in biogeography above are linked. Here, we suggest ways in which biogeographers, both individually and collectively through our institutions, can act to decolonise research practice.

1. That the centres of biogeography publication lie in Global North universities is unsurprising, but we can act to remedy this in multiple ways. These include capacity building in other countries, which should have as its primary objective the sharing of tools for contributing towards international research. Furthermore, we must formally recognise the contributions of collaborators as equal partners in research, and encourage the development of research agendas based on the priorities of scientists outside the Global North. If the patterns we study are globally relevant then the means of contributing to the literature should be globally distributed as well. To reinforce the idea that everyone on a research project is an equal partner and to avoid the issue of deciding who will be lead author, there have been some positive examples of new authorship models whereby the paper is referenced by the project name rather then emphasising the leadership of a single person (see DRYFLOR 2016, LPWG 2017).
2. Influence in biogeography is largely determined by access to repositories of data which are usually aggregated and held by senior academics in major universities or institutes. Whenever possible, which means in all cases except where legal obstacles preclude it, these databases should be made open and available to all researchers irrespective of their location. Many already are (e.g., GBIF[2]), while others will release data on request (e.g., ForestGEO[3]), but a large portion remain in the private possessions of single individuals or closed groups. It is important to recognise the effort involved in compiling and maintaining large datasets but also acknowledge the collective labour required to produce the data in the first place, which provides a moral argument for sharing it widely. Also, in an inter-connected world, there is no reason why repositories of data should not be held and managed by researchers in developing countries, who could be accordingly trained and supported.
3. Recognising that biogeography emerged as a colonial practice requires us to reflect upon how our immersion in a set of shared assumptions and perspectives might perpetuate viewpoints which normalise a view of natural systems based in temperate climates. We need to critically reflect on how our own backgrounds inflect the way we collect, interpret, and describe data (e.g., Griffiths 2017). One practice well-established in the humanities, but still rare in the sciences, is to write a positionality statement. We have therefore included one at the end of this article and suggest that similar statements should be seen as a necessary part of scientific practice equivalent to declarations of conflicts of interest or funding sources.

Decolonising biogeography should not be an exercise in satisfying an arbitrary set of criteria for the conduct of research. An ongoing dialogue is required between researchers in the Global North and the contributors of data throughout the world, one which seeks to make the field more diverse, inclusive and reflective of a plurality of approaches and perspectives. Biogeography as a whole will be stronger if it becomes a genuinely collaborative and fully global scientific enterprise.

Positionality statement

We recognise that our status as European nationals based at research universities provides us with a platform which is not as readily available to others; it is for this reason that we chose to use this invited review to highlight the unequal accessibility of biogeographical research. We came to explore this area through recognition of how our own research practices were in need of critical evaluation and improvement. We have previously co-authored a paper on the need to decolonise field ecology (Baker et al. 2019), which contains a related set of arguments but with

2 https://www.gbif.org/

3 https://forestgeo.si.edu/

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recommendations tailored to improving interactions between ecologists and locals in the field. M.P.E. is an ecologist whose studies in forests around the world have relied upon a large number of field assistants whose insights and efforts have not been adequately reflected in his publications to date. K.B. is a geographer by training, conducting aquatic field research in Negara Brunei Darussalam during her PhD. She now works with water engineers helping lead the engagement aspects on various EU funded international projects. Reflections on issues around the legacies of colonial relations were triggered after realising that the literature being produced by social scientists, environmental historians, and cultural geographers on the topic of decolonising research was not being engaged with by certain other disciplines. M.G is a human geographer whose work focuses on the ethics of fieldwork in the Global South. He is a British citizen whose work in India and Palestine recognises and interrogates the colonial histories that are detectable in contemporary political struggles in both states.

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