

Mobilising Papua New Guinea's Conservation Humanities: Research, Teaching, Capacity Building, Future Directions

Jessica A. Stockdale^{a,b,c,#}, Jo Middleton^{b,c}, Regina Aina^{d,†}, Gabriel Cherake^d, Francesca Dem^e, William Ferea^d, Arthur Hane-Nou^d, Willy Huanduo^d, Alfred Kik^{f,g,h}, Vojtech Novotny^{e,f,g}, Ben Ruli^e, Peter Yearwood^d, Jackie Cassell^b, Alice Eldridge^{ij}, James Fairhead^k, Jules Winchester^l, and Alan J. Stewart^c

^aPhilosophy, School of Media, Arts and Humanities, University of Sussex, Falmer, UK

^bPrimary Care and Public Health, Brighton and Sussex Medical School, Falmer, UK

^cEvolution, Behaviour and Environment, School of Life Sciences, University of Sussex, Falmer, UK

^dHistory, Gender Studies and Philosophy, School of Humanities & Social Sciences, University of Papua New Guinea, Port Moresby, PNG

^eNew Guinea Binatang Research Center, Madang, PNG

^fBiology Centre, Institute of Entomology, Czech Academy of Sciences, České Budějovice, Czech Republic

^gFaculty of Science, University of South Bohemia, České Budějovice, Czech Republic

^hScience and Technology, University of Goroka, Goroka, PNG

ⁱSussex Humanities Lab, School of Media, Arts and Humanities, University of Sussex, Falmer, UK

^jMusic, School of Media, Arts and Humanities, University of Sussex, Falmer, UK

^kAnthropology, School of Global Studies, University of Sussex, Falmer, UK

^lLanguage Studies, School of Media, Arts and Humanities, University of Sussex, Falmer, UK

[†]Author deceased

#Corresponding author. Email: mail@jessicastockdale.com

Abstract

We suggest that the emerging field of the conservation humanities can play a valuable role in biodiversity protection in Papua New Guinea (PNG), where most land remains under collective customary clan ownership. As a first step to mobilising this scholarly field in PNG and to support capacity development for PNG humanities academics, we conducted a landscape review of PNG humanities teaching and research relating to biodiversity conservation and customary land rights. We conducted a systematic literature review, a PNG teaching programme review, and a series of online workshops between the authors (10 PNG-based, 7 UK-based). We found a small but notable amount of PNG research and teaching focused on biodiversity conservation or customary land rights. This included explicit discussion of these topics in 8 of 156 PNG-authored humanities texts published 2010-2020 and related teaching content in the curricula of several different humanities-based programmes. We discuss current barriers to PNG academic development. The

growth of fully fledged in-country conservation humanities will require a joint collaborative effort by PNG researchers, who are best placed to carry out such work, and researchers from abroad who can access resources to support the process.

Keywords: Papua New Guinea, conservation humanities, biodiversity, customary land rights, higher education

Access this article online

Quick Response Code:



Website:
<https://journals.lww.com/coas>

DOI:
10.4103/cs.cs_48_23

INTRODUCTION

Lying in the South Pacific, New Guinea has the third-largest remaining rainforest globally (Shearman and Bryan 2011), with the highest plant biodiversity of any island (Cámara-Leret et al. 2020). Its eastern half, Papua New Guinea (PNG), contains over 5% of Earth's terrestrial animal and plant species (Novotny and Toko 2015), and its seas harbour exceptionally biodiverse coral reefs as part of the Coral Triangle (Allen 2008). In the past few decades, however, these natural systems have come under increasing threat from extractive activities such as corporate logging, land conversion to plantations, industrial fishing, expanding subsistence farming, and—to a far lesser extent—subsistence fisheries (Shearman et al. 2009; Drew et al. 2015). The lasting ecological damage caused by these activities make it imperative to protect PNG's forest and water habitats with conservationists applying the ecological, medical and social sciences towards these aims (Novotny and Drozd 2000; Basset et al. 2004; Novotny 2010; Novotny and Molem 2020; Middleton et al. 2020a; Middleton et al. 2023).

As these efforts indicate, biodiversity conservation has traditionally been a science-led endeavour. However, in recent decades, humanities-based disciplines have played increasingly valuable and essential roles in efforts to preserve natural systems too. This has led to the emergence of the 'conservation humanities' which, as a subset of the environmental humanities, "focuses on biodiversity loss and efforts to address it ...[providing] insights into questions of human culture, values, history, and behaviour" (Holmes et al. 2022: 1-2). This incorporates a range of different disciplines. For instance, historians have examined how past biophysical, socioeconomic, and intellectual factors contribute to long-term feedbacks in coupled human and natural systems (Steen-Adams et al. 2015). Philosophers have explored the implicit social dimensions of key concepts in conservation science and the ethical principles guiding research and implementation (Colyvan et al. 2009). Literature scholars have investigated the representation of 'the natural' across media and how that has impacted conservation action (Huggan and Tiffin 2015).

Similar to the sciences, conservation humanities research can accomplish positive outcomes for biodiversity in a variety of ways. This includes using humanities-based research findings to change conservation practices by either engaging with conservation-based organisations or directly influencing conservation policy. For instance, work on religion in sacred natural areas of the Himalayas has brought local indigenous knowledge into dialogue with secular conservation initiatives by informing NGO ecological monitoring and influencing policies set out by the International Union for Conservation of Nature (IUCN) (Tuladhar-Douglas 2014). Contributions may also occur through more indirect routes. For instance, as others have noted, humanities scholarship has the capacity to raise public and stakeholder awareness through different cultural mediums like accessible books, media, and museum exhibitions (Bennet and Roth 2018). If executed effectively, such humanities-based environmental communication can

generate pro-environmental beliefs and actions, as well as cultivate empathy for nature, which may be beneficial for biodiversity conservation (Goralnik et al. 2017).

In PNG, these humanities-based disciplinary skills and methodologies are of particular importance given the majority of the country's forests, coasts and waterways are under the collective customary ownership of local clans. This protected tenure is globally exceptional due to the remarkable legislative protections granted in PNG's national constitution (Carrier 1987; Asafu-Adjaye 2000; AusAID 2008). This continuity with pre-colonial land rights systems is, in part, due to the comparatively late point that most of eastern New Guinea was incorporated into global socio-economic and political systems. Although some coastal and island peoples had sporadic contact with maritime Europeans for hundreds of years (Fairhead 2015), European colonial intrusions rarely reached far inland, beyond coastal areas, until the mid-twentieth century. The heavily populated central highlands were only first 'discovered' by Australian gold prospectors in the 1930s (Connolly 1988). In addition, plantation and livestock industries—that elsewhere have caused large-scale programmes of enclosures and land appropriations (The Ecologist 1993)—never expanded to levels typical of the colonial states (Denoon 1989) of Imperial Germany, United Kingdom of Great Britain and Ireland, and the Commonwealth of Australia. Thus, customary land rights—communal and non-registered—remained largely in place when PNG declared Independence in 1975 and still cover most of PNG today (Filer 2011).

Recent years have witnessed increasing global calls to centre indigenous knowledge and self-determination in conservation practice (for testimonials by members of indigenous peoples, see Dawson, Longo, and Survival International 2023). Since the majority of PNG's population meet the criteria of being indigenous under several definitional accounts of indigeneity (Sanders 1999; Kalinoe 2005; Schram 2014), these global calls unsurprisingly echo long-established presumptions in PNG about the value of indigenous knowledge to biodiversity conservation (Filer 2004). As a result, conservation biologists—both PNG nationals and internationals—have argued that indigenous PNG knowledge of biodiversity is essential for effective species cataloguing and, thus, planning and evaluating interventions (Copete et al. 2023). However, Kik et al. (2021, 2023) warn that such indigenous knowledge is in rapid decline amongst secondary school-educated PNG youths in relation to language proficiency, hunting skills, and basic knowledge of birds and plants, along with their medicinal and ceremonial use. As Kik et al. (2021, 2023) suggest, these key losses in indigenous knowledge may, in turn, reduce the future attractiveness of conservation to communities throughout PNG.

Despite such cultural transitions, some PNG initiatives have demonstrated that the traditional methods of habitat management embedded in indigenous knowledge can successfully protect biodiversity. For example, Aini et al. (2023: 350) have written how a major focus of successful marine conservation in Aini's own community and others

has been “strengthening indigenous modes of knowledge production and the role of community elders”. Such customary systems and communal land regimes have also sometimes presented a barrier to resource extraction by corporations seeking timber, minerals and other resources driven by global commodity demands and the PNG state’s shortage of revenues. However, clans sometimes have little choice but to work with companies if no other ways of accessing sustainable developmental pathways are available (Novotny 2010; Laurance et al. 2011; Middleton et al. 2020b).

Due to these circumstances, the success of site-based conservation projects in PNG is contingent on the support and involvement of local PNG landowner communities. This is a key factor underpinning the ongoing conservation work which some of our coauthors have been engaged in for the last two decades. Operating in the north of PNG, these efforts have enabled clans based in the lowland forests around the village of Wanang to leverage both their land ownership, and their desire for development to protect rather than exploit their forest home. This was achieved through a multi-stakeholder agreement which was put in place by villagers and has been supported by the New Guinea Binatang Research Centre, University of Sussex, Czech Academy of Sciences, University of Minnesota, Swire and Sons, and other international institutions to preserve 15,000 ha of the forest now referred to as the Wanang Conservation Area (see www.ngbinatang.com/wanang).

As a result of these efforts, the villagers of Wanang have secured not just developmental benefits like training and employment as parataxonomists, schooling, income, and health provision but have also safeguarded the forest and its biodiversity (Middleton et al. 2020b). This collaboration’s work, funded by the UK government’s Darwin Initiative (see www.darwininitiative.org.uk/) and others, has also trained 65 PNG parataxonomists, 20 BSc students, and 20 masters students within PNG (Basset et al. 2004; Peck and Stewart 2014; Middleton et al. 2020b; Stewart et al. 2021). In the process, it has also helped build New Guinea Binatang Research Center as one of PNG’s largest non-medical biodiversity research institutions, alongside others like the PNG Institute of Biological Research, which has facilitated around 30 PNG students to study Master’s and doctorates in conservation biology and related topics at universities abroad.

This international collaboration has enabled real conservation gains on the ground whilst building local capacity in biodiversity research. Seeking to replicate these successes, but this time widening its scope to mobilise the humanities rather than just the sciences, researchers in the collaboration embarked upon network building with humanities scholars from a range of disciplines. This established new links with PNG humanities scholars from the University of Papua New Guinea (UPNG) and UK-based humanities scholars from the University of Sussex. Our now widened multidisciplinary collaboration quickly realised that further action was impeded by the existence of key knowledge gaps. This concerned the contemporary landscape of research and teaching in

PNG humanities (particularly on its engagement with conservation), as well as what types of capacity-building work would be required to mobilise PNG humanities for conservation successfully. To fill these knowledge gaps and determine pathways for future interventions, we carried out a landscape exercise to: 1) assess the current state of humanities teaching and research in PNG for biodiversity conservation and customary land rights (which is a key factor in PNG conservation); and 2) identify capacity building needs so as to set a framework for our future collaborative humanities work (outlined in the Future Directions section of this paper).

The following research questions thus drove the landscaping exercise:

1. What is the research and teaching landscape for academic humanities in PNG?
2. How has the academic humanities engaged with conservation in PNG?
3. What are the capacity-building needs of the academic humanities in PNG?
4. How can the academic humanities in PNG mobilise for biodiversity conservation?

METHODS

Three sources of information were used: data from workshops, a review of PNG humanities teaching programmes, and a systematic literature review of humanities publications. In conducting this research, we recognised that as a general description, the meaning and scope of the term ‘humanities’ can vary from one context, country or educational system to another. Since in-depth public guidance on the scope of the humanities in PNG was absent, we used documentation from the UK’s national humanities funding body, the Arts and Humanities Research Council (AHRC), as a guiding framework for this review. As AHRC recognises, identification of humanities work must be guided, not just by simple reference to disciplinary areas, but by an assessment of the problems, questions, context, and methodologies of scholarly work in a way that protects core subject areas and acknowledges the close connections between the humanities and social sciences (AHRC 2020a). In taking this approach, we followed AHRC’s list of core humanities disciplines, which includes a range of subjects like history, archaeology, literature and philosophy (AHRC 2020b). We also used the subject-based framework jointly produced by AHRC and UK’s Economic and Social Research Council (ESRC). Covering a variety of subject areas, this framework provides guidance for distinguishing nontraditional humanities from social science work (AHRC and ESRC 2020). For instance, while anthropology is usually regarded as a social science, AHRC and ESRC recognise that at least some anthropological research will fall into the humanities if it is “significantly concerned” with humanities phenomena such as religion for example (AHRC and ESRC 2020: 4).

While we recognise the arts (e.g., the products of artistic work including novels, poetry, painting, sculpture, performance, and photography) can also play a valuable role in the protection of

biodiversity, much artistic work is produced outside academic settings both in PNG and beyond, unlike the humanities. On this basis, any inclusion of the arts in such a review would require a much broader set of methods beyond this research programme's scope.

Workshops

Four two-hour online workshops were held from April through July, 2021 including 17 academic researchers and teachers (making up the full authorship of this paper) from a range of science and humanities disciplines. Ten were PNG-based (of which, eight were PNG nationals), and seven were from the University of Sussex (four with prior research on PNG); affiliations and disciplinary backgrounds of the contributors are detailed in Table S1 in the Supplementary Data File. Workshops involved a mixture of structured discussion and presentations. The first workshop began with presentational overviews on key topics such as conservation and customary land rights in PNG to ensure consistent foundational knowledge. After these informational presentations, we discussed methodology and identified key available data needed for the study, which were subsequently collected by those taking part in the workshop. In the second and third workshops, we presented our findings for discussion and identified areas for further exploration. In the fourth workshop, we discussed the capacity-building needs of the humanities in PNG and future directions.

Review of PNG Teaching Programmes

We conducted a two-part review of PNG teaching programmes to map the overall landscape of humanities teaching and identify how it has engaged with conservation. We obtained publicly available school-leaver data from PNG's governmental Department of Higher Education, Research, Science and Technology (DHERST) concerning 2021 admissions to bachelor programmes in PNG which fell either wholly or partially into the UK's AHRC remit at Higher Education Institutions (HEIs) (AHRC 2020a,b; AHRC and ESRC 2020). This data was combined with the non-school-leaver data for these programmes extracted from the individual websites of the concerned HEIs. Since student data were not available for postgraduate programmes across all PNG HEIs, or bachelor programmes at church-run non-university educational institutions, a list of programmes was produced by co-author William Ferea based on expert knowledge and through a review of institutional websites. Additionally, we reviewed teaching content across humanities courses offered by two institutions: one from the university sector (UPNG, PNG's largest and secular university) and one from the smaller church-based institutions offering undergraduate degrees (the Catholic Theological Institute).

Systematic Review of Publications by PNG authors

We conducted a two-stage systematic review of publications authored by PNG-affiliated scholars from 2010 to 2020. In the

first stage, we mapped the overall publication output of the PNG humanities, and in the second stage, we described the subset of publications engaged with biodiversity conservation in PNG. Publications were identified in three ways. This included:

1. An online bibliographic search of two electronic databases with the capacity to search author affiliation (The Humanities Index; Scopus) on December 19, 2020. In both databases author affiliation was searched using the search term 'Papua New Guinea' and restricted to items published from 2010 to 2020 inclusive. There were no restrictions on publication type (i.e., the search was not restricted to journal articles only, and included monographs etc.) or language.
2. A manual search of non-internationally indexed PNG-based humanities journals covering articles published from 2010 to 2020 inclusive which was conducted throughout April 2021. Journals were identified using the websites of PNG's academic institutions and by drawing on the expert knowledge of UPNG co-authors.
3. A search of publications catalogued on PNG's National Research Institute website throughout May 2021.

Identified PNG-based journals were screened by co-author Jessica A. Stockdale using the stage-1 inclusion-exclusion criteria for journals (Table 1). Articles in these PNG-based journals were then extracted and combined with the database publication results before duplicates were removed using Endnote. These publications were then screened by co-author Stockdale using the stage-1 inclusion-exclusion criteria for literature (Table 1). Material was first assessed by title, then the abstracts of those papers which had not been excluded based on their title were read and excluded when necessary. Finally, the full texts of the remaining papers were read and once again excluded where they did not meet the criteria (Table 1). All included publications were re-screened to ensure that at least one author was affiliated with a PNG institution. After this, co-author Stockdale applied the stage-2 inclusion-exclusion criteria to full texts to identify the subset of publications engaged with the conservation of biodiversity and customary land rights (Table 1).

RESULTS AND DISCUSSION

Humanities Research Landscape

We found that while the humanities in PNG had a low research output, a small but notable proportion of scholarship engaged with biodiversity conservation or customary land rights. In the workshops, senior PNG-based contributors felt that the overall capacity of the humanities represented a loss of momentum since the 1980s and the 1990s, when PNG's newly established academic community flourished with the emerging opportunities that arose from the country's recent independence. Despite this, we identified some recent humanities-based projects with PNG lead authors that had engaged specifically with biodiversity conservation. This included linguistic work

Table 1
Systematic Review exclusion and inclusion criteria

Inclusion	Exclusion
Stage 1: Humanities publications by PNG-based institution-affiliated authors	
Criteria for literature search	
<ul style="list-style-type: none"> Publications which met the UK's Arts and Humanities Research Council (AHRC) humanities remit guidance (AHRC 2020a, b; AHRC and ESRC 2020) Material published between 2010-2020 including both the years 	<ul style="list-style-type: none"> Editorials, book and film reviews Reissued publications with an original publication date before 2010 Publication with no PNG-based institution-affiliated author
Criteria for PNG-based journal search	
<ul style="list-style-type: none"> Journals with academic articles Journals managed or published by an institution or organisation based in PNG 	<ul style="list-style-type: none"> Journals with no content published since 2009 Journals with aims and scope that do not meet AHRC's subject coverage guidance
Stage 2: Subsets related to conservation of a) biodiversity and b) customary land rights	
Includes content about threats to, or methods to conserve, a) biodiversity in PNG, or b) customary land rights in PNG	Does not include content about threats to, or methods to conserve, a) biodiversity in PNG or b) customary land rights in PNG

on indigenous knowledge exploring the relationship between local plant knowledge and indigenous language skills as factors relevant to the protection of biodiversity (part of which is now published in Kik et al. 2021). Importantly, amongst young, educated speakers of 392 languages in PNG, they found a rapid decline in indigenous language skills, associated with a reduction in indigenous knowledge about native plants. This loss of biocultural plant knowledge risks distancing younger generations from the ecologies of their clan lands, not least by removing the perceived use-value of components of their environments (e.g., medicinal plants, building materials) with implications for how they evaluate the costs and benefits of logging and agricultural conversion of forests. In addition, we also identified Nugi and Whitmore's (2020) study (also found in the systematic literature search), which investigated the current impact of feather headdress-making on PNG's Pesquet's Parrot (*Psittichas fulgidus*) population.

In the systematic literature review, 2,584 publications were identified, with 2,062 extracted from the online database search, 339 extracted from four PNG-based journals, and 183 found on the PNG National Research Institute website (see adapted PRISMA diagram in Supplementary Data, Figure S1, and details of journals in Supplementary Data, Table S3). Only 156 publications were found to be in the remit of the humanities (see Supplementary Data, Table S4). In terms of disciplinary breakdown, linguistics constituted the largest proportion of the included papers at 28.8% (45), followed by theology 28.2% (44), archaeology 19.9% (31), history 9% (14), anthropology 4.5% (7), journalism 3.2% (5), philosophy 2.6% (4), gender studies 1.3% (2), and finally archive studies, law, literary studies, as well as classics each at 0.6% (1) (see Supplementary Data, Figure S2). Out of the four largest disciplines, archaeology (30 of 30) and history (13 of 14) were disproportionately found in the bibliographic databases, while linguistics (43 of 45) and theology (38 of 44) were disproportionately found in the PNG-based journals. This distribution may, in part, be due to the high productivity of two archaeological researchers in PNG submitting to international journals and the operational interests in linguistics of missionary and other religious organisations.

In terms of authorship, 109 (84%) of the 156 publications had single PNG-affiliated authorship, and 21 (13.5%) were jointly authored with a PNG-affiliated author in either first or last position. Of these 130 publications, a majority, 88 (68%) were published in PNG-based journals, while 42 (32%) were found in online bibliographic databases. All 26 publications jointly authored with a PNG-affiliated author in a middle position were extracted from online databases.

Over a decade, 156 humanities publications is a relatively modest national output, even given the number of PNG HEIs and associated educational establishments. This output stands in contrast to the abundance of published humanities works (particularly in linguistics and those parts of anthropology under the AHRC remit) that are about PNG but without PNG-affiliated authors. We are aware of only one anthropology doctorate awarded by a PNG HEI to a PNG national in the last four years, although many international doctoral students travel to PNG to collect data. Such disparities between PNG and non-PNG authors can also be seen in much of the nonmedical biological sciences (Novotny and Toko 2021). It seems that value in the international academy (grant funding, careers, institutional reputations) continues to be generated from the representation of New Guinea, but very little of this value flows back into PNG institutions or peoples, a term West has described as "accumulation by dispossession" (West 2016: 24).

Of the publications identified, eight were found to include content about threats to, or methods to conserve, either biodiversity or customary land rights in PNG (Table S2). Of these, only Mandui and Leavesley's article (2013-2015) discussing the climate change and development challenges to archaeology includes content on both aspects. The first concerned the threat of climate change-induced sea rises customary land tenure, driving concomitant losses in traditional knowledge; while the second concerned the importance of PNG's archaeological record to potentially settle the megafauna extinction debate. Of the five publications which only included content related to biodiversity, two touch upon traditional clan beliefs and practices as a way of supporting biodiversity conservation. This includes Kwara (2014), who discusses a variety of potentially protective practices and

beliefs in PNG while exploring environmental stewardship as a fundamental Christian obligation. Practices and beliefs mentioned by Kwara include fasting during mourning rituals, abstaining from eating certain animals or plants because they are either totemic or taboo, and ideas about the custodial responsibilities that humans and living creatures have to each other and their environment. Inamara and Thomas (2017) investigate what traditional practices may aid community adaptation to the negative impacts of climate change using participant photography on Andra Island, PNG. Out of the identified practices, two were recognised to have a potentially positive environmental impact, including the sustainable use of traditional nets and the creation of new habitats for other marine species using traditional fish traps.

The remaining environmentally relevant publications touch upon conservation-based topics in a variety of ways. In some cases, this was the major focus of an article like Nugi and Whitmore (2020) who find that demand for feathers for traditional PNG headdress-making is a major threat to wild Pesquet's Parrot populations in PNG. In other cases, environmental themes played a minor role. For instance, in a historical account of two early-twentieth century PNG butterfly specimens held in UK museum collections, Tennent and Mitchell (2017) briefly comment on environmental changes to one of the two original specimen collection sites. Noting the area's substantial loss of vegetation compared to that reported by the collector Albert Stewart Meek in his 1913 diaries, Tennent and Mitchell (2017) hypothesise that such changes may be the result of anthropogenic-driven burnings. In addition, Keig et al. (2019) give a broad historical overview of collaborative Australian-PNG work during the mid- to late-twentieth century, which sought to conduct a land assessment to address issues relating to food security. As Keig et al. (2019) highlight, this work would later be used to assist the National Forest Service and PNG's Department of Environment and Conservation to monitor forest change and ensure long-term rainforest ecosystem sustainability.

Only two publications include content that related only to customary land rights (Gibbs 2016; Gesch 2020). For instance, in a general exploration of Enga masculinity, Gibbs (2016) indicates that rapid social changes (e.g., the banning of warfare, eradication of menstrual taboos, diversification of Christian denominations, promotion of family living arrangements and education) can drive land privatisation by eroding communal clan life through transformations to male identity. Beyond this, customary land rights is also a topic of central focus of Gesch's publication (2020) concerning the nature of sacred sites in PNG. As part of this, Gesch reports that customary land tenure was historically defended by successive colonial governors in PNG and threatened by the introduction of PNG Special Agricultural Business Leases (otherwise known as the lease-back scheme). Following this, Gesch argues that further support for customary land rights can be borrowed from Aboriginal efforts in Australia to secure sovereignty over traditional land by appealing to the right to religious practice. This holds that customary land rights must be preserved on

the basis that 1) "the most important aspects of religion are [in PNG] derived from sacred sites and sacred stories that belong to them" (Gesch 2020: 44); and 2) that PNG's constitution holds that every individual has the right to manifest their religion.

These findings suggest that the conservation humanities have been a modest area of critical interest for PNG-based scholars, over the last ten years. We suggest that further expanding this engagement could have useful on-the-ground impacts for the conservation of biodiversity and customary land rights, and given that it is seen as an important topic of scholarship internationally, it could also serve the purpose of strengthening the humanities in PNG. Exemplary international work in this area include Paige West's (2006) *Conservation is Our Government Now*, which investigates the history and social effects of conservation efforts during the 1990s at PNG's Crater Mountain; Andrew L. Mack's (2014) *Searching for Pekpek* which argues that, at least up until the 2000s, conservation organisations were not adequately investing in capacity building of the local communities they were operating in; Alex Golub's (2014) *Leviathans at the Gold Mine*, which discusses how the ceding of land tenure to an environmentally destructive international gold mine generated the breakdown of PNG's Ipili community's social structures; and, Victoria Stead's (2016) *Becoming Landowners*, which explores customary land ownership in PNG with a focus on the losses and gains in local autonomy as a result of changing structures of power.

Humanities Teaching Landscape

We found that compared to PNG's population of eight million, a low number of students were selected for recruitment to humanities-based bachelor programmes in PNG, with even fewer going on to study honours and postgraduate courses in the country. In terms of bachelor programmes, we identified 29 humanities programmes across 10 educational institutions that were either being offered or had actively selected students for 2021 recruitment. This included 19 programmes in a range of humanities disciplines across four HEIs as part of DHERST's list (Table 2), as well as 10 programmes in theology and related religious subjects across five church-based non-university institutions as part of expert knowledge and website review (see Supplementary Data, Table S5). Of the four HEIs, featured on DHERST's list, 516 students were selected for 2021 recruitment. This was comprised of 303 school-leavers (identified through DHERST's list) and 213 non-school-leavers (identified through data independently reported by the HEIs) (Table 2). Out of the 516 prospective bachelor students, only six were recruited to the higher award of bachelor's with honours, all at the University of Goroka (Table 2).

These low numbers may be partly due to and exacerbated by the challenges PNG faces in providing quality education at earlier levels (Pham et al. 2020). Concerning postgraduate education, three institutions were found to offer a total of four humanities programmes. Out of those institutions that offered masters-level programmes, Pacific Adventist University and

Table 2
The number of students selected for admission to bachelor programmes in the arts and humanities at PNG Higher Education Institution (HEI) for the 2021 intake

Institution	Courses	# of School Leavers from the Course	# of Non-School-Leavers in the Course	Total Students in the Course
UPNG	BA Law	60	128	188
	BA Journalism and Public Relations	22	5	27
	BA Linguistics and Modern Languages	21	10	31
	BA English Communication	17	0	17
	BA Literature	16	0	16
	BA Philosophy	10	3	13
	BA Gender Studies	10	0	10
	BA History	0	2	2
	BA English Communication and Literature	0	2	2
Institution Total	156	150	306	
Divine Word University	BA Social Work and Religious Studies	45	6	51
	BA Communication Arts (Journalism)	25	5	30
	BA PNG Studies and International Relations	25	5	30
	Institution Total	95	16	111
Pacific Adventist University	BA Ministry and Theology	15	21	36
	BA Geography and History	7	3	10
	BA English and Geography	6	4	10
	BA English and History	6	2	8
	Institution Total	34	30	64
University of Goroka	BA English	18	11	29
	BA (Hons.) Melanesian Perspectives	0	4	4
	BA (Hons.) Language and Literature	0	2	2
	Institution Total	18	17	35
	Overall Total	303	213	516

Note: Compiled from PNG's Department of Higher Education, Research, Science and Technology (DHERST) Grade 12 school leavers selection list for 2021 HEI Admission and cross-referenced with non-school selection lists published by included HEIs.

the Christian Leadership Training College offered an MTh in theology, while Pacific Adventist University offered a multidisciplinary MPhil (reporting four students for 2021). Only Divine Word University explicitly advertised a PhD programme in a humanities discipline in entire PNG.

For a country with a complex pre-colonial through postcolonial history, it is notable that only 20 students were reportedly selected for 2021 recruitment to a history bachelor's programme, 18 of which were joint majors with another subject (although it is possible that some bachelor's may contain a minor historical component like the BA in PNG Studies and International Relations offered by Divine Word University). Beyond this, it is worth noting the great extent to which Christianity frames and organises modern PNG, with two of the four HEIs providing humanities bachelor programmes allied to specific Christian denominations. As we speculate, these two universities, combined with the church-based non-university institutions offering bachelor's, teach the majority of humanities students in PNG (Supplementary Data, table S5).

UPNG has a range of yearly courses and modules featuring content related to biodiversity conservation and customary land rights. This includes BA Philosophy (modules: Contemporary Moral Issues; Civics and Ethics; Business Ethics and Development; Melanesian Philosophy), BA Gender Studies (modules: Introduction to Gender Studies; Gender issues in PNG), BA History (modules: Oral History; PNG in the World

Economy; Reading Course in PNG Economic Development; Oral Traditions Fieldwork), BA Linguistics and Modern Languages (modules: Language, Power and Development; Literacy in PNG; Readings in Development Linguistics; Language, Culture and History; Study and Description of PNG Language; Linguistic Field Methods), BA Journalism and Public Relations (modules: Media Law and Ethics), BA Literature (modules: Oral Literature and Traditions; Literature and Politics; Literature, Nation and Culture; Cultural Studies; Advanced Folklore: Ethnobotany; Specialist Writing: Cultural Studies), and BA English Communication (module: Intercultural Communication). The Catholic Theological Institute periodically runs a module 'Environmental Ethics'.

Although collated from only two institutions, the inclusion of these topics across a range of courses suggests that the humanities are already raising critical awareness of the value of biodiversity conservation and customary land tenure through education in PNG. However, at least some of this teaching material around land rights might run counter to the interests of conservation and/or customary land rights. This is because such teaching may focus only on creating 'just' relationships between extractive industries and local people to the detriment of biodiversity conservation. Other course content may risk erosion of customary land ownership through advocacy for the official registration of clans or land titles in the process of leasing or selling land to resource extractors.

Capacity Building Needs

During the workshops, senior PNG-based contributors emphasised that the professional development of in-country researchers is essential to capacity building of the conservation humanities in PNG. Our discussions revealed at least two key barriers to PNG academic development. The first concerned the typical PNG academic career journey that was understood as differing from other countries. This is because PNG nationals are more likely to be hired as HEI faculty after undergraduate study and complete postgraduate study at a much later career stage. This latter point, combined with the fact that high-achieving students often ended up travelling abroad for postgraduate study, was understood by senior contributors to our discussions as being particularly problematic:

People should graduate with PhD degrees when they are in their 30s, not when they are in their 50s, and that's what often happens in Papua New Guinea...you graduate [from your bachelor's and get a] job. You [then] go overseas for a Master's. You return [and] have a family. You go overseas for PhD. You return, and then you retire. [Contributor 1]

Negative impacts associated with these circumstances raised by PNG-based contributors included slow attainment of core research skills, shorter active research durations, and lack of growth in HEI postgraduate provision, that may also generate low confidence in teaching Master's-level courses. As stated in a workshop: "I think I am not in a good position [to supervise] because I might be saying things that is not correct and looking at things that are incorrect" [Contributor 3].

The second barrier we identified during our workshops concerned the status of the HEI research environment in PNG. As PNG-based contributors highlighted, although HEI faculty are usually expected to do some research as part of their contracts, research success was limited by institutional research cultures that have weakened over recent decades. These ideas about the decline of research culture were strongly linked to overall PNG publication output, which was reinforced by the lack of positive research role models:

[Concerning] publication by Papua New Guineans...one [problem] is the lack of local role models [Contributor 1]

I think it is...being in a university where people are not publishing regularly [Contributor 2]

To this end, it was suggested that researchers from beyond PNG could play a more supportive role in building professional development capacity. This should include aiding PNG researchers to publish internationally as lead authors and providing supervisory support for in-country PhD and MRes programmes. There is a need for collaborative research programmes that aim to build PNG capacity to conduct and supervise independent humanities research. This has already been substantially achieved in conservation biology in PNG through long-standing collaborations between the New Guinea Binatang Research Centre, overseas partners and multiple PNG HEIs (Novotny and Toko 2015, 2021), as well as the PNG Institute of Biological Research. The latter organised the training abroad of some of the first Papua New

Guinean PhD conservation zoologists alongside running in-country field courses for PNG undergraduates and mentoring honours projects (Mack et al. 2011). The success of that work encourages us to believe that a similar achievement can be obtained in the PNG humanities.

Future Directions

This landscaping exercise identified a small but notable interest in biodiversity conservation and customary land rights in PNG across humanities teaching and research. As our findings suggest, basic capacity-building around professional development and the HEI research environment will be key to nurturing this interest in the mid-term. However, since this is unlikely to yield conservation benefits on its own, such activities must be part of a broader approach explicitly directed at building skill and knowledge among conservationists and conservation initiatives. This not only requires supporting the production of humanities research that has the capacity to yield tangible benefits to biodiversity but also incentivising scholars to convert research into real-world impact through engagement with conservation stakeholders.

To accompany this, additional integration of conservation humanities topics into the undergraduate curricula for future conservation practitioners and humanities students across PNG HEIs may provide further support for biodiversity protection in the long term, along with the introduction of a postgraduate programme in the broader environmental humanities at UPNG. Potential positive outcomes for conservation may either be a result of increased research capacity through targeted training of future PNG humanities scholars or the fostering of pro-conservation attitudes in a key population of PNG. Crucially, such environmental humanities courses are becoming increasingly standard internationally (O'Gorman et al. 2019) and in the US, with several HEIs like Arizona State University, Princeton, and the University of Utah offering qualifications in this area (Rodewald 2022). For PNG HEIs, in some instances, this may involve the introduction of courses with a specialist focus, while others may involve embedding these subjects across a whole programme. Relevant topics include, but are not limited to, ethnobotany and ethnobiology, sustainable development, natural history, environmental ethics, colonial and post-colonial economic history, gender and climate change, and eco-literary criticism. In addition, this exposure in the curricula must adopt a decolonising approach by including indigenous knowledge standpoints as part of this teaching.

Beyond these capacity-building strategies, we also sought to identify a general framework for future collaborative research in PNG, both in terms of our own work and that of other researchers. Given the threats to nature and barriers to career development in PNG, we recognised that there is an important need for future conservation humanities action research (i.e., research that affects social change through a critically engaged process that combines taking action and doing research) that must be led jointly by PNG academics. Working in this way, such collaborative initiatives should

simultaneously focus a decolonial lens (Tuck and Yang 2012) on its attempt to build in-country research capacity and work with local communities to protect biodiversity and the sovereignty of their customary land rights. This should consider the critical transition zones of the forest margins and peri-urban, potentially studying how changes and continuities affect threatened socio-ecological systems and how to support their conservation (see Alcamo et al. 2020 for more on critical transition zones).

In terms of our own work, a number of potential collaborative interlinked conservation humanities projects are planned, all with a cross-cutting theme of gender. These included understanding local conceptions of freedom; social, ideological, and environmental transformations and contestations in the capital Port Moresby and surrounding areas; historical analyses of disease introductions and depopulations in the colonial era and the resultant framing of PNG as ‘wilderness’ alongside the loss of rights to ‘alienated’ land; co-designing soundscape methods to register changing human-environment relations; and skill declines in plant knowledge and self-concepts in plant naming shifts. In the process, we aim to empower existing PNG faculty, co-train a new generation of PNG humanities researchers, bring their voices to international audiences, and attract resources to their institutions.

Strengths and Limitations

Our workshops were held over a relatively brief period that may have limited the emergence of themes that a longer process may have brought to light. Similarly, while 10 out of 17 of us were based at PNG-based institutions, we should not be regarded as being fully representative of all humanities researchers across relevant PNG institutions. Despite these limitations, the online workshop design allowed us to collaborate in a focused manner across international and intranational borders amidst COVID-19 related travel closures. One key limitation of the systematic literature review was that the search could not identify literature published by PNG researchers working or studying abroad when they did not list a PNG affiliation. Nevertheless, this was balanced by the fact that the bibliographic search also sought to identify PNG-published journals that would not have otherwise emerged in a standard systematic review based only on electronic bibliographic databases. We did not review PNG newspapers for humanities articles by PNG-based institution affiliated authors given the number of issues of daily newspapers that would have needed to have been reviewed and the inability to digitally disaggregate search results to only authors with academic affiliations.

CONCLUSION

Some valuable humanities research and teaching by PNG academics have addressed the conservation of biodiversity and customary land rights in PNG. Yet the volume and breadth of this work remains small, particularly when compared to

similar research and teaching by scholars based overseas. We suggest expanding this engagement further could have useful on-the-ground impacts for conservation of biodiversity and customary land rights and help strengthen the humanities in PNG generally. The present situation is at least partially a result of barriers to professional development in PNG concerning the typical career journey and HEI research environment. Responding to these challenges will require a structured approach that not only supports humanities work with the capacity to aid conservation but also incentivises scholars to convert that research into impact by working with conservationists, conservation organisations and indigenous peoples. As part of these efforts, the development of a fully-fledged in-country ‘conservation humanities’ will require collaborative research initiatives involving PNG researchers who are best placed to carry out such work, and researchers from abroad who can access resources to support a scholarly process applying a decolonial lens. This landscaping project has laid a foundation for addressing the problem. By continuing to share knowledge and perspectives, building stronger professional relationships and bringing more collaborators together, we can progress on the next important steps of building PNG’s national conservation humanities academic programmes.

Supplementary Material: rb.gy/mt0kkw

Author Contributions

Author order is alphabetical, with PNG-based authors first, followed by UK authors, except the lead author (who wrote most of the first draft), the second (who contributed to the first draft) and the last (principal investigator). For clarity, we detail contributions using the CRediT Contributor Taxonomy (<https://credit.niso.org/>) and provide disciplinary backgrounds in Table S1 in Supplementary Data. Conceptualisation: JS, JM. Data curation: JS. Formal analysis: JS. Funding acquisition: JS, FD, AE, JF, JM, VN, JW, PY, AJS. Investigation: JS, RA, JAC, GC, FD, AE, JF, WF, AH-N, WH, AK, JM, VN, BR, JW, PY, AJS. Methodology: JS, JM, AJS. Project Administration: JS. Supervision: AJS. Visualization: JS. Writing – original draft: JS, JM. Writing – review & editing: JS, RA, JAC, GC, FD, AE, JF, WF, AH-N, WH, AK, JM, VN, BR, JW, PY, AJS.

Competing Interests

The authors declare no competing interests in the conduct of this research.

Funding

This work was funded by the UK Global Challenges Research Fund, and administered jointly between the International Development Challenge Fund (IDCF) and the Sussex Sustainability Research Programme (SSRP) as part of: Mapping COVID-19 impacts on Papua New Guinea

conservation and building a collaboration between ecology, arts, and the humanities to help preserve forests and indigenous land rights (IDCF3-11). This grant was received by JS, JM, FD, VN, PY, AE, JF, JW, and AJS.

Data Availability

The supplementary file details all 156 stage 1 inclusions of the systematic review. If that data is used, we request citation of this paper. Workshop transcripts are not available due to privacy restrictions.

REFERENCES

- AHRC. 2020a. Arts and Humanities Research Council subject coverage. <https://web.archive.org/web/20201226162512/https://ahrc.ukri.org/documents/guides/ahrc-s-subject-coverage/>. Accessed on December 26, 2020.
- AHRC. 2020b. Arts and Humanities Research Council disciplines. <https://web.archive.org/web/20201225214142/https://ahrc.ukri.org/funding/research/subjectcoverage/ahrc-disciplines/>. Accessed on December 26, 2020.
- AHRC and ESRC. 2020. Interfaces between the arts and humanities and the social sciences: a joint statement by the Arts and Humanities Research Council and the Economic and Social Research Council. <https://web.archive.org/web/20201226151056/https://ahrc.ukri.org/documents/policy/interfaces-between-the-arts-and-humanities-and-the-social-sciences/>. Accessed on December 26, 2020.
- Aini, J., P. West, Y. Amepou, M.L. Piskaut et al. 2023. Reimagining conservation practice: indigenous self-determination and collaboration in Papua New Guinea. *Oryx* 57(3):350-359. doi:10.1017/S003060532200103X
- Alcama, J., J. Thompson, A. Alexander et al. 2020. Analysing interactions among the sustainable development goals: findings and emerging issues from local and global studies. *Sustainability Science* 15(6):1561-1572. doi: 10.1007/s11625-020-00875-x.
- Allen, G.R. 2008. Conservation hotspots of biodiversity and endemism for Indo-Pacific coral reef fishes. *Aquatic Conservation: Marine and Freshwater Ecosystems* 18(5):541-556. doi: 10.1002/aqc.880.
- Asafu-Adjaye, J. 2000. Customary marine tenure systems and sustainable fisheries management in Papua New Guinea. *International Journal of Social Economics* 27(7/8/9/10):917-927. doi: 10.1108/03068290010336856.
- AusAID. 2008. *Making land work—volume one: reconciling customary land and development in the Pacific*. Canberra, AU: AusAID.
- Basset, Y., V. Novotny, S.E. Miller, et al. 2004. Conservation and biological monitoring of tropical forests: the role of parataxonomists. *Journal of Applied Ecology* 41(1):163-174. doi: 10.1111/j.1365-2664.2004.00878.x.
- Bennett, N.J. and R. Roth. 2018. Realizing the transformative potential of conservation through the social sciences, arts and humanities. *Biological Conservation* 229: A6-A8. doi: 10.1016/j.biocon.2018.07.023.
- Cámara-Leret, R., D.G. Frodin, F. Adema, et al. 2020. New Guinea has the world's richest island flora. *Nature* 584(7822):579-583. doi: 10.1038/s41586-020-2549-5.
- Carrier, J.G. 1987. Marine tenure and conservation in Papua New Guinea: problems in interpretation. In: *The question of the commons: the culture and ecology of communal resources* (eds. McCay, B.J. and J.M. Acheson). Pp. 142-167. Tucson, AZ: University of Arizona Press.
- Colyvan, M., S. Linquist, W. Grey, et al. 2009. Philosophical issues in ecology: recent trends and future directions. *Ecology and Society* 14(2): [online].
- Connolly, B. 1988. *First contact: New Guinea's highlanders encounter the outside world*. Ringwood, NJ: Penguin.
- Copete, J.C., A. Kik, V. Novotny et al. 2023. The importance of indigenous and local people for cataloging biodiversity. *Trends in Ecology and Evolution* 38(12):1112-1114. doi:10.1016/j.tree.2023.08.017.
- Dawson, A., and F. Longo. (eds.) and Survival International. 2023. *Decolonize conservation: global voices for indigenous self-determination, land, and a world in common*. Brooklyn, NY: Common Notions.
- Denoon, D. 1989. *Public health in Papua New Guinea: medical possibility and social constraint, 1884–1984*. Cambridge, UK: Cambridge University Press.
- Drew, J.A., K.L. Amatangelo, and R.A. Hufbauer. 2015. Quantifying the human impacts on Papua New Guinea reef fish communities across space and time. *PLOS ONE* 10(10):e0140682. doi: 10.1371/journal.pone.0140682.
- Fairhead, J. 2015. *The Captain and "the Cannibal": an epic story of exploration, kidnapping, and the Broadway stage*. New Haven, CT: Yale University Press.
- Filer, C. 2011. The political construction of a land grab in Papua New Guinea. Last Modified 6-8 April 2011. <https://web.archive.org/web/20230323173902/https://www.future-agricultures.org/wp-content/uploads/pdf-archive/Colin%20Filer%20Revised.pdf>. Accessed on March 23, 2023.
- Filer, C., 2004. How can Western conservationists talk to Melanesian landowners about indigenous knowledge? Resource Management in Asia-Pacific Working Paper No 27. Canberra, AU: Australian National University.
- Gesch, P. 2020. Migrations and visitations: sacred sites and sacred stories in East Sepik Province, PNG. *Contemporary PNG Studies* 33(Nov):30-46.
- Gibbs, P. 2016. I could be the last man: changing masculinities in Enga society. *The Asia Pacific Journal of Anthropology* 17(3-4):324-341. doi: 10.1080/14442213.2016.1179783.
- Goralnik, L., M.P. Nelson, H. Gosnell et al. 2017. Arts and humanities inquiry in the long-term ecological research network: empathy, relationships, and interdisciplinary collaborations. *Journal of Environmental Studies and Sciences* 7: 361-373. doi: 10.1007/s13412-016-0415-4.
- Golub, A. 2014. *Leviathans at the gold mine: creating indigenous and corporate actors in Papua New Guinea*. Durham, NC: Duke University Press.
- Holmes, G., J. Carruthers-Jones, G. Huggan, et al. 2022. Mainstreaming the humanities in conservation. *Conservation Biology* 36(3):e13824. doi: 10.1111/cobi.13824.
- Huggan, G. and H. Tiffin. 2015. *Postcolonial ecocriticism: literature, animals, environment*. Abingdon, UK: Routledge.
- Inamara, A., and V. Thomas. 2017. Pacific climate change adaptation: the use of participatory media to promote indigenous knowledge. *Pacific Journalism Review: Te Koako* 23(1):113-132. doi: 10.24135/pjr.v23i1.210.
- Kalinoe, L. 2005. Protection and preservation of expressions of indigenous culture—a perspective from Papua New Guinea. *Indilinga: African Journal of Indigenous Knowledge Systems* 4(2): 401-413.
- Keig, G., R.L. Hide, S.M. Cuddy et al. 2019. CSIRO and land research in Papua New Guinea 1950–2000: part 2: post-Independence. *Historical Records of Australian Science* 30(2):100-111. doi: 10.1071/HR18025.
- Kik, A., P. Duda, J. Bajzekova et al. 2023. Hunting skills and ethnobiological knowledge among the young, educated Papua New Guineans: implications for conservation. *Global Ecology and Conservation* 43:e02435. doi:10.1016/j.gecco.2023.e02435.
- Kik, A., M. Adamec, A.Y. Aikhenvald et al. 2021. Language and ethnobiological skills decline precipitously in Papua New Guinea, the world's most linguistically diverse nation. *Proceedings of the National Academy of Sciences* 118(22):e2100096118. doi: 10.1073/pnas.2100096118.
- Kwara, T. 2014. Towards an ecotheology for PNG—relating biblical environmental stewardship with the melanesian cultural concept of inseparability and interrelatedness of humankind and nature. *Melanesian Journal of Theology* 30(1):75-97.

- Laurance, W.F., T. Kakul, R.J. Keenan et al. 2011. Predatory corporations, failing governance, and the fate of forests in Papua New Guinea. *Conservation Letters* 4(2):95-100. doi: 10.1111/j.1755-263X.2010.00156.x.
- Mack, A.L. 2014. *Searching for Pekpek: Cassowaries and conservation in the New Guinea rainforest*. New Florence, PA: Cassowary Conservation & Publishing LLC.
- Mack, A.L., D. Wright, and P. Osborne. 2011. Papua New Guinea Institute of Biological Research (PNGIBR): national scientists building capacity to meet the nation's ecological research needs. *Bulletin of the Ecological Society of America* 92(4): 392–395.
- Mandui, H. and M. Leavesley. 2013-2015. Some possible futures for archaeology in Papua New Guinea. *South Pacific Journal of Philosophy and Culture* 12:9-15.
- Middleton, J., M.Y. Abdad, E. Beauchamp et al. 2020a. Health service needs and perspectives of remote forest communities in Papua New Guinea: study protocol for combined clinical and rapid anthropological assessments with parallel treatment of urgent cases. *BMJ Open* 10(10):e041784. doi: 10.1136/bmjopen-2020-041784.
- Middleton, J., J.A. Cassell, G. Colthart et al. 2020b. Rationale, experience and ethical considerations underpinning integrated actions to further global goals for health and land biodiversity in Papua New Guinea. *Sustainability Science* 15(6):1653-1664. doi: 10.1007/s11625-020-00805-x.
- Middleton, J., G. Colthart, F. Dem., et al. 2023. Health service needs and perspectives of a rainforest conserving community in Papua New Guinea's Ramu lowlands: a combined clinical and rapid anthropological assessment with parallel treatment of urgent cases. *BMJ Open* 13:e075946. doi: 10.1136/bmjopen-2023-075946.
- Novotny, V. 2010. Rain forest conservation in a tribal world: why forest dwellers prefer loggers to conservationists. *Biotropica* 42(5):546-549. doi: 10.1111/j.1744-7429.2010.00658.x.
- Novotny, V. and P. Drozd. 2000. The size distribution of conspecific populations: the peoples of New Guinea. *Proceedings of the Royal Society of London. Series B: Biological Sciences* 267(1446):947-952. doi: 10.1098/rspb.2000.1095.
- Novotny, V. and K. Molem. 2020. An inventory of plants for the land of the unexpected. *Nature* 584:531-533. doi: 10.1038/d41586-020-02225-4.
- Novotny, V. and P. Toko. 2015. Ecological research in Papua New Guinean rainforests: insects, plants and people. In: *The state of the forests of Papua New Guinea 2014: measuring change over period 2002–2014* (eds. Bryan, J.E. and P.L. Shearman). Pp. 71–85. Port Moresby: University of Papua New Guinea.
- Novotny, V. and P. Toko. 2021. Biological research in Papua New Guinea: a publication activity analysis. bioRxiv: 2021.08.25.457669. doi: 10.1101/2021.08.25.457669.
- Nugi, G. and N. Whitmore. 2020. More dead than alive: harvest for ceremonial headdresses threatens Pesquet's Parrot in Papua New Guinea. *Emu—Austral Ornithology* 120(2):156-161. doi: 10.1080/01584197.2019.1676162.
- O'Gorman, E., T. van Dooren, U. Münster et al. 2019. Teaching the environmental humanities: international perspectives and practices. *Environmental Humanities* 11(2): 427–460. doi: 10.1215/22011919-7754545
- Peck, M. and A. Stewart. 2014. REF 2014 impact case study: the conservation of tropical rainforests in Papua New Guinea and Ecuador. <https://web.archive.org/web/20211025130932/https://impact.ref.ac.uk/casestudies/CaseStudy.aspx?Id=27171>. Accessed on March 23, 2023.
- Pham, N.B., A.D. Okely, M. Whittaker, et al. 2020. Millennium development goals in Papua New Guinea: towards universal education. *Educational Research for Policy and Practice* 19(2):181-209. doi: 10.1007/s10671-019-09255-4.
- Rodewald, L. 2022. Crowded waters: a pedagogical review of recent environmental humanities introductory texts. *The Journal of Environmental Education* 53(4): 221-230. doi: 10.1080/00958964.2022.2098222
- Sanders, D.E. 1999. Indigenous peoples: issues of definition. *International Journal of Cultural Property* 8(1): 4-13. doi: 10.1017/S0940739199770591
- Schram, R. 2014. Only the names have changed: dialectic and differentiation of the indigenous person in Papua New Guinea. *Anthropological Theory* 14(2):133-152. doi: 10.1177/1463499614534100
- Shearman, P., and J. Bryan. 2011. A bioregional analysis of the distribution of rainforest cover, deforestation and degradation in Papua New Guinea. *Austral Ecology* 36(1):9-24. doi: 10.1111/j.1442-9993.2010.02111.x.
- Shearman, P.L., J. Ash, B. Mackey et al. 2009. Forest conversion and degradation in Papua New Guinea 1972–2002. *Biotropica* 41(3):379-390. doi: 10.1111/j.1744-7429.2009.00495.x.
- Stead, V. 2016. *Becoming landowners: entanglements of custom and modernity in Papua New Guinea and Timor-Leste*. Honolulu, HI: University of Hawaii Press.
- Steen-Adams, M.M., N. Langston, M.D.O. Adams et al. 2015. Historical framework to explain long-term coupled human and natural system feedbacks: application to a multiple-ownership forest landscape in the northern Great Lakes region, USA. *Ecology and Society* 20(1): 28. doi: 10.5751/ES-06930-200128.
- Stewart, A., M. Peck, and J. Middleton. 2021. REF 2021 case study: establishing conservation, economic and health initiatives in local communities in Papua New Guinea and Ecuador. <https://web.archive.org/web/20230317135528/https://results2021.ref.ac.uk/impact/9a808f61-2eca-4348-b4f4-58257ffe7cde?page=1>. Accessed on March 23, 2023.
- Tennent, W.J. and D.K. Mitchell. 2017. A brief historical account of an endemic swallowtail butterfly first collected a century ago on Goodenough Island (D'Entrecasteaux group) in Papua New Guinea. *Archives of Natural History* 44(1):159-169. doi: 10.3366/anh.2017.0424.
- The Ecologist. 1993. *Whose common future? reclaiming the commons*. London: Earthscan Publications.
- Tuck, E., and K.W. Yang. 2012. Decolonization is not a metaphor. *Decolonization: Indigeneity, Education & Society* 1(1):1-40.
- Tuladhar-Douglas, W. 2014. REF 2014 case study: the conservation of sacred and protected areas. <https://web.archive.org/web/20231116185703/https://impact.ref.ac.uk/casestudies/CaseStudy.aspx?Id=43374>. Accessed on October 22, 2023.
- West, P. 2006. *Conservation is our government now: the politics of ecology in Papua New Guinea*. Durham, NC: Duke University Press.
- West, P. 2016. *Dispossession and the environment: rhetoric and inequality in Papua New Guinea*. New York, NY: Columbia University Press.