

## Ethno-Ornithology and Conservation

# Decolonizing bird knowledge: More-than-Western bird–human relations

Bastian Thomsen,<sup>1,2,3,#,\*</sup>  Kellen Copeland,<sup>3,#</sup>  Michael Harte,<sup>3,4</sup>  Olav Muurlink,<sup>11</sup>   
Daniel A. Villar,<sup>5,6,7</sup>  Benjamin H. Mirin,<sup>8,9</sup> Samuel R. Fennell,<sup>2</sup> Anant Deshwal,<sup>10</sup>   
Payton Campbell,<sup>10</sup>  Ami Pekrul,<sup>5</sup> Katie L. Murtough,<sup>5</sup> Apoorva Kulkarni,<sup>5</sup> Nishant Kumar,<sup>5,12,13,14</sup>   
Jennifer Thomsen,<sup>2,15</sup>  Sarah Coose,<sup>5,16</sup> Jon Maxwell,<sup>2,15</sup> Zhenhuan Zhang,<sup>5</sup> Dane Nickerson,<sup>2</sup> and  
Andrew Gosler<sup>1,5,17</sup> 

<sup>1</sup>School of Anthropology and Museum Ethnography, University of Oxford, Oxford, UK

<sup>2</sup>Multispecies Livelihoods Lab, Human Dimensions of Natural Resources, Colorado State University, Fort Collins, Colorado, USA

<sup>3</sup>Environmental Sciences Graduate Program, Oregon State University, Corvallis, Oregon, USA

<sup>4</sup>College of Earth, Ocean, and Atmospheric Sciences, Oregon State University, Corvallis, Oregon, USA

<sup>5</sup>Edward Grey Institute of Field Ornithology, Department of Biology, University of Oxford, Oxford, UK

<sup>6</sup>Wildlife Conservation Research Unit, University of Oxford, Oxford, UK

<sup>7</sup>Museo Nacional de Historia Natural, La Paz, Bolivia

<sup>8</sup>Department of Natural Resources and the Environment, Cornell University, Ithaca, New York, USA

<sup>9</sup>Yang Center for Conservation Bioacoustics, Cornell Lab of Ornithology, Cornell University, Ithaca, New York, USA

<sup>10</sup>Department of Biology, Bradley University, Peoria, Illinois, USA

<sup>11</sup>Central Queensland University, Brisbane, Queensland, Australia

<sup>12</sup>Oxford India Centre for Sustainable Development, Somerville College, Oxford, UK

<sup>13</sup>Dr. B R Ambedkar University, Delhi, India

<sup>14</sup>Wildlife Institute of India, Chandrabani, Dehradun, Uttarakhand, India

<sup>15</sup>College of Veterinary Medicine and Biomedical Sciences, Colorado State University, Fort Collins, Colorado, USA

<sup>16</sup>Department of Geography and Tourism Studies, Brock University, St. Catharines, Ontario, Canada

<sup>17</sup>Institute of Human Sciences, University of Oxford, Oxford, UK

#These authors contributed equally to the paper.

\*Corresponding author: [bastian.thomsen@anthro.ox.ac.uk](mailto:bastian.thomsen@anthro.ox.ac.uk)

## ABSTRACT

Traditional ecological knowledge (TEK) or local ecological knowledge (LEK) has only recently gained traction as “legitimate” science in Western academic discourse. Such approaches to inclusivity continue to face institutional, sociocultural, and equity barriers to being fully accepted in academic discourse in comparison to Western-based frameworks. Postcolonial studies have attempted to rectify this Western-dominance in characterizing diverse forms of bird–human relationships. However, the integration of multiple cosmologies (worldviews) and ontologies (realities) in research or management creates challenges that we discuss. We elucidate commonalities and antithetical positions between Western-derived bird knowledge and management with that of TEK or LEK in both local and global contexts. We combine ecological/ornithological studies with key terms, theories, and methods from the social sciences to integrate the approaches and facilitate understanding. For example, we follow a “theory synthesis” approach in this conceptual paper to question epistemological and ontological assumptions of bird knowledge and how we acquire it to question, “how do we move from a decolonial approach (discussions and acknowledgement) to decolonization (action)?” This paper is a product of ongoing discourse among global researchers of an academic ethno-ornithology research lab based in the United Kingdom, who partner with global collaborators. The 3 case studies draw from ongoing research in Southeast Asia, South America, and decolonizing policy efforts in New Zealand. We analyzed these case studies using a postcolonial theoretical lens to provide insights into how Western scientists can embrace TEK and LEK and actively work to decolonize ethno-ornithology and ornithology in theory and practice. Further, we discuss perceived core tenets to equity and inclusion in community-based TEK and LEK conservation projects from the Global South. Diversity, equity, inclusivity, and justice in bird–human relations and knowledge were identified as targets for systemic change within the academic institutions of Western scientists. By recognizing, discussing, and embracing non-Western cosmologies and ontologies, non-Indigenous scientists can help influence the decolonization of ethno-ornithology, ornithology, and bird–human relations through respectful, participatory, equitable, culturally considerate, and “non-extractive” community-based initiatives in partnership with local groups.

**Keywords:** ethno-ornithology, local ecological knowledge, postcolonial studies, traditional ecological knowledge, wildlife-human relations

## How to Cite

© The Author(s) 2023. Published by Oxford University Press for the American Ornithological Society.

This is an Open Access article distributed under the terms of the Creative Commons Attribution License (<https://creativecommons.org/licenses/by/4.0/>), which permits unrestricted reuse, distribution, and reproduction in any medium, provided the original work is properly cited.

Thomsen, B., K. Copeland, M. Harte, O. Muurlink, D. A. Villar, B. H. Mirin, S. R. Fennell, A. Deshwal, P. Campbell, A. Pekrul, K. L. Murtough, A. Kulkarni, N. Kumar, J. Thomsen, S. Coose, J. Maxwell, Z. Zhang, D. Nickerson, and A. Gosler (2023). Decolonizing bird knowledge: More-than-Western bird–human relations. *Ornithological Applications* 126:duad053.

## LAY SUMMARY

- Bird–human discourse and knowledge acquisition are often dominated by Western science and culture.
- By embracing a “more-than-Western” approach to the science of birds that includes local and traditional ecological knowledge, equity, diversity, inclusion, and justice can emerge between different human groups.
- Three case studies provide insights about the application of a non-Western approach by multiple rights and title holders to consider how they could apply a more-than-Western approach to decolonize ethno-ornithology.

## Abrazando el conocimiento “más allá de lo occidental” de las aves: Un proceso descolonial para pasar de la discusión a la acción

### RESUMEN

El conocimiento ecológico tradicional (CET) o el conocimiento ecológico local (CEL) solo han ganado recientemente reconocimiento como ciencia “legítima” en el discurso académico occidental. Tales enfoques hacia la inclusión continúan enfrentando barreras institucionales, socioculturales y de equidad para ser plenamente aceptados en el discurso académico en comparación con los marcos basados en lo occidental. Los estudios poscoloniales han intentado rectificar esta dominación occidental al caracterizar diversas formas de relaciones entre aves y humanos. Sin embargo, la integración de múltiples cosmologías (visiones del mundo) y ontologías (realidades) en la investigación o la gestión crea desafíos que discutimos en este trabajo. Esclarecemos similitudes y posiciones antitéticas entre el conocimiento occidental de las aves y su gestión con respecto al CET o al CEL en contextos locales y globales. Combinamos estudios ecológicos/ornitológicos con términos clave, teorías y métodos de las ciencias sociales para integrar los enfoques y facilitar la comprensión. Por ejemplo, seguimos un enfoque de “síntesis de teoría” en este artículo conceptual para cuestionar las suposiciones epistemológicas y ontológicas del conocimiento de las aves y cómo lo adquirimos, para cuestionar “¿cómo pasamos de un enfoque descolonial (discusiones y reconocimiento) a la descolonización (acción)?” Este artículo es el producto de un discurso en curso entre investigadores globales de un laboratorio de investigación en etno-ornitología académica con sede en el Reino Unido, que trabaja con colaboradores globales. Los tres estudios de caso se basan en investigaciones en curso en el sudeste asiático, América del Sur y esfuerzos de políticas descolonizadoras en Nueva Zelanda. Analizamos estos estudios de caso utilizando una lente teórica poscolonial para proporcionar ideas sobre cómo los científicos occidentales pueden abrazar el CET y el CEL y trabajar activamente en la descolonización de la etno-ornitología y la ornitología teórica y práctica. Además, discutimos los principios fundamentales percibidos de equidad e inclusión en proyectos de conservación basados en la comunidad que consideran el CET y el CEL provenientes del Sur Global. La diversidad, la equidad, la inclusión y la justicia en las relaciones y el conocimiento entre aves y humanos fueron identificados como objetivos para el cambio sistémico dentro de las instituciones académicas de los científicos occidentales. Al reconocer, discutir y abrazar cosmologías y ontologías no occidentales, los científicos no indígenas pueden ayudar a influir en la descolonización de la etno-ornitología, la ornitología y las relaciones entre aves y humanos a través de iniciativas basadas en la comunidad que sean respetuosas, participativas, equitativas, con consideración cultural y “no extractivas,” en colaboración con grupos locales.

**Palabras clave:** conocimiento ecológico local, conocimiento ecológico tradicional, estudios poscoloniales, etno-ornitología, relaciones entre vida silvestre y humanos

### INTRODUCTION

The acquisition of bird knowledge and its relations to human culture are often dominated by Western researchers using mainstream theories and methods (Bonta 2010, Whitney 2021). Only in the last 2 decades have alternative modes of ecological knowledge production gained traction as “legitimate” science in the academic literature, outside of a subset of work in the humanities or social sciences (Dayer et al. 2020, Sidik 2022). Dayer et al. (2020) suggest that “conservation efforts must consider and integrate human values, perceptions, activities and organizational structures to be effective,” encouraging studies that focus on traditional ecological knowledge, also referred to as TEK (Lindell 2020). This is evident from the vast contrast in methodology and epistemology that underpin “bird knowledge,” as highlighted by two examples. Serra et al. (2021) assess sonographic variables and the effectiveness of Samoan pigeon hunters in differentiating “coo calls” between the critically endangered Tooth-billed Pigeon (*Didunculus strigirostris*) or “Manumea,” and the relatively common sympatric species Pacific Imperial Pigeon (*Ducula pacifica*). The authors find that “the coo call for *Didunculus* is lower in pitch and more regularly spaced within a sequence” (p. 280), suggesting that a dialectic process of both

scientific knowledge and TEK, “may enable implementation of urgently needed conservation work (such as local community engagement, forest protection and restoration, invasive predator and hunting control)” (p. 281). Naves et al.’s (2019) approach to bird–human knowledge focuses their study on the Central Yup’ik of the Yukon-Kuskokwim Delta (Alaska, U.S.) to understand the culturally significant practices of subsistence and or emergency harvest of seabirds. They use harvest, ethnography, and ethnotaxonomy to represent relational knowledge and build partnerships with local communities for bird conservation and management. The Serra et al. (2021) and Naves et al. (2019) studies highlight a small, but growing interest in, ethno-ornithological and ornithological studies on “more-than-Western” approaches to knowledge acquisition and its entangled disposition. Multiple institutions (e.g., natural history museums, universities, governments, nonprofits, and corporations) uphold and reinforce “bird knowledge” using concepts from conservation biology and birds’ value to human beings, though others are trying to be more inclusive. Here, we too want to be inclusive and recognize that many social science-based terms may be new or uncommon to the readers of this journal. To better understand our arguments, we developed Table 1 to define some key terms.

**TABLE 1.** Lexicon of social science-based terms.

| Term                  | Definition  |
|-----------------------|---|
| Assemblage            | Something made through the drawing together of disparate or inconsistent parts  |
| Consilience           | Joining principles from different fields of thought to form a single comprehensive theory                                     |
| Cosmology             | The science of the origin and development of the universe, or large-scale properties thereof                                  |
| Decolonial/decolonize | An attempt to undo the impacts of colonization  |
| Dialectical           | Where 2 or more differing points of view interact, establishing truth through reasoned argument                               |
| Epistemology          | The theory of knowledge, informing our understanding of how and where knowledge is gathered                                   |
| Ethno-ornithology     | Knowledge that embraces ornithology while taking in social dimensions, often interlinked with ethics and conservation         |
| Ethno-taxonomy        | Subdiscipline of ethnology related to the naming system for plants and animals used by a particular ethnic group              |
| Hegelian dialectic    | An interpretative method in which truth is sought through contradiction between a proposition and its antithesis              |
| Hegemony              | Dominance of one state or group by others   |
| Incommensurability    | The fundamental differences that emerge between viewpoints that cannot be reconciled  |
| Ontology              | Relating to the nature of being, existence, questioning how we can be certain about what we know                              |
| Postcolonial          | Pertaining to the critical academic study of the legacy of colonialism, focusing on the lingering impact of colonial practice |
| Paraconsistent logic  | Seeking to reason and reconcile between inconsistent ideas without lapsing into absurdity                                     |

While postcolonial projects have actualized some integration with Indigenous communities, most programs are largely not decolonial; they act as decolonial metaphors (*Migrations in Prehistory: Inferring Population*). In their detailed work on settler invasions, current occupation, subjugation of forced labor, settler slavery, and cautionary moves to settler innocence, the authors state, “we want to say, first, that decolonization is not obliged to answer [settler] questions [of imagining decolonization]—decolonization is not accountable to settlers, or settler futurity. Decolonization is accountable to Indigenous sovereignty and futurity” (p. 35). To some, ethno-ornithology can be, but is not always, exclusive and exploitative in its acquisition of bird knowledge—explicitly and implicitly. There is value in thinking with a decolonial approach to bird knowledge and its complex relationships with science, conservation, and the rights of birds themselves. We recognize that this work and its ensuing complexities are unresolved, but will explain our positionality and current thinking. We aim to inspire ethno-ornithologists to confront the often “invisible” tensions that exist in the acquisition and production of bird–human knowledge in conservation management. To facilitate an understanding of current discourse on more-than-Western knowledge, we engage contemporary literature on TEK and local ecological knowledge (LEK). Though the terms TEK and LEK are evolving due to concerns about what is meant by “traditional,” we use it here for its familiarity to the existing literature and only signify its most respectful meanings toward Indigenous cultures. We then provide an overview of our dialectic exercise on engaging a decolonial approach. Dialectics is a philosophical method to engage with opposing sides on a given issue (Maybee 2016). We present 3 case studies that show our effort to “do the work” of actually attempting to decolonize ethno-ornithology. The first case study is written by a Western U.S.-based researcher working with Indigenous and local research partners in Indonesia; the second is from the perspective of a Hispanic biologist from Colombia, working with Indigenous and Mestizo communities in Peru and Bolivia; and the third is from a Pākehā (of European descent) New Zealander, now living and working as an aca-

dem in the United States. He previously worked within the New Zealand government and seafood industry in partnership with Māori to develop and implement biodiversity policy and conservation management actions.

It is important to state who we are as a group and share our positionality. This paper is inspired by ongoing dialogue (e.g., expanding the Hegelian dialectic process; see below) in a university-affiliated ethno-ornithology lab based in the U.K. More than half of the members are from the Global South (i.e., Colombia, Nigeria, India, and China). The rest are of Euro-American descent from North America or Europe, and lab members regularly collaborate with non-Western, often Indigenous, research partners in the Global South. Two additional authors on this paper are Hispanic, one is Venezuelan, and the other is Mexican-American. This multicultural engagement has forced all of us to grapple with our individual and collective positionalities on how we acquire bird–human knowledge, and who we empower or harm in that process. This constant dialectical exercise helped each of us, but especially those from Western countries and institutions, to recognize our privilege and power to question: How do we move from a decolonial approach (discussions and acknowledgment) to decolonization (action)? The objectives of this paper are to (1) question epistemological and ontological assumptions of bird knowledge and how we acquire it; (2) spark dialectic discourse about decolonizing Western science and specifically in the fields of ethno-ornithology; (3) use insights from the case studies to provide recommendations on how Western scientists can embrace TEK and LEK, to actively work to decolonize ethno-ornithology in theory and practice; and (4) inspire ethno-ornithologists—academics and practitioners—to move beyond tokenistic representation to think (decolonial approach) and work to decolonize the field. We do not intend to imply that we know all the answers, or any for that matter. Rather, our positionality is simple: we must collectively do better if we are to embrace a more-than-Western approach in theory and practice. This paper reflects this dialectic exercise, and our current thinking at this moment in time—our ambition is to inspire discourse so that we may continue to improve.

## Understanding TEK and LEK for Bird Conservation and Management

TEK and LEK may be based on a shared history of coexistence (Bonta 2010, Wyllie de Echeverria and Thornton 2019), observational adaptations (Aswani et al. 2018), bird behavior (Granderson 2017), and their cultural relevance to humans (Hosen et al. 2020). Local ecological knowledge may include TEK but also considers knowledge by local residents to a specific site or region, inhabited by *contemporary* human occupants (Camino et al. 2020, Gosler and Tilling 2021, Deshwal et al. 2022). LEK is the live, first-hand experience of nature held by people who are willing to share their understanding or knowledge about it (Becker and Ghimire 2003). Each particular individual can grant prior informed consent to use their insight for research, so there is little ethical concern beyond standard ethical committee approval in publishing responses in whatever form was agreed upon between the researcher and interlocutor (e.g., quoted anonymously or otherwise). However, LEK is sometimes dismissed in the academic literature as “anecdotal” or “anecdotal evidence,” implying it is untrustworthy if not replicated many times (see Bevilacqua et al. 2016). This was particularly salient in the ecological sciences until the past 10–15 years, as ecologists began to accept LEK as credible even though questions of how to validate its claims remain a point of debate within the discipline (see Davis and Ruddle 2010, Bélisle et al. 2018). Nevertheless, this form of knowledge is dynamic and evolving as a result of changing ecological, sociocultural, and economic circumstances (Joshi and Singh 2010).

Traditional ecological knowledge may start out as LEK but is so consequential that it engenders cultural significance. Traditional ecological knowledge consists of Indigenous peoples’ knowledge of the various flora, fauna, or natural bodies (e.g., rivers or lakes) that participate in a particular ecosystem or traditional relationships (Whyte 2017, Chisholm Hatfield et al. 2018). Knowledge is passed down through generations, is not the intellectual property of any particular individual, and therefore may require a deeper level of permission even to acquire such knowledge (e.g., sharing shamanic knowledge), let alone publish it. This dissemination of knowledge may come from oral narratives or observations and are often tools for relating to local ecosystems that are contextualized in cultural traditions, languages, beliefs, identities, and cosmologies (White et al. 2018, Suwardi et al. 2020). To embrace traditional ecological knowledge in research, it is necessary to seek permission in asking, sharing, gaining, or documenting its knowledge, and it may be appropriately concealed (*Migrations in Prehistory: Inferring Population*) (Rubis and Theriat, 2020).

We focus on these 2 bases of knowledge—LEK and TEK—to show that community knowledge of birds is fundamentally different in context, and without engaging with this variation, we risk incommensurability (Table 1) that displaces decolonization in favor of settler innocence (Tuck and Wayne Yang 2021). The loss of such knowledge, associated with globalization and the extinction of local languages, has increased the necessity to prioritize biocultural diversity while being attentive to its accumulation (Park et al. 2020). Indigenous scholars have cautioned against “weaving” LEK and TEK into Western science as this *could* replicate epistemological violence that has marginalized Indigenous’ knowledge for centuries

(Kovach 2021). This does not mean that TEK and Western science are incompatible. Rather, it is a warning to embrace TEK without appropriating it; but how do Western scientists do this in practice? Decolonial scholarship is evolving with (eco)feminism(s) to “decentralize Eurocentric or universalizing knowledge claims” and focus more on mixed (human and nonhuman) communities under oppression (Sultana 2021, p. 161). The structural marginalization(s) of colonization based on the conception of “nature” and “class” continue to dispossess local and Indigenous peoples that should be further traced and prioritized in practice (Sharma 2017). However, integration of multiple ontologies in conservation frequently acts in isolation from more dominant beliefs, customs, and practices (Thomsen 2022). The following section describes how our group embraced multiple ontologies (realities) and cosmologies (worldviews) in a dialectic process to better understand how to respectfully engage TEK and LEK in theory and practice.

## Reconciling Inconsistent Ideas

Verran (2002) unpacks divergence among environmental scientists in Australia’s Northern Territory by assessing differences and commonalities between Western prescribed burning and Aboriginal *worrk* (Yolngu Aboriginal land management firing). Verran argues that the sciences of ordering complexity (e.g., ecology, systematics/taxonomy) may benefit from an authentic engagement with new forms of ontological ritual. The logics often assumed by TEK (paraconsistent; see Table 1) and conservation biology (classical) present antithetical schools of thought. Increased receptivity to opposing ideas, and the recognition that opposing perspectives have a logical basis, may help to improve perceptions through a Hegelian dialectic process. However, what are the assumptions underlying different logics? Sinclair (2020) takes up this question to reveal the limitations of classical logic. Put simply, *classical* logic assumes that both true and false knowledge claims cannot exist simultaneously whereas *paraconsistent* logic rests with truth claims that can be contradictory and paradoxical. Classical logic is limited both in its organization and structure (i.e., rationality); it is problematic for its dominion over truth claims, emphasis on dualisms, hierarchies, and deeply entrenched exclusions. Classical logic legitimizes subjugation and violence (Norton-Smith 2010), assumes unitary authority over language and ideas (Plumwood 2002), asserts conformity to platonic knowledge (Waters 2004), creates strict division to mind and body (Eichler 2019), and refuses to admit or reconcile contradictions that exist in the world (Nye 2019). Sinclair (2020) suggests:

Native scholars continue to foreground the ways their paraconsistent logical systems offer much needed resources, both for resisting the logics of domination and elimination, and for making important truth claims about the sometimes contradictory and paradoxical nature of reality (p. 59).

The Hegelian dialectic suggests that, upon the proposition of an ideology (i.e., thesis), an opposite ideology (i.e., antithesis) arises, and the best parts of the thesis and antithesis are combined into a synthesis (Väyrynen 2019). The synthesis serves as the thesis for a further cycle of dialectic, which results in a repetitive dialectic process. Hegel proposed that this dialectic is the means by which knowledge grows. Recognizing paraconsistent logic in bird conservation and management as a basis of reason fundamentally disrupts universal

assumptions and the rigidity of knowledge to serve an improved synthesis. Polarized arguments preclude this process, as each disregards the opposing perspective without engaging in dialogue, where each side expresses their beliefs. This is essential to the dialectic's completion. To develop knowledge, beliefs must remain receptive to reconcile viewpoints for compromise, even if these beliefs are perceived to have no logical basis (see [Blaser 2018](#)). The exclusive control, management, and knowledge production of Western bird knowledge is an example of disengagement and violent disposition. The often-polarized positions of TEK or LEK compared to Western bird knowledge could benefit from the process of reconciliation through the Hegelian dialectic process. Our research team engaged in this process on a weekly basis over the past 3 years, an act of embracing a decolonial approach. We share some of the key themes below.

### A Decolonial Approach: Embracing the Hegelian Dialectic Through Weekly Discussions

Beyond being a multicultural group, our ethno-ornithology lab consists of biologists, ecologists, geographers, anthropologists, and psychologists. Our interdisciplinarity at times presented challenges where we had to learn each other's vocabulary, theories, and methods. This learning helped us to build trust over time, think slowly ([Günel et al. 2020](#)), and engage in serious topics that challenged our particular individual beliefs and positionality. Major themes discussed included topics such as what does it mean to be Indigenous in a specific context, how to define indigeneity—should we even be doing it—and recognizing that Indigenous persons and groups are not homogenous. For example, a research partner in Peru was ethnically and racially Indigenous, but upon completing his university education he believed he no longer identified as Indigenous, but Mestizo (mix of Euro-Indigenous). Indigenous scholars ([Kovach 2021](#)) might suggest that this is colonial violence in action due to their “identity transition,” as an indigenous-biologist wanting or needing to assimilate to more Western standards and cultural influences.

Other challenging issues arose when we discussed how to move from speaking about the rights of a more-than-Western approach to applying it in practice. We discussed examples from the field of how to distinguish between LEK and TEK when it is (occasionally) ambiguous; how to identify and establish long-term research collaborators with Indigenous persons and other locals; how to recognize cultural practices without acting in a neo-colonial manner. In one case, our dialectic allowed us to think about whether to condone the killing of a bird in the name of “cultural rights” versus the antithesis of critiquing the practice as an excuse of “cultural relativism.” We learned that the “ethno” in ethno-ornithology is contextual, and that anthropology and other social sciences complement more-than-human and more-than-Western approaches to bird knowledge acquisition, if done respectfully. Our Hegelian dialectic exercise was arguably successful because we are a close-knit research group that has thought about decolonizing Western science, and ethno-ornithology more specifically. But speaking about these issues, and what we mean by a decolonial approach, is relatively useless if we do not do the work to actively decolonize Western science. The following methods section outlines our approach to synthesizing 3 case studies where we have worked to decolonize our science in the field.

## METHODS

We follow a theory synthesis approach to summarize and integrate current understandings, outline the conceptual domain of an idea, and structure a fragmented field by analyzing it through a particular theoretical lens ([Jaakkola 2020](#)). It is a product of ongoing discourse amongst global researchers of an academic ethno-ornithology research lab based in the U.K. Members of the lab are citizens of Nigeria, India, China, Colombia, U.S., Canada, and the U.K., and research collaborators from several other countries regularly participate on projects or discussions. Ages range from early 20s to mid-60s. A full university professor heads the lab, and members are either graduate students in zoology/biology, environmental sciences, geography, or anthropology, tenure-track academic staff (faculty), postdoctoral researchers, or nonprofit research partners. The lab meets weekly throughout the year, and this paper is a product of ongoing (ethical) debates within the group. Namely, with further integration and scale of LEK and TEK, what new syntheses emerge? How can Western governments and NGOs better integrate justice within these models rather than extracting local knowledge for their own benefit? Last, how can the rights, welfare, and agency of individual species be protected in local contexts despite differing practices, beliefs, or conflicts for global immersion ([Copeland 2021](#), [Thomsen and Thomsen 2021](#), [Thomsen et al. 2021a, 2021b](#), [Copeland 2022](#))?

The 3 case studies are described by members or collaborators of ongoing research in Southeast Asia, South America, and decolonializing policy efforts in New Zealand. In each case, we begin with a testimonial, one of several projects inspired to decolonize Western methodologies ([Smith 2004](#)), and provide background of the section's author. Lab members from Colombia, India, and China provided guidance on shaping thoughts and perspectives in this paper, with particular care given to understanding when persons from the Global North (self-identified as a Western scientist) spoke for and about a non-Western collaborator. The analysis uses a postcolonial theoretical lens to posit insight into how Western scientists can embrace TEK and LEK that actively works to decolonize ethno-ornithology in theory and practice. We also describe ethical dilemmas in adhering to local communities' practices who problematize certain species over others in maintaining biocultural diversity, which is an ongoing academic debate concerning cultural relativism ([Kopnina 2017](#)). These efforts promote the necessity of TEK and LEK research agendas, particularly within educational curriculum, and government agencies while providing new syntheses to be analyzed for conservation and management.

We engage diverse conversations and attend to the complex relations of both *decolonial* approaches and *decolonization* itself. We describe how each case study contributes to decolonization work and summarize our key findings in [Figure 1](#). Case one shows how colonization transferred legitimacy to bird keeping as a regional practice that continues to abuse birds for human entertainment. In doing so, we become more attentive to the coloniality of power assemblage ([Mabele et al. 2021](#)), and question Western scientists' right to criticize other nation's practices when the U.S. has a colonial legacy of bird and wildlife extirpation. Case 0 problematizes ethics in relation to TEK and LEK when considering the rights of birds within a neoliberal economic paradigm, based on more than 210 interviews. This case

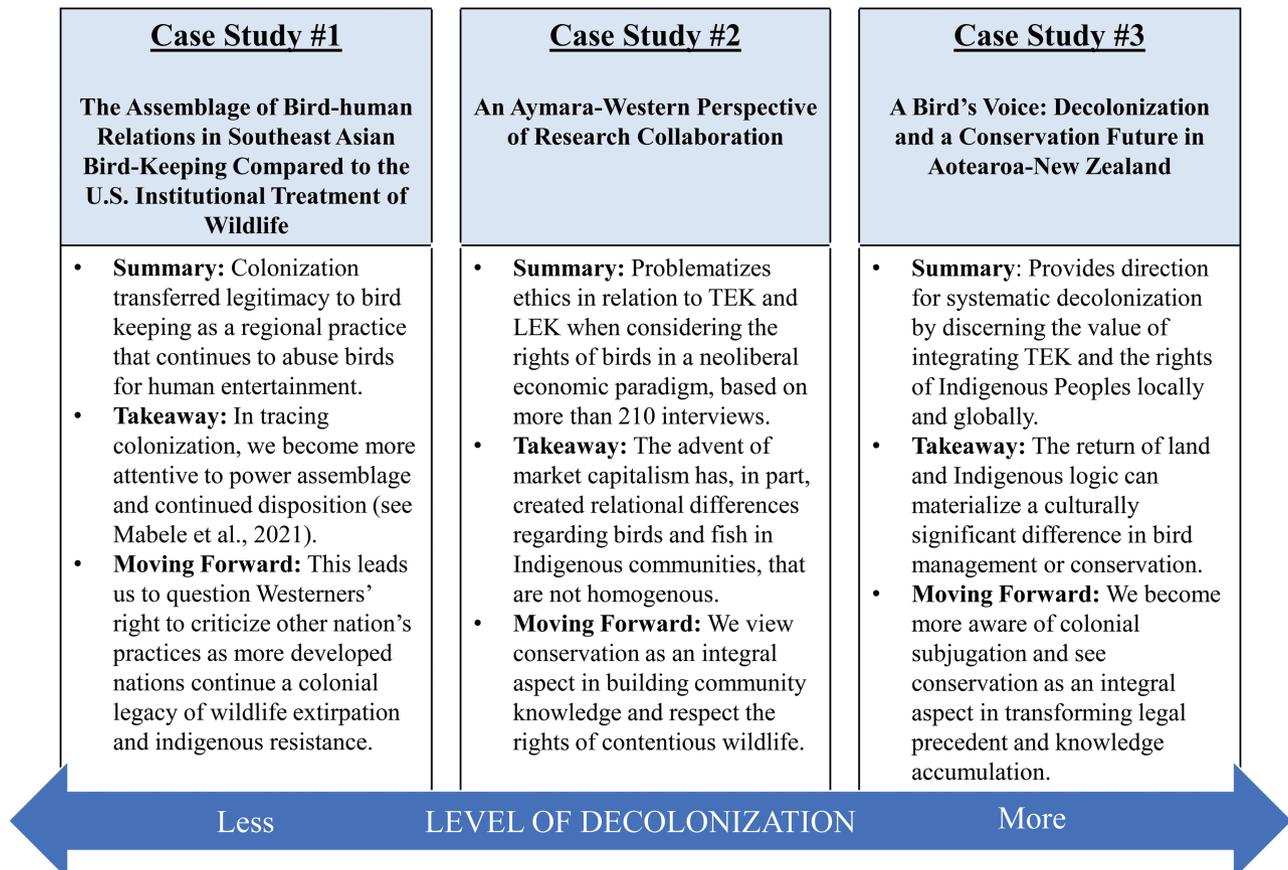


FIGURE 1. Case studies organized by level of decolonization.

shows how the advent of market capitalism has, in part, created relational differences regarding birds and fish in Indigenous communities of Lake Titicaca (Peru and Bolivia). Case 3 provides direction for systematic decolonization by discerning the value of integrating TEK and the rights of Indigenous Peoples locally and globally. Case 3 also highlights how the return of land and Indigenous logic could materialize as a culturally significant difference in bird management or conservation. The intention of these case studies and the discussion within each are to understand the nature of decision making with Indigenous peoples, and we are cautious of current colonial practices that may perpetuate the status quo of hegemonic colonial power relations over Indigenous peoples (McDonnell and Regenvanu 2022).

**Case Studies and Discussion on Decolonizing Bird-Human Relations and Knowledge**

**Case Study #1:**

The Assemblage of Bird-Human Relations in Southeast Asian Bird-keeping Compared to the U.S. Institutional Treatment of Wildlife

*Testimonial: The author of this section is a Caucasian male ethno-acoustic biologist from the U.S. He is an external collaborator with the ethno-ornithology lab, and has watched and studied birds since childhood. He is currently based in Yogyakarta, Indonesia where he is conducting a year of fieldwork alongside members of Central Java's bird-keeping and bird-watching communities. He offers these perspectives in gratitude to his local collaborators*

*and co-authors, and to support decolonizing songbird conservation through a shared love of birds.*

Bird-keeping is a point of national pride among many Southeast Asian nations, and perhaps nowhere more than in Indonesia (Jepson and Ladle 2005, Jepson 2010, Mirin and Klinck 2021). Bird singing competitions take place at a national level hundreds of times a year, and offer cash prizes that can be as high as 10 times the country's average annual household income (Gill 2018). Markets for "competitive" birds are massive. In urban centers like Java and parts of Kalimantan and Sumatra, birds are the most popular common household pet (Jepson and Ladle 2009, Harris et al. 2017). The rules for bird-keeping and especially singing competitions across Indonesia are highly varied, reflecting local aesthetics for avian plumage, movement, and singing behavior (Su et al. 2014), as well as the variety of local species available either in markets or in forests. Bird-keepers and traders generally prefer birds trapped in the "wild" over those bred in captivity, because those birds are believed to be better singers and because of the high costs involved in keeping and buying captive birds (Burivalova et al. 2017).

Bird keeping is common across the North-South divide. It ties countries together in a shared model of human-animal relationships framed by colonialism and scaled by consumer cultures. Many nations are at different stages of wildlife-human relations, but no society in this region is exempt from paternalistic or hierarchical attitudes towards birds. These attitudes have had (and have) bloody consequences. In Indonesia, bird-keeping today has achieved

massive scale as part of a nationalistic renunciation of colonial rule. Before the country achieved independence in 1945, and even afterward, Western Nations tried to assimilate its citizens and their Southeast Asian neighbors by discouraging “native” leisure practices and replacing them with Western constructs (Moser et al. 2017). In Europe, meanwhile, bird-keeping has a centuries-old history that included brutal practices such as blinding captive finches to motivate singing behavior (Bilefsky 2007). Colonization of others’ territories carried these traditions to new frontiers, where they inspired successive generations of bird-keepers in the United States and throughout Central and South America (Mirin and Klinck 2021). Euro-American settlers, sanctioned by the U.S. government through bounty systems, extirpated millions of wildlife (e.g., bison, wolves, beavers, etc.) from the 1860s to the 1940s (Thomsen 2022). Quintero Toro (2012) details how the U.S. used science and medicine, and particularly a newfound interest in Colombian avifauna in the early 20th century, to impose itself as the hegemonic power in Latin America.

Anti-wildlife dominance persists in the U.S. in the name of (conservation) management, often supported by biological scientists’ species-level research or political rhetoric. Gray wolf (*Canis lupus*) bounties returned to Idaho and Montana in 2021, and the U.S.’s Wildlife Services has killed or euthanized more than 12 million individual birds from 1996 to 2020, including various species of geese (*Anser* spp.), ducks (*Anatidae* spp.), gulls (*Larinae* spp.), Common Mynas (*Acridotheres tristis*), hawks (*Buteo* spp.), etc. (United States Department of Agriculture Animal and Plant Health Inspection Service 2021, Thomsen 2022). Who are Western scientists, then, to judge the practices of a developing nation such as Indonesia when their/our own measures of “success” are culturally constructed and predicated on a legacy of extirpation? This anti-wildlife cultural relativism paradox is becoming increasingly contested in academic discourse (Kopnina 2017). Thomsen et al. (2021a, 2022, 2023) challenge this paradigm from a posthumanist, ethical pluralities perspective to value nonhumans at the species *and* individual levels as nonhumans are also marginalized in colonial histories. If humanity wishes to rectify these mistakes, it is imperative to realize that conservation is not a privilege or an afterthought when considering more-than-human ontologies. It is a critical ingredient to our survival—as living beings—no matter the species (Copeland 2020, Copeland Copeland et al. 2022, Gosler 2022).

Adopting a postcolonial mindset starts by finding common ground, as human cultures have long been connected to birds. Currently, Western nations remain the largest importers of “natural commodities” and wildlife products from countries like Indonesia (Lenzen et al. 2012). The extraction of these resources has had tremendous effects on habitats for local wildlife (Lenzen et al. 2012). Indonesia’s bird trade may be predominantly domestic in scope (Nash 1993), but it takes place within a larger neocolonial framework. To participate in global markets and diplomacy, many developing nations are forced to find an economic and cultural foothold by exploiting their resources. Birds and other wildlife are diminished in these contexts to the status of object and resource, at least at the macro level (Kopnina 2017). Western hegemonies, who continue to exploit their dominance within their own borders, exert their influence from abroad through globaliza-

tion and neoliberal capitalistic forces. Western conservationists’ identities and beliefs are entangled within this cultural construction (Thomsen 2022), which places even the most well-intentioned Western ornithologists in positions of power over the people and birds they/we study in developing countries like Indonesia. The first step to embrace a decolonial approach is for Westerners to acknowledge their/our inherent hegemonic position and that we continue to kill or treat birds as subservient within their/our own borders. In addition, we must acknowledge our collective legacy as cultures engaged in exploiting wildlife for human amusement and control. Only then can they/we begin to work alongside local communities from a position of equity and inclusion, and acknowledge birds as particular individuals. Western researchers must also partner through active collaboration with (Indigenous) locals. This is vital to transition from speaking about decolonial approaches to decolonizing, and recent works by Ruelas Inzunza et al. (2023) and Soares et al. (2023) provide complementary insights into how ornithologists can better engage with Indigenous and or Global South research partners to be more equitable in knowledge (co)-production.

We must conduct research from a combination of top-down and grassroots approaches, with local researchers involved at every step from research conception and design to execution and publication. There are 4 priority areas for research on the songbird trade in Southeast Asia, including captive breeding and assurance colony management, trade legislation and enforcement, genetics and population studies, and education and outreach (Lee et al. 2016). Mirin and Klinck (2021) found that education research is particularly lacking over the last 30 years in Indonesia, and advocate developing community-led education programs that teach about sustainable use of traded songbirds to preserve nature and culture together. Specific examples of such programs and their models for sustainable use are part of the author of this section’s forthcoming dissertation research. He is writing in Central Java, where he is working with local partners on his dissertation research as an equal contributor—not as an employer. His comments here are informed by his team’s ongoing ethnographic research process, which has included over 30 in-depth interviews, collaborative research design, and extensive media documentation of the songbird trade with input from Javanese bird-keepers. The next case study shows how we can better understand discrepancies in perspectives toward a bird species within a homogenous Indigenous group in South America.

### Case Study #2:

#### An Aymara–Western Perspective of Research Collaboration

**Testimonial:** *The author of this section is a Hispanic biologist from Colombia, but is now in graduate school at the university that the ethno-ornithology lab is affiliated with. His extensive personal and professional experience in South America shaped his understanding of the sociocultural, sociopolitical, and socioeconomic dynamics that informed his relationships and fieldwork in the Lake Titicaca region of Peru and Bolivia.*

This paper’s aim is to find consilience between Indigenous communities and Western conservation, but Indigenous peoples are not monolithic and exhibit a range of opinions

and actions towards nature between and within communities (Dove 2006). When focusing on this consilience, we risk simplifying Indigenous peoples' interactions with nature as being universally beneficial for biodiversity (Hames 2007). Deleterious interactions between Indigenous people and biodiversity can stem from hostility toward wildlife (Quispe Coila et al. 2023), apathy toward environmental problems (Holladay and Ormsby 2011), previous sustainable existence being predicated on factors independent of culture, such as population density (Vickers 1994, Redford and Anderson 2000), or changes in culture (Peres 2000, Ogendi et al. 2011, Shepard et al. 2012). This case study examines conflicts between and within Indigenous communities using an example of the interactions between Aymara peoples at Lake Titicaca and the Lake Titicaca Grebe (*Rollandia microptera*; hereafter grebe). In part, colonial pressures to monetize nature have shifted the balance of power in these communities and foreground human-grebe relations.

Lake Titicaca, like the rest of the central Andes, has been wholly transformed since the advent of agriculture in the region circa 5,000 BCE (Ellenberg 1979, Gade 1999, Erickson 2000). The Aymara have lived around the Lake Titicaca area for at least 800 years (Bouysson-Cassagne 1992). For most of history, fishing occurred (Miller et al. 2010, Capriles et al. 2014), but it was not an important part of the lakeside economy (La Barre 1948, Young 1997, Capriles et al. 2008, Moore 2011). This changed in the mid-20th century, with the introduction of trout (*Salmo trutta*) and pejerrey (*Odontesthes bonariensis*) as part of a Peruvian government initiative to modernize economically by establishing a capitalist fishing industry. This led to an increase of fishers (gender neutral term signifying the people who fished) and the modernization of equipment (Everett 1973, Laba 1979, Orlove et al. 1992, Orlove 2002). By the late 20th century, a fishing economy had been established amongst the Aymara along Lake Titicaca (Orlove 2002).

Interviews with Aymara fishers suggested that the majority are hostile toward the grebe (Quispe Coila et al. 2023). The reasons for this are 2-fold; first, the grebe competes with fishers for fish; and second, the grebe often gets stuck in nets, breaking them. The former reason to dislike the grebe may have intensified in the last few years as Lake Titicaca has seen a significant decrease in the number of fish (personal observations and interlocutors' accounts). While interviewing fishers in Orurillo, Bolivia, this author asked a fisher if he had caught any birds. The fisherman replied no, but if the author wanted him to, he could go and kill some. The author told him that this was not his desire, but the fisherman replied that he would enjoy the task, as the birds annoyed him and competed with him for fish. He proceeded to express that he wished all the grebes in the region were killed, to leave more fish for fishermen like himself. While this anti-bird attitude toward the grebe is common among fishers, not all Aymara share this perspective. Most non-fishers in these villages are apathetic towards grebes. Others harbor positive attitudes toward the grebe, indicating that they enjoy watching it play and swim in the evenings. Additionally, those who want to transition from fisheries and agriculture toward tourism often hold positive opinions of the grebe, viewing it as a way to attract birdwatchers. Even among fishers, once informed of the grebe's endangered and endemic status, many were willing to say that they would support conservation measures.

As this example shows, not all interactions between Indigenous people and birds are positive nor homogenous. This case study ultimately highlights the effects of neocolonial capitalism on contemporary and recent colonial oppression that has negative consequences for Aymara fishers and grebe alike. In this instance, since most Aymara were apathetic toward the grebe and some showed positive signs, it suggests that while the fishers' opinions are valid in their own right, they are not representative of the community. Cosmological and ontological questions of whose opinion or agency to value in grebe–Aymara relations then arise (Chua et al. 2020). Who speaks for the grebe, and how could non-Aymara bird conservationists work with Aymara residents in these villages to engage a Hegelian dialectic process, led by the Aymara? Issues that could be discussed include the grebe's suffering (e.g., starving when entangled in fishing nets), and to seek potential solutions that are culturally appropriate while demonstrating an acknowledgement of the grebe's rights, welfare, and agency. In this way, non-Aymara can work with local Indigenous members through a transcultural approach, where each maintains their own identity and cultural values, but exchange knowledge on bird–human relations without infringing on Indigenous' rights, welfare, or agency (Rouse 1986, Thomsen et al. 2020). This case study showed how Aymara Indigenous communities along the shores of Lake Titicaca are entangled with (neo)colonialism and neoliberal capitalism, including (eco)tourism, which can engender competing views about the grebe within the group, and that the findings of more than 210 interviews provide a basis for a transcultural setting to facilitate a Hegelian dialectic approach to grebe–Aymara relations.

The conflict between indigenous people and the Reserva Nacional del Titicaca, which includes many ornithologists among its rangers, has been well documented (Orlove 1991). However, this has been reduced by the park training Indigenous people to become park rangers, thus providing an employment that is predicated on preserving the biodiversity of Lake Titicaca, rather than on fishing and hunting. While there remain many indigenous people, especially Uro, who are hostile to the park, this seems to have reduced hostility to both conservation in general and to the Titicaca Grebe in particular, with the author DAV even working with a local Indigenous man who used to participate in anti-Reserva protests. Now, however, due to his employment as a park Ranger, he actively helps protect the avian fauna of the Reserva Nacional del Titicaca. In the next case study, we show how to move beyond identifying discord in bird–human relations among Indigenous communities to actively working on decolonizing bird conservation *with* Indigenous groups. In the next case study, we show how to move beyond identifying discord in bird–human relations among Indigenous communities to actively working on decolonizing bird conservation *with* Indigenous groups.

### Case Study #3:

A Bird's Voice: Decolonization and a Conservation Future in Aotearoa-New Zealand

**Testimonial:** *The author of this section is a white Pākehā New Zealander, now living and working as an academic in the United States. They support the Māori call to honor Te Tiriti o Waitangi and offer this section as contribution*

to that call. Using Māori terms in practice is part of this contribution.

Aotearoa-New Zealand (Aotearoa is New Zealand's Māori name and henceforth referred to as Aotearoa) was settled by humans some 750 years ago and 59 of New Zealand's bird species have become extinct since (Robertson et al. 2017). Now nearly 4,000 species of plants and animals are threatened or at risk of becoming extinct (Ministry for the Environment and Stats NZ 2019). Aotearoa's government from the 1880s onward, adopted a colonial preservationist approach to the management of wildlife, including native birds, alienating indigenous Māori from *taonga* (treasured possessions) and losing *mātauranga* Māori (Māori knowledges) of those *taonga* (Parsons et al. 2021). Changing cultural, social, scientific, and legal norms is now decolonizing the conservation landscape, creating a reimagining of Aotearoa's conservation future (Lyver et al. 2019, Wehi et al. 2019a). *Te Ao* Māori (Māori cosmology) is founded on an understanding that everything seen and unseen, human, the natural and beyond-natural world, is related (Clapcott et al. 2018). *Iwi* (Māori tribes) derive their identity from the landscape and its flora and fauna establishing *whakapapa* (ancestry) that informs *tikanga* (customary practices) and creates *mātauranga* (Wilkinson et al. 2020). *Mātauranga taiao* (environmental knowledge) is simultaneously a traditional and contemporary *taonga*, expanding and evolving as it is passed from one generation to the next (King et al. 2018).

*Te Tiriti o Waitangi* (Treaty of Waitangi), signed in 1840, is the founding constitutional document of Aotearoa, establishing the formal relationship between the British Crown and *tangata whenua* (people of the land). Since its signing the meaning of *Te Tiriti* has been contested (Options Development Group 2022). This is, in part, because there is both a *te reo Māori* (Māori language) and English language version of *Te Tiriti*. In the English version of the Treaty, Māori give the British Crown sovereignty over their lands and were guaranteed undisturbed possession of their lands, forests, fisheries, and other properties. In *Te Tiriti*, Māori give the Crown *kawanatanga katoa* (governorship) and in turn received *tino rangatiratanga* (chieftainship over their lands, dwelling places, and all other possessions) and sovereignty was not conceded (Salmond 2022). The consequences of these linguistic differences, combined with the adoption of European protectionist conservation ethic by the British Crown, mean Aotearoa's conservation laws and their interpretation by Crown institutions and courts have created a barrier to Māori expressing *tino rangatiratanga* and practicing *kaitiakitanga* (practices for environmental management), including the harvest of native birds (Lyver et al. 2019).

Considerable effort has been made to advance the involvement of *tangata whenua* in conservation initiatives over the last 3 decades. Māori from the southern Tītī Islands, have rights to access and manage the islands, including the harvest of tītī (Sooty Shearwaters [*Puffinus griseus*]) in accordance with their *kaitiakitanga* (Moller 2009, Geary et al. 2019).

Efforts are also underway to increase the visibility of Māori bird names in biodiversity reporting and recognizing regional variations in Māori names (Wehi et al. 2019b). Recovery plans for the endangered Pāteke (Brown Teal [*Anas chlorotis*]) have been co-managed with *Iwi* that have *kaitiaki* (guardianship) obligations and *Iwi* are consulted about *pāteke* restoration

and translocations to other regions of New Zealand (Lyver et al. 2019). Biocultural approaches incorporating *kaitiakitanga* are proposed to manage Weka (*Gallirallus australis*), an endangered native bird that is a predator of other endangered species at some island and ecosanctuary sites (Carpenter et al. 2021). The decolonization of conservation in Aotearoa will accelerate because of recent legal rulings creating a new relationship between people and nature. Notably, legal decisions include the decision to declare, in 2014, the landscape that was Te Urewera National Park its own legal entity with the rights of a person as part of a treaty settlement between the tribal federation of Tūhoe and the Crown (Lyver et al. 2019). Similarly, legal personhood was awarded to Whanganui River as part of the Awa Tupua (Whanganui River Claims Settlement) Act in 2017.

Of perhaps even greater significance, in 2018 Aotearoa's Supreme Court in its Ngāi Tai ki Tāmaki Tribal Trust v Minister of Conservation decision found that the Department of Conservation's obligation to give effect to the principles of Te Tiriti were not overridden by other statutory imperatives (ODG 2022). Conservation legislation and other statutory (and non-statutory) objectives must be achieved in a way that best gives effect to the principles of Te Tiriti. In 2020, an independent review comprising representatives of *tangata whenua*, conservation boards and 3 Department of Conservation (DOC) staff as ex officio members was established. The Options Development Group (ODG) task was to assess DOC's obligation to give effect to the principles of Te Tiriti. Its recommendations were far reaching, including to: Transform conservation through fundamental reform of the conservation system; reframe the purpose of conservation to ensure it is fit for purpose for Aotearoa New Zealand; center *kawa* (Māori protocol and etiquette), *tikanga* and *mātauranga* within the conservation system; and recast the legal status of conservation lands, waters, resources, Indigenous species and other *taonga*, including revoking crown ownership of Indigenous resources, and particularly native birds (ODG 2022).

It is too soon to know the practical impact of the OSG (2022) recommendations. Its findings are a seismic change in the way that the Crown legislates for and operationalizes conservation in Aotearoa. At the very least, legal treaties and judicial decisions require a transformation of societal values that dismantle a colonial construction of conservation. They demand a decolonized conservation discourse centered around *kawa*, *tikanga*, and *mātauranga*, helping to stem the decline in biological and cultural diversity in Aotearoa. We conclude our paper with a summary and short discussion of how to move from a decolonial approach to decolonization in practice.

## CONCLUSION

### From a Decolonial Approach to Decolonization

In this paper, we set out to address 4 key objectives to answer our research question, "How do we move from a decolonial approach (discourse) to decolonization (application)?" These included questioning the epistemological and ontological assumptions of bird knowledge and how it is acquired; sparking dialectic discourse about decolonizing ethno-ornithology; providing insights on how to move from a decolonial approach to decolonization; and to inspire other Western

scientists to do this, with the aid of a Hegelian dialectic exercise. Our research group's ongoing Hegelian dialectic process provides a step toward embracing a more-than-Western approach to bird knowledge acquisition and management. Case study one showed how (neo)colonial cultural practices and neoliberal markets influence contemporary bird keeping practices through bird singing competitions. It contrasted U.S. cultural and institutionalized killings or euthanasia of wildlife and specifically birds to question the standing of Westerners to dictate their/our effects on birds and human cultures in the Global South. This complemented Quintero Toro's (2012) account on how the U.S. used the study of avifauna in Colombia in the early 20th century to seize hegemonic control in the region. Case study 2 provided a cautionary example to not treat all particular individuals within an Indigenous community as homogenous, which would disparage their agency. Instead, this case study suggested that a non-Indigenous scientist's work can influence bird conservation or management in an Indigenous community if it is done respectfully and in collaboration with local peoples, as in the example of how the Peruvian park ranger now helps to protect birds in his care. We pondered how that the Hegelian dialectic process could assist in this process. Finally, case study 3 showed a concrete example of a Western scientist honoring Māori rights, agency, and welfare in practice by actively working to decolonize conservation management and policy. The Aotearoa/New Zealand now prioritizes Māori rights in bird conservation, as does The Ornithological Society of New Zealand (2023).

Each case study provided distinct ways in which Western ethno-ornithologists can recognize their own cultural influences on their/our epistemology and ontology, how to conduct ethically responsible fieldwork with local and or Indigenous peoples (see Hough 2017), and that a Hegelian dialectic process can provide insights into a decolonial approach and decolonization itself. To inspire discourse on how Western ethno-ornithologists can engage more-than-Western persons, cosmologies, and ontologies in bird knowledge acquisition and management, we suggest 5 pathways: (1) engage with a reflexive process of recognizing one's own particular individual positionality, question their methods, epistemology, and ontology; (2) actively seek and carry out meaningful partnerships with persons who self-identify as Indigenous, are traditionally marginalized, and or are from the Global South; (3) disseminate research that adequately acknowledges more-than-Western knowledge where appropriate, and formally recognize partnerships through publication or other outlets as applicable; (4) try practicing a Hegelian process throughout every step of the research process; and (5) advocate for Indigenous and or traditionally marginalized rights, agency, and welfare in research and policy. If each of these steps is applied in practice, our collective knowledge of bird-human relations should fundamentally shift to establish a new paradigm of ethno-ornithology; new research on these outcomes could result in innovate approaches to bird conservation and management. We caution that it is insufficient to only discuss these issues without materializing an ethic of equity, diversity, and inclusion in practice. Otherwise, discussions that simply retain a decolonial approach could be described as a "thoughts and prayers" approach to reform. ethno-ornithology has the potential to lead deeper, more genuine reform by embracing a more-than-Western approach in theory and practice, but will we do so?

## ACKNOWLEDGMENTS

We would like to thank everyone who has contributed to the discussions and research that led to this article, including the editors and reviewers of the journal who helped improve our manuscript.

## Funding statement

There is no funding to declare.

## Ethics statement

There were no study participants and no ethical clearance to declare and no available data to share.

## Conflict of interest statement

There are no conflicts of interest to declare.

## Author contributions

All authors wrote the paper or helped to substantially edit the paper, and helped to develop the methods and analyze the data.

## LITERATURE CITED

- Aswani, S., A. Lemahieu, and W. H. Sauer (2018). Global trends of local ecological knowledge and future implications. *PLoS One* 13:e0195440.
- Becker, C. D., and K. Ghimire (2003). Synergy between traditional ecological knowledge and conservation science supports forest preservation in Ecuador. *Conservation Ecology* 8:1.
- Bélisle, A. C., H. Asselin, P. LeBlanc, and S. Gauthier (2018). Local knowledge in ecological modeling. *Ecology and Society* 23:2.
- Bevilacqua, A. H. V., A. R. Carvalho, R. Angelini, and V. Christensen (2016). More than anecdotes: Fishers' ecological knowledge can fill gaps for ecosystem modeling. *PLoS One* 11:e0155655.
- Bilefsky, B. D. (2007). "A Belgian contest for the birds." *The New York Times*, 16 May 2007. <https://www.nytimes.com/2007/05/16/world/europe/16iht-finch.5.5742355.html>.
- Blaser, M. (2018). Doing and undoing Caribou/Atiku: Diffractive and divergent multiplicities and their cosmopolitical orientations. *Tapuya: Latin American Science, Technology and Society* 1:47–64.
- Bonta, M. (2010) Ethno-ornithology and biological conservation. In *Ethno-ornithology: Birds, Indigenous Peoples, Culture and Society* (S. Tidemann and A. Gosler, Editors). Earthscan, London, UK.
- Bouysson-Cassagne, T. (1992). Past and present human populations. In *Lake Titicaca: A Synthesis of Limnological Knowledge*. (C. Dejoux and A. Iltis, Editors). Kluwer Academic Publishers, Dordrecht, Netherlands. pp. 473–494.
- Burivalova, Z., T. M. Lee, F. Hua, J. S. H. Lee, D. M. Prawiradilaga, and D. S. Wilcove (2017). Understanding consumer preferences and demography in order to reduce the domestic trade in wild-caught birds. *Biological Conservation* 209:423–431.
- Camino, M., J. Thompson, L. Andrade, S. Cortez, S. D. Matteucci, and M. Altrichter (2020). Using local ecological knowledge to improve large terrestrial mammal surveys, build local capacity and increase conservation opportunities. *Biological Conservation* 244:108450.
- Capriles, J. M., A. I. Domic, and K. M. Moore (2008). Fish remains from the Formative Period (1000 BC-AD 400) of Lake Titicaca, Bolivia: Zooarchaeology and taphonomy. *Quaternary International* 180:115–126.
- Capriles, J. M., K. M. Moore, A. I. Domic, and C. A. Hastorf (2014). Fishing and environmental change during the emergence of social

- complexity in the Lake Titicaca. *Journal of Anthropological Archaeology* 34:66–77.
- Carpenter, J. K., J. G. Innes, J. R. Wood, and P. O. B. Lyver (2021). Good predators: The roles of weka (*Gallirallus australis*) in New Zealand's past and present ecosystems. *New Zealand Journal of Ecology* 45:1–14.
- Chisholm Hatfield, S., E. Marino, K. P. Whyte, K. D. Dello, and P. W. Mote (2018). Indian time: time, seasonality, and culture in Traditional Ecological Knowledge of climate change. *Ecological Processes* 7:1–11.
- Chua, L., M. E. Harrison, H. Fair, S. Milne, A. Palmer, J. Rubis, P. Thung, S. Wich, B. Büscher, S. Cheyne, et al. (2020). Conservation and the social sciences: Beyond critique and co-optation A case study from orangutan conservation. *People and Nature* 2:42–60.
- Clapcott, J., J. Ataria, C. Hepburn, D. Hikuroa, A. Jackson, R. Kirikiri, and E. Williams (2018). mātauranga Māori: Shaping marine and freshwater futures. *New Zealand Journal of Marine and Freshwater Research* 52:457–466.
- Copeland, K. (2020). Commodifying Biodiversity: Socio-economic approaches to wildlife–human coexistence. *Encyclopedia of the UN Sustainable Development Goals, Partnerships for the Goals* 1:1–12.
- Copeland, K. (2021). Reimagining innovation for “social” entrepreneurship: Nonhuman spaces for the SDGs. *Journal of the International Council for Small Business* 2:134–146.
- Copeland, K. (2022). *Speaking Sea Lion: Storytelling with t'amanāwas and nonhuman bodies*. Working paper. Corvallis, OR, USA.
- Davis, A., and K. Ruddle (2010). Constructing confidence: Rational skepticism and systematic enquiry in local ecological knowledge research. *Ecological Applications* 20:880–894.
- Dayer, A., J. C. Barnes, A. M. Dietsch, J. M. Keating, and L. C. Naves (2020). Advancing scientific knowledge and conservation of birds through inclusion of conservation social sciences in the American Ornithological Society. *Ornithological Applications* 120:duaa047.
- Deshwal, A., B. Thomsen, P. Panwar, and A. Gosler. (2022). *Natural History Knowledge: Perseverance of the Traditional Ecological Knowledge*. Working paper. Peoria, IL, USA.
- Dove, M. R. (2006). Indigenous people and environmental politics. *Annual Review of Anthropology* 35:191–208.
- Eichler, L. (2019). *Dehumanization and the Metaphysics of Genocide: A New Theory for Genocide Prevention*. University of Oregon, Corvallis, OR, USA.
- Ellenberg, H. (1979). Man's influence on tropical mountain ecosystems in South America. *Journal of Ecology* 67:401–416.
- Erickson, C. L. (2000). The Lake Titicaca Basin: A Precolumbian built landscape. In *Imperfect Balance: Landscape Transformations in Pre-Columbian Americas*. (D. L. Lentz, Editor). Columbia University Press, New York, NY, USA. pp. 311–356
- Everett, G. (1973). The rainbow trout *Salmo gairdneri* (Rich) fishery of Lake Titicaca. *Journal of Fisheries Biology* 5:429–440.
- Gade, D. W. (1999). *Nature and Culture in the Andes*. University of Wisconsin Press, Madison, WI, USA.
- Geary, A. F., N. J. Nelson, G. Paine, W. Mason, D. L. Dunning, S. E. Corin, and K. M. Ramstad (2019). Māori traditional harvest, knowledge and management of Sooty Shearwaters (*Puffinus griseus*) in the Marlborough Sounds, New Zealand. *New Zealand Journal of Ecology* 43:1–7.
- Gill, V. (2018). Sold for a Song. [https://www.bbc.co.uk/news/resources/idt-sh/sold\\_for\\_a\\_song](https://www.bbc.co.uk/news/resources/idt-sh/sold_for_a_song)
- Gosler, A. (2022). Epilogue—The emergence of ethno-ornithology. In *Feathered Entanglements: Human–Bird Relations in the Anthropocene* (S Simon and F Laugrand, Editors) UBC Press, Vancouver, BC, Canada 1:257–273.
- Gosler, A. G., and S. M. Tilling (2021). Knowledge of nature and the nature of knowledge: Student natural history knowledge and the significance of birds. *People & Nature* 4:127–142.
- Granderson, A. A. (2017). The role of traditional knowledge in building adaptive capacity for climate change: Perspectives from Vanuatu. *Weather, Climate, and Society* 9:545–561.
- Günel, G., Varma, S., and Watanabe, C. (2020). A manifesto for patchwork ethnography. Member Voices, Fieldsights, 9.
- Hames, R. (2007). The ecologically noble savage debate. *Annual Reviews in Anthropology* 36:177–190.
- Harris, J. B. C., M. W. Tingley, F. Hua, D. L. Yong, J. M. Adeney, T. M. Lee, W. Marthy, D. M. Prawiradilaga, C. H. Sekercioglu, Suyadi, N. Winarni, D. S. Wilcove (2017). Measuring the impact of the pet trade on Indonesian birds. *Conservation Biology* 31:394–405.
- Holladay, P. J., and A. A. Ormsby (2011). A comparative study of local perceptions of ecotourism and conservation at Five Blues Lake National Park, Belize. *Journal of Ecotourism* 10:118–134.
- Hosen, N., H. Nakamura, and A. Hamzah (2020). Adaptation to climate change: Does traditional ecological knowledge hold the key? *Sustainability* 12:676.
- Hough, D. (2017). Ethical and moral issues for doing fieldwork with indigenous peoples. *Sociology and Anthropology* 5:651–654. <https://www.doc.govt.nz/Documents/science-and-technical/nztc19entire.pdf>
- Jaakkola, E. (2020). Designing conceptual articles: Four approaches. *AMS Review* 10:18–26.
- Jepson, P. (2010). Towards an Indonesian bird conservation ethos: Reflections from a study of bird-keeping in the cities of Java and Bali. In *Ethno-ornithology: Birds, Indigenous Peoples, Culture and Society* (A. Gosler and S. Tidemann, Editors). Earthscan, London, UK. pp. 313–331
- Jepson, P., and R. J. Ladle (2005). Bird-keeping in Indonesia: Conservation impacts and the potential for substitution-based conservation responses. *Oryx* 39:442–446.
- Jepson, P., and R. J. Ladle (2009). Governing bird-keeping in Java and Bali: Evidence from a household survey. *Oryx* 43:364–374.
- Joshi, N. K., and V. Singh (2010). *Traditional Ecological Knowledge of Mountain People: Foundation for Sustainable Development in the Hindu Kush–Himalayan Region*. Daya Publishing House, New Delhi, India.
- King, D. N., S. W. Shaw, P. N. Meihana, and J. R. Goff (2018). Māori oral histories and the impact of tsunamis in Aotearoa–New Zealand. *Natural Hazards and Earth System Sciences* 18:907–919.
- Kopnina, H. (2017). Beyond multispecies ethnography: Engaging with violence and animal rights in anthropology. *Critique of Anthropology* 37:333–357.
- Kovach, M. (2021). *Indigenous Methodologies: Characteristics, Conversations, and Contexts*. University of Toronto Press, Toronto, ON, Canada.
- La Barre, W. (1948). The Aymara Indians of the Lake Titicaca Plateau. *American Anthropological Association Press*.
- Laba, R. (1979). Fish, peasants, and state bureaucracies: The development of Lake Titicaca. *Comparative Political Studies* 12:335–361.
- Lee, J. G. H., Chng, S. C. L., and Eaton, J.A. (2016). Conservation Strategy for Southeast Asian Songbirds in Trade. In *Recommendations from the first Asian Songbird Trade Crisis Summit 2015 held in Jurong Bird Park, Singapore 27–29 September 2015*. <https://doi.org/10.13140/RG.2.2.12805.96483>
- Lenzen, M., D. Moran, K. Kanemoto, B. Foran, L. Lobefaro, and A. Geschke (2012). International trade drives biodiversity threats in developing nations. *Nature* 486:109–112.
- Lindell, C. A. (2020). Conservation social science in *Ornithological Applications*. *Ornithological Applications* 122:duaa056.
- Lyver, P. O. 'B., J. Ruru, N. Scott, J. M. Tylanakis, J. Arnold, S. K. Malinen, C. Y. Bataille, M. R. Herse, C. J. Jones, A. M. Gormley, et al. (2019). Building biocultural approaches into Aotearoa–New Zealand's conservation future. *Journal of the Royal Society of New Zealand* 49:394–411.
- Mabele, M. B., L. T. Sandroni, A. Collins, and J. Rubis (2021). What do we mean by decolonizing conservation? A response to Lanjouw 2021. *Conviva (blog)* 7:1–2.

- Maybee, J. E. (2016). Hegel's dialectics. In *The Stanford Encyclopedia of Philosophy. Metaphysics Research Lab* (E. N. Zalta, Editor). Stanford University. <https://plato.stanford.edu/archives/win2020/entries/hegel-dialectics/>
- McDonnell, S., and R. Regenvanu (2022). Decolonization as practice: Returning land to indigenous control. *AlterNative: An International Journal of Indigenous Peoples* 18:235–244.
- Miller, M. J., J. M. Capriles, and C. A. Hastorf (2010). The fish of Lake Titicaca: Implications for archaeology and changing ecology through stable isotope analysis. *Journal of Archaeological Science* 37:317–327.
- Ministry for the Environment & Stats NZ (2019). New Zealand's Environmental Reporting Series: Environment Aotearoa 2019. <https://environment.govt.nz/publications/environment-aotearoa-2019/>
- Mirin, B. H., and H. Klinck (2021). Bird singing contests: Looking back on thirty years of research on a global conservation concern. *Global Ecology and Conservation* 30:e01812.
- Moller, H. (2009). Matauranga Maori, science and seabirds in New Zealand. *New Zealand Journal of Zoology* 36: 203–210.
- Moore, K. N. (2011). Grace under pressure: Responses to changing environments by herders and fishers in the Formative Lake Titicaca Basin, Bolivia. In *Sustainable Lifeways: Cultural Persistence in an Ever-Changing Environment* (N. F. Miller, K. N. Moore, and K. Ryan, Editors). University of Pennsylvania Press, Philadelphia, PA, USA. pp. 244–272.
- Moser, S., Clinton, E., and Wallach, J. (2017). Leisure activities in Southeast Asia, from pre-colonial times to the present. *The Palgrave Handbook of Leisure Theory*, 107–125.
- Nash, S. V. (1993). Sold for a song: The trade in southeast Asian non-CITES birds.
- Naves, L. C., J. M. Keating, T. L. Tibbitts, and D. R. Ruthrauff (2019). Shorebird subsistence harvest and indigenous knowledge in Alaska: Informing harvest management and engaging users in shorebird conservation. *The Condor: Ornithological Applications* 121:duz023.
- Norton-Smith, T. M. (2010). *The Dance of Person and Place: One Interpretation of American Indian Philosophy*. SUNY Press, New York, NY, USA.
- Nye, A. (2019). *Words of Power: A Feminist Reading of the History of Logic*. Routledge. London, UK.
- (ODG) Options Development Group (2022). *Partial reviews of the Conservation General Policy and General Policy for National Parks regarding Te Tiriti o Waitangi the Treaty of Waitangi*. Department of Conservation, New Zealand. <https://www.doc.govt.nz/globalassets/documents/our-work/options-development-group/options-development-group-report-march-2022.pdf>
- Ogendi, G., R. Morara, and N. Olekaikai (2011). The influence of westernization on water resource use and conservation among the Maasai people of Kenya. In *Water, Cultural Diversity, and Global Environmental Change* (B. Johnston, L. Hiwasaki, I. Klaver, A. Ramos Castillo, and V. Strang, Editors), Springer, Dordrecht, The Netherlands. pp. 137–147.
- Orlove, B. S. (1991). Mapping reeds and reading maps: The politics of representation in Lake Titicaca. *American Ethnologist* 18:3–38.
- Orlove, B. (2002). *Lines in the Water*. University of California Press, Berkeley, CA, USA.
- Orlove, B. S., D. S. Leveil, and H. P. Treviño (1992). Social and economic aspects of the fisheries. In *Lake Titicaca: A Synthesis of Limnological Knowledge* (C. Dejoux and A. Itlis, Editors). Kluwer Academic Publishers, Dordrecht, The Netherlands. pp. 500–504.
- Park, K. E., F. S. Wyndham, A. G. Gosler, and J. Fanshawe (2020). Creating a meaningful world: nature in name, metaphor and myth. In *Creative Multilingualism: A Manifesto* (K. Kohl, R. Dudrah, A. Gosler, S. Graham, M. Maiden, W. Ouyang, and M. Reynolds, Editors). Open Book Publishers, Cambridge, UK. pp. 47–69.
- Parsons, M., K. Fisher, and R. P. Crease (2021). *Decolonising Blue Spaces in the Anthropocene: Freshwater Management in Aotearoa New Zealand*. Springer Nature, Palgrave Macmillan, Cham, Switzerland.
- Peres, C. A. (2000). Effects of subsistence hunting on vertebrate community structure in Amazonian forests. *Conservation Biology* 14:240–253.
- Plumwood, V., 2002. Environmental culture: the ecological crisis of reason. London: Routledge
- Quintero Toro, C. (2012). *Birds of Empire, Birds of Nation: A History of Science, Economy, and Conservation in United States–Colombia Relations*. Ediciones Uniandes-Universidad de los Andes, Peru.
- Quispe Coila, J. A., D. Villar, J. Zapana, B. Thomsen, and A. Gosler (2023). Local perceptions of Titicaca Grebe (*Rollandia microptera*) in the Lake Titicaca shoreline community of Karana, Peru. *Ethnobiology Letters* 14:49–57.
- Redford, K. H., and S. E. Sanderson (2000). Extracting humans from nature. *Conservation Biology* 14:1362–1364.
- Robertson, H., K. Baird, J. Dowding, G. Elliott, R. Hitchmough, C. Miskelly, N. McArthur, C. F. J. O'Donnell, P. Sagar, R. P. Scofield, and G. A. Taylor (2017). Conservation Status of New Zealand Birds, 2016. *New Zealand Threat Classification Series* 19:1–27. Wellington, New Zealand.
- Rouse, I. (1986). *Migrations in Prehistory: Inferring Population Movement from Cultural Remains*. Yale University Press, New Haven, CT, USA.
- Rubis, J. M., and N. Theriault (2020). Concealing protocols: Conservation, indigenous survivance, and the dilemmas of visibility. *Social & Cultural Geography* 21:962–984.
- Ruelas Inzunza, E., K. L. Cockle, M. G. Núñez Montellano, C. S. Fontana, C. Cuatianquiz Lima, M. A. Echeverry-Galvis, R. A. Fernández-Gómez, F. A. Montaña-Centellas, E. Bonaccorso, S. A. Lambertucci, et al. (2023). How to include and recognize the work of ornithologists based in the Neotropics: Fourteen actions for *Ornithological Applications, Ornithology*, and other global-scope journals. *Ornithological Applications* 125:duac047.
- Salmond, A. (2022). Where Will the Bellbird Sing? Te Tiriti o Waitangi and “Race”. *Policy Quarterly* 18:3–25.
- Serra, G., G. R. Wood, S. A. Failagi, S. T. Foliga, M. Uili, and F. Enoka (2021). Using Samoan traditional ecological knowledge to identify calls of the critically endangered endemic Tooth-billed Pigeon (*Didunculus strigirostris*). *Pacific Conservation Biology* 27:275–283.
- Sharma, M. (2017). *Caste and Nature: Dalits and Indian Environmental Policies*. Oxford University Press, Oxford, UK.
- Shepard, G. H., T. Levi, E. G. Neves, C. A. Peres, and D. W. Yu (2012). Hunting in ancient and modern Amazonia: Rethinking sustainability. *American Anthropologist* 114:652–667.
- Sidik, S. M. (2022). Weaving indigenous knowledge into the scientific method. *Nature* 601:285–287.
- Sinclair, R. (2020). Exploding individuals: Engaging Indigenous logic and decolonizing science. *Hypatia* 35:58–74.
- Smith, L. T. (2004). *Decolonizing Methodologies: Research and Indigenous Peoples*. Zed Books, LTD, London, UK.
- Soares, L., K. L. Cockle, E. Ruelas Inzunza, J. T. Ibarra, C. I. Miño, S. Zuluaga, E. Bonaccorso, J. C. Ríos-Orjuela, F. A. MontañaCentellas, J. F. Freile, et al. (2023). Neotropical ornithology: Reckoning with historical assumptions, removing systemic barriers, and reimagining the future. *Ornithological Applications* 125:duac046.
- Su, S., P. Cassey, P. T. M. Blackburn, (2014). Patterns of non-randomness in the composition and characteristics of the Taiwanese bird trade. *Biological Invasions* 16:2563–2575.
- Sultana, F. (2021). Political ecology 1: From margins to center. *Progress in Human Geography* 45:156–165.
- Suwardi, A. B., Z. I. Navia, T. Harmawan, and E. Mukhtar (2020). Ethnobotany and conservation of indigenous edible fruit plants in South Aceh, Indonesia. *Biodiversitas Journal of Biological Diversity* 21:5.
- The Ornithological Society of New Zealand (2023). *A revised Strategy for Birds New Zealand/ Te Kāhui Mātai Manu o Aotearoa – 2015 to 2025*. <https://www.birdsnz.org.nz/wp-content/uploads/2021/05/Strategy-Birds-NZ-2015-2025-revised-2021.pdf>.

- Thomsen, B. (2022). *The Precarity of Nonhuman Livelihoods: Re-thinking Speciesism in a Genocidal State*. Doctoral thesis, University of Oxford, Oxford, UK.
- Thomsen, B., and J. Thomsen (2021). Multispecies livelihoods: Partnering for sustainable development and biodiversity conservation. In *Partnerships for the Goals: Encyclopedia of the UN Sustainable Development Goals* (W. L. Filho, A. M. Azul, L. Brandl, A. L. Salvia, and T. Wall, Editors). Springer, Cham, Switzerland. pp. 1–11.
- Thomsen, B., O. Muurlink, T. Best, J. Thomsen, K. Copeland (2020). Transcultural development. *Human Organization* 79:43–56.
- Thomsen, B., J. Thomsen, K. Copeland, S. Coose, E. Arnold, H. Bryan, K. Prokop, K. Cullen, C. Vaughn, B. Rodriguez, et al. (2021a). Multispecies livelihoods: A posthumanist approach to wildlife ecotourism that promotes animal ethics. *Journal of Sustainable Tourism* 31:1195–1213.
- Thomsen, B., J. Thomsen, M. Cipollone, and S. Coose (2021b). Let's save the bear: A multispecies livelihoods approach to wildlife conservation and achieving the SDGs. *Journal of the International Council for Small Business* 2:114–124.
- Thomsen, B., T. Cousins, K. Copeland, J. Thomsen, S. Coose, A. Mensah, S. R. Fennell, A. Deshwal, J. Guzman, S. Copeland, et al. (2022). Posthumanist pluralities: Advocating for nonhuman species' rights, agency, and welfare in ecosystem governance. *Advances in Ecological Research: Pluralism in Ecosystem Governance* 66:117–146.
- Thomsen, B., K. Copeland, S. R. Fennell, J. Thomsen, M. Harte, A. Deshwal, J. Maxwell, B. Breidenbach, M. Taylor, S. Copeland, et al. (2023). The promise of posthumanism in wildlife ecotourism: A set of case studies of veterinarians' role at wildlife rehabilitation centers in Costa Rica. *Journal of Ecotourism* 4:1–19.
- Tuck, E., and Yang, K. W. (2021). Decolonization is not a metaphor. *Tabula Rasa* 38:61–111.
- U.S. Department of Agriculture (USDA) (2021). 2020 Program Data Reports. [https://www.aphis.usda.gov/aphis/ourfocus/wildlifedamage/sa\\_reports/sa\\_pdrs/pdr-reports-2020](https://www.aphis.usda.gov/aphis/ourfocus/wildlifedamage/sa_reports/sa_pdrs/pdr-reports-2020)
- Väyrynen, K. (2019). Ecological wisdom as a challenge for the philosophy of education. *Disciplinary Struggles in Education* 1:195–214.
- Verran, H. (2002). A postcolonial moment in science studies: Alternative firing regimes of environmental scientists and aboriginal landowners. *Social Studies of Science* 32:729–762.
- Vickers, W. T. (1994). From opportunism to nascent environmentalism. *Human Nature* 5:307–337.
- Waters, A. S. (2004). *That Alchemical Being Strait Theory!* Oxford University Press, Oxford, UK.
- Wehi, P. M., J. R. Beggs, and T. G. McAllister (2019a). Ka mua, ka muri. *New Zealand Journal of Ecology* 43:1–8.
- Wehi, P. M., L. Carter, T. W. Harawira, G. Fitzgerald, K. Lloyd, H. Whaanga, and C. J. MacLeod (2019b). Enhancing awareness and adoption of cultural values through use of Māori bird names in science communication and environmental reporting. *New Zealand Journal of Ecology* 43:1–9.
- White, R. L., K. Eberstein, and D. M. Scott (2018). Birds in the playground: Evaluating the effectiveness of an urban environmental education project in enhancing school children's awareness, knowledge and attitudes towards local wildlife. *PLoS One* 13:e0193993.
- Whitney, K. (2021). Bird banding and the environmental humanities: Institutions, intersubjectivities, and the phenomenological method of Margaret Morse Nice. *Environmental Humanities* 13:113–135.
- Whyte, K. (2017). What do indigenous knowledges do for indigenous peoples? In *Keepers of the Green World: Traditional Ecological Knowledge and Sustainability* (M. K. Nelson and D. Shilling, Editors). Cambridge University Press, Cambridge, UK.
- Wilkinson, C., D. C. Hikuroa, A. H. Macfarlane, and M. W. Hughes (2020). Mātauranga Māori in geomorphology: Existing frameworks, case studies, and recommendations for incorporating Indigenous knowledge in Earth science. *Earth Surface Dynamics* 8:595–618.
- Wyllie de Echeverria, V. R., and T. F. Thornton (2019). Using traditional ecological knowledge to understand and adapt to climate and biodiversity change on the Pacific coast of North America. *Ambio* 48:1447–1469.
- Young, K. R. (1997). Wildlife conservation in the cultural landscapes of the central Andes. *Landscape and Urban Planning* 38:137–147.