



The production-protection nexus: How political-economic processes influence prospects for transformative change in human-wildlife interactions

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ABSTRACT

This article advances a novel analytical framework for investigating the influence of political-economic processes in human-wildlife interactions (HWI) to support efforts to transform wildlife conservation governance. To date, the majority of research and advocacy addressing HWI focuses on micro-level processes, while even the small body of existing literature exploring social dimensions of such interactions has largely neglected attention to political-economic forces. This is consonant with efforts to transform conservation policy and practice more broadly, which tend to emphasize “circular” change within current political-economic structures rather than “axial” transformation aiming to transcend these structures themselves. Our analysis thus advances understanding of potential for axial transformation in HWI via confrontation with, and “unmaking” of, constraining political-economic structures. It does so through cross-site analysis of conservation policy and practice in relation to three apex predator species (lions, jaguars and wolves) in varied geographic and socio-political contexts, grounded in qualitative ethnographic study within the different sites by members of an international research team. We explore how the relative power of different political-economic interests within each case influences how the animals are perceived and valued, and how this in turn influences conservation interventions and their impact on HWI within these spaces. We term this analysis of the “production-protection nexus” (the interrelation between process of resource extraction and conservation, respectively) in rural landscapes. We emphasize importance of attention to this formative nexus both within and across specific locales in growing global efforts to transform situations of human-wildlife conflict into less contentious coexistence.

1. Introduction

Around the world, so-called human-wildlife conflict (HWC) has been identified as a growing problem, particularly in areas where endangered wildlife is the subject of conservation interventions that overlap with

spaces of human use and occupation (Frank et al., 2019; Hodgson et al., 2020). This is particularly true with respect to large carnivorous mammals, who as “apex predators” anchoring wider ecosystems are both a central focus of conservation activities and a commonly perceived threat to human lives and livelihoods (Treves and Karanth, 2003; Van

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Valkenburgh and Wayne, 2010; Van Eeden et al., 2018). How to transform situations of conflict involving large carnivores and other species into less divisive modes of coexistence has thus become an important question for discussion and debate among researchers, policymakers and conservation practitioners.¹

To date, most research addressing this question has focused on the immediate context of human-wildlife interactions (HWI), and thus prescriptions to redress conflict and cultivate coexistence have predominantly sought either to increase tolerance towards neighbouring wildlife or to develop ways to mediate HWI by erecting barriers to animal movements or providing compensation for loss of livestock to predation (e.g. Van Eeden et al., 2018; Frank et al., 2019; Hodgson et al., 2020). While this focus and associated efforts are important, and can indeed dramatically influence HWC management in the short-term (Hodgson et al., 2020), an interrelated body of research has also highlighted the importance of overarching socio-cultural conditions in shaping HWI (Decker, 2012; Dickman et al., 2013; Pooley et al., 2017; Carter et al., 2019). Within this human-centred literature, a small but growing strand of analysis has recently called attention to how HWI is also commonly influenced by broader political-economic processes transcending the immediate contexts of such interaction (e.g. de Silva and Srinivasan, 2019; Fletcher and Toncheva, 2021; Hussain, 2019; Komi and Kröger, 2022; Margulies and Karanth, 2018; Skogen et al., 2019).

Yet thus far, this line of analysis has remained predominantly focused on political-economic dynamics within or influencing a particular site. How different sites in disparate contexts are interconnected within the overarching world-system, and how this in turn influences HWI both within and across sites, has largely remained outside the scope of analysis to date. In this article, we contribute to research addressing HWI by investigating the ways that broader political-economic forces and connections shape local relations between human residents and large carnivores species in three case studies on different continents. Our cases concern efforts to conserve and manage grey wolves (*Canis lupus*) in eastern Finland, lions (*Panthera leo*) in southwestern Tanzania, and jaguars (*Panthera onca*) in west-central and southeastern Brazil. We first illustrate how a focus on questions of broader political economy helps to illuminate patterns of conflict or coexistence within each case. Based on this site-specific investigation, we then highlight common patterns across the different cases in terms of the formative influence of political-economic forces. This comparison allows us to develop a series of general lessons for training attention to such forces in understanding and transforming patterns of HWI more generally. Building on previous conceptualizations of an “ecotourism-extraction nexus” (Büscher and Davidov, 2013; 2016) and broader “conservation-extraction nexus” (Enns et al., 2019; Le Billon, 2021), we introduce the idea of a “production-protection nexus” as a central conceptual axis of our analysis.

We begin by outlining the main bodies of literature in which our analysis is situated and to which it contributes. We then explain the methodology grounding our multi-sited study. Following this, we introduce our three case studies. We then draw out the common patterns and lessons revealed by comparative analysis across these cases and

conclude by explaining the implications of our findings for promotion of transformative change in HWI more generally.

2. The political economy of human-wildlife interactions

As previously noted, the substantial body of research and policy work concerning HWI has thus far focused on mediating forms of direct interaction between humans and wildlife and/or on how humans perceive, value and behave in relation to neighbouring animals. Within this first stream of inquiry, proposals include modification of animals' behavior (sometimes by permanent measures, such as killing of animals that behave in unwanted ways) and/or prevention of activities that overlap in space (by fences, zoning, relocation, etc) (Treves and Karanth, 2003; Hodgson et al., 2020). Within the second strand, the focus is usually on factors that shape people's perceptions of and attitudes towards wildlife. Highlighted factors include a variety of sociocultural and socioeconomic variables, including human actors' identity and values, social positioning, political power and cultural perspectives (Dickman et al., 2013; Manfredo et al., 2009a; Manfredo et al., 2009b; Pooley et al., 2017).

While both foci are important in a holistic approach, recently a small body of research has arisen to complement them by exploring the formative influence of overarching political-economic structures and processes in also shaping HWI. Notable case studies include human-tiger relations (Margulies and Karanth, 2018) and human-elephant relations in India (De Silva and Srinivasan, 2019), human-snow leopard relations in Pakistan (Hussain, 2019), and human-wolf relations in Finland (Komi and Kröger, 2022). Building on these case examples, Fletcher and Toncheva (2021) outline the main political-economic forces commonly shaping HWI across contexts. They emphasize that both human resource use encroaching on wildlife habitats and conservation interventions intended to preserve these habitats can be understood as shaped by how capitalism functions as a dominant form of political economy in the contemporary world-system. Drawing on research concerning uneven geographical development (UGD) (Harvey, 1989; Bridge, 2010; Smith, 2010), they demonstrate that increasing encroachment of extractive activities into spaces occupied by wildlife is compelled by the continual pursuit of new sources of accumulation on which capitalism depends. Meanwhile, drawing on another body of research exploring the relationship between capitalism and conservation (Brockington et al., 2008; Büscher et al., 2014), they demonstrate that efforts to protect such spaces from excessive resource extraction have themselves become increasingly tied up with efforts to generate value from preservation of *in situ* natural resources through so-called market-based instruments (MBIs) such as ecotourism and payment for environmental services (PES).

While illustrating their analysis through two different case studies, Fletcher and Toncheva (2021) do not explore how these two cases are interconnected through wider processes. Nor do they clearly differentiate between processes of resource exploitation and conservation, or examine how the relationship between them is differentially configured in different contexts to influence HWI. Addressing these neglected but important issues in understanding HWC and coexistence is our aim in this analysis. To do so we draw, firstly, on a body of research investigating natural resource management and conservation from the perspective of political ecology, as an approach that “combines the concerns of ecology with a broadly defined political economy” (Blaikie and Brookfield, 1987: 17), to develop our understanding of a “production-protection nexus.”

3. The production-protection nexus

Research in the field of political ecology has highlighted two distinct yet interrelated approaches to managing natural resources within capitalist markets: conventional processes of resource extraction and their transformation into global commodities (e.g., logging, mining,

¹ Human-Wildlife conflict (HWC) is defined herein as “struggles that arise when the presence or behaviour of wildlife poses actual or perceived direct, recurring threats to human interests or needs, often leading to disagreements between groups of people and negative impacts on people and/or wildlife” (Gross et al., 2021: 6). By contrast, *coexistence* is considered “a dynamic state in which the interests and needs of both humans and wildlife are generally met, though this coexistence may still contain some level of impact to both and is characterised by a level of tolerance on the human side” (Gross et al., 2021: 6). Consequently, conflict and coexistence should be considered not polar opposites but rather different positions within a spectrum of possibilities (Frank, 2016). In this sense, successful coexistence can still be seen to encompass some degree of conflict (Pooley et al. 2021). Human-wildlife interaction (HWI), finally, is a neutral generic term encompassing all of these others.

agricultural production) on one hand (Heynen et al., 2007; Bakker, 2009; Castree, 2010; Dempsey, 2012), and the opposite process whereby resources are preserved *in situ* for so-called “non-consumptive” use (via ecotourism, payments for ecosystem services, etc) through conservation (Brockington et al., 2008; Büscher et al., 2012; Büscher et al., 2014). Conventionally considered distinct and separate, these different processes have developed as parallel foci within the growing body of research addressing natural resource management as a whole. While exploration of conservation has been strongly influenced by research concerning resource extraction, this influence has been largely unidirectional and hence the two discussions have proceeded with relatively little dialogue between them (for notable exceptions see *inter alia* Castree, 2010; Büscher et al., 2012; Dempsey, 2012).

In an initial effort to develop a common analytical frame for these twin processes, Büscher and Davidov (2013, 2016) describe different aspects of what they termed an “ecotourism-extraction nexus.” More recently, Enns et al. (2019) and Le Billon (2021) build on this to highlight a general interface between processes of conservation and extraction more broadly, thus linking not only ecotourism but other strategies to facilitate conservation with processes of resource exploitation including mineral, hydrocarbon, and timber extraction. While these are often considered separately from large-scale agricultural production (by e.g., Bakker, 2009), in our use of the conservation-extraction nexus analytic herein we also include the latter. Consequently, we introduce the term “production-protection nexus” to better capture our aim to unite all of these different processes under a common conceptualisation.

4. Uneven geographical development

We combine this focus on the production-protection nexus with exploration of how it plays out at multiple scales, not only within but also across geographical contexts. To do so we draw on an uneven geographic development (UGD) approach. As a main source of inspiration for this approach, world-system theorists have long conceptualized capitalism as a relatively coherent world-economy that has progressively expanded throughout the globe over the last 500 years (Wallerstein, 1974; Arrighi, 2009; Frank, 2011). Positions within this world-system are typically divided into three categories – core, periphery and semi-periphery – with respect to polities’ relative status as sites of either capital accumulation or resource extraction. Central to this form of analysis, however, is the understanding that different polities’ place in the world-system is not inexorably fixed but may shift over time as one centre of accumulation is replaced by another and other polities reshuffle in relation to this upheaval. Despite such shifts, theorists assert that the overarching world-system attains ever greater integration and global reach as it expands over time to incorporate new spaces and resource frontiers.

Analysis from the perspective of UGD complements world-system theory by highlighting the dynamics intrinsic to capitalist accumulation that drive this expansion and the way it differentially impacts disparate places around the globe. While UGD has been approached from various perspectives, the most prominent, closely associated with geographers Harvey (1989) and Smith (2010), understands capitalism as a particular mode of production and exchange driven by an imperative to perpetually accumulate. This continual movement and expansion of capital in quest of profit thus drives the process of UGD, wherein certain places become sites of capital accumulation while others become sites of extraction of both labour power and natural resources as their value is appropriated for accumulation elsewhere. In aggregate, these opposing forces combine to produce “a patterned internal differentiation of world space” (Smith, 2010: 140).

In relation to the production-protection nexus, this discussion of UGD across scales helps to explain Weinzettel and colleagues’ (2013) analysis of the impact of international trade on patterns of resource use within particular societies. Worldwide, the authors document a “net displacement of land use from high-income to low-income countries”

amounting “to 6% of the global land demand” (2013: 433). For lower-income countries, Weinzettel et al. conclude, such displacement for “export production causes important pressures on land use and thus biodiversity” (2013: 436), while, conversely, increased reliance on imports for domestic resource consumption allows higher-income societies to “spare more land for nature” (2013: 433). In other words, within wealthier countries “conservation of natural landscapes involved a shift in the trade of agricultural and forestry products towards a larger net displacement, partially offsetting the gains of domestic nature protection through increased use of nature in other countries” (2013: 436; see also Meyfroidt et al., 2010). When viewed through the lens of UGD, this analysis highlights the important influence of the production-protection nexus globally in understanding how it also plays out within particular national and/or local contexts.

A reverse form of displacement has also been evident. The history of conservation reveals that the global expansion of spaces for wildlife protection beyond their historical centers in North America and Western Europe was initially in large part a response to pressure from actors based within these historical centers (Igoe, 2004; Kashwan et al., 2021). Thus, dozens of protected areas were established throughout Sub-Saharan Africa and other regions in the course of European colonization as well as via the continued influence of prominent Western conservation organizations during the postcolonial era (Mbaria and Ogada, 2017; Collins et al., 2021). This both freed up space for more “productive” land use in the historical centers and provided spaces to which western elites could escape the perceived constraints of life within industrialised society through travel to lower-income societies to practice nature-based tourism within conservation spaces there (as well as within settler colonial societies themselves) (Fletcher, 2014). A global perspective therefore helps to understand the relationship between processes of resource protection across spaces and scales too.

5. Transformations to sustainability

We situate this analysis within growing discussion of the need to transform conservation policy and practice more generally to effectively address the mounting global biodiversity crisis (see Massarella et al., 2021; Visseren-Hamakers and Kok, 2022). To date, this discussion has been dominated by positions emphasizing what O’Brien et al. (2013) call “circular” transformation, “whereby new things are tried, but within the same hierarchies of knowledge and power” (Massarella et al., 2021: 82; see also Kareiva et al., 2011; Wuerthner et al., 2015). Increasingly, however, a range of conservationists assert that this is inadequate to address the daunting problems confronting us, and that what is needed is more radical “axial” transformation (O’Brien, 2013) aiming to transcend “the status quo by questioning the entire system” (Massarella et al., 2021: 82; see also IPBES, 2019; Wybord et al., 2020). The need for axial transformation is also a growing emphasis within the sustainability transformations literature more broadly, which has thus far similarly tended to emphasize working within existing political-economic structures rather than questioning whether genuine sustainability could ever be achieved within these (see Scoones et al., 2020; Feola et al., 2021). In particular, Feola and colleagues point out, existing transformations research has “foregrounded the construction (making) of novel socio-ecological relations,” thereby overemphasizing “the emergence of novelty and undertheorized the deconstruction and disarticulation of existing socioecological configurations” (2021: 2). Yet as the authors emphasize, available “research suggests that sustainability transformation might not come about through the mere *addition* of supposed “solutions”, values or social imperatives...but rather by *subtracting* problematic existing institutions, forms of knowledge, practices, imaginaries, power structures, and human-non-human relations in the first place” (2021:2, emphasis in original) – what Feola (2019) terms a process of “unmaking” constraining structures. Our analysis herein thus responds to Feola et al.’s “call for a research agenda on sustainability transformation that is sensitive to and theoretically equipped for the

analysis of transformation as a multifaceted, multilevel process that entails the deconstruction of capitalist modernity or elements thereof” (2021: 2). By unpacking the relationship between political economy and HWI, we contribute key insights towards the confrontation and “un-making” of existing political-economic structures requisite to the pursuit of axial transformation in support of human-wildlife coexistence.

6. Methods

Data for this study were collected as part of a larger research project exploring prospects and challenges for transformative conservation governance in different sites throughout the world (Massarella et al., 2021). Specific studies were developed by particular researchers, all of whom originate from the societies in which their research was conducted. Field research in each site took place intermittently over the same three-year period (2018–2021).

In Finland, most material was collected during a 5-month period of ethnographic fieldwork in 2019–2020 in Lieksa, a municipality in North Karelia, at the eastern border of Finland (Map 1). Research entailed semi-structured interviews as well as participant observation in formal events and informal settings. Informants included hunters, hunting dog breeders, conservationists, agricultural producers, eco-tourism operators and other people active in their communities. Informants represented a range of personal stakes in wolf conservation, from people who had themselves lost domestic animals to wolf predation, to individuals who had no personal interest in the issue. They were selected via a combination of snowball sampling with criteria to ensure high variation, and purposive sampling from known local organisations and institutions.

The Tanzanian case study focused on the Ruaha-Rungwa landscape in southern Tanzania (Map 2). In multiple field visits over the three-year project, the researchers conducted key informants interviews with

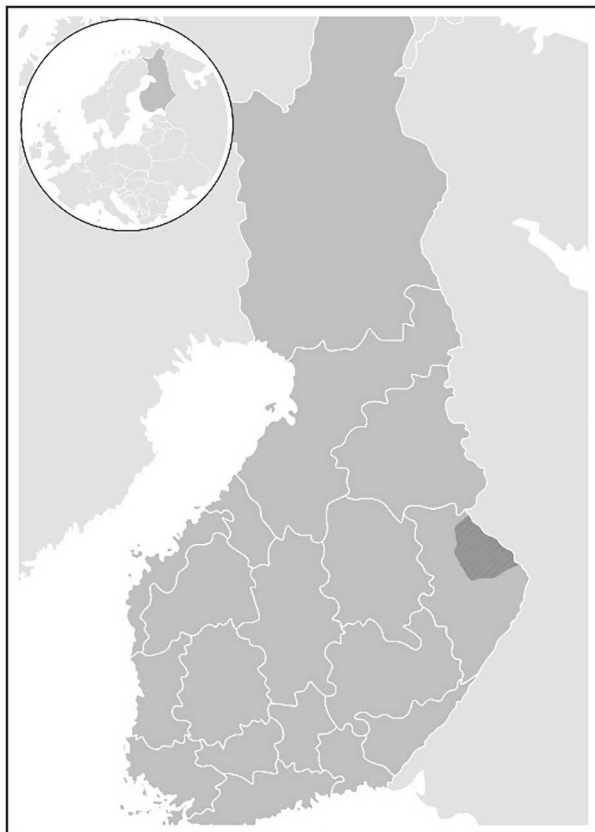
government officials, community conservation officers from the core conservation areas, village leaders and the district game officer. Additionally, the researchers undertook field observations as well as content analysis of scientific articles, government documents and donor reports detailing conservation policy and planning in the field site.

Our Brazilian research focused on two specific areas in the Brazilian Atlantic Forest (BAF) (Map 3). The first is the Parque Nacional do Iguaçu (PNI; Iguaçu National Park), located in the western frontier of Paraná. The PNI encompasses the internationally renowned Iguazu waterfalls and is the main focus of the jaguar conservation network in the BAF (Franco et al., 2018; Marchini et al., 2021). The second study area, the Serra do Mar Biodiversity Corridor (SMBC), is the envisioned connection among the biggest fragments of BAF in the province of São Paulo. The research was developed in partnership with the National Institute for Carnivore Conservation (CENAP/ICMBio), the Manacá Institute, an NGO working on inclusive conservation in the BAF, the project “Onças do Iguaçu” (the biggest project specifically working on Jaguar conservation in the region), and researchers dedicated to jaguar conservation. This group of partners first performed a stakeholder mapping exercise to identify groups for collaboration and inclusion in the research. Collectively, the working group then used the resulting maps to identify appropriate stakeholders for further study. The resulting research entailing semi-structured interviews with these key stakeholders as well as participant-observation in conservation activities conducted by them. This was complemented by collection of secondary data on environmental conflicts involving biodiversity conservation in the areas of focus.

These three sites were selected for the comparative insights they can provide into the dynamics under investigation. The cases represent a range of contrasting dynamics. First, they exist within societies generally considered to occupy different positions within the overarching world-system: core, in the case of Finland; semi-periphery, for Brazil; and periphery, for Tanzania. Secondly, the wildlife species central to each case also differ in their behavioral specificity. In addition to contrast, the three cases exhibit important similarities too. For one, they all occupy rural areas where direct interaction between humans and wildlife is most common. Additionally, the key wildlife species in each case is a large predator that requires a large roaming range and is seen to compete for resources with people. Consequently, analysis across the cases allows for comparison and contrast of the influence of political-economic conditions in relation to a wide range of societal, geographical and ecological variables. The three cases also concern spaces of different size (one specific municipality in Finland; a larger region comprising multiple communities in Tanzania; and an even more extensive landscape along the Brazilian coast) in order to illustrate the different degrees of specificity at which the sort of analysis we model herein can be conducted.

In all cases, research focused on the causes and consequences of dominant patterns of interaction between humans and apex predators as well as the perceptions and attitudes of the former about the latter. To facilitate comparative analysis across sites, research within each was guided by a common analytical framework focused on investigating influences on patterns of HWI spanning five interconnected dimensions: 1) environmental; 2) institutional; 3) political-economic; 4) cultural; and 5) behavioural. The analysis developed in this paper focuses on dimension 3 in particular. This is not to suggest that it is more important than the other dimensions, which will also be elaborated further in subsequent papers.

While empirical research in each site was conducted independently, all researchers remained in close contact with one another and the overall project team, enabling real time communication of preliminary findings and areas of inquiry for planning subsequent investigation. Following completion of fieldwork, all of the researchers involved in this study engaged in a series of interactive workshops (held online due to COVID-19 restrictions) to present and compare overall findings and develop the subsequent analysis.



Map 1. Finland study site.



Map 2. Tanzania study site.

7. Results

7.1. Finland

Lieksa municipality comprises 11,000 habitants sprawling over 4068 km². The population has diminished by about half in the past 40 years. Most remaining working-age residents work in public administration, services and small to middle-sized industries, while around 10% continue full-time in more traditional livelihoods entailing forestry and agriculture (Pohjois-Karjalan maakuntaliitto, 2020). Wolves have always lived in the area, yet by the end of the 19th century they were nearly eliminated due to an intentional programme of eradication by the Finnish state, during which wolves were demonized as a major threat to human lives and livelihoods disproportionate to the actual damage they caused (Komi and Kröger, 2022). Yet after Finland joined the EU in 1995 and wolves were declared endangered and fully protected by a habitats directive (Council Directive 92/43/EEC), in the past 10–15 years a small but more permanent wolf population has returned to the Lieksa area, numbering between 2 and 4 packs today.²

The majority of Lieksa residents included in our research are indifferent to the existence of wolves, while others regard the animals' conservation favourably. Yet sightings of wolves and their tracks, as well as occasional attacks on domestic animals, provoke public debate and negative uproar in the grassroots discussions colloquially called "*katu-parlamentti*" ("street parliament") as well as in social media. In these public spheres, opposers of wolf conservation are very vocal, giving the

impression of representing widespread interests even though they represent a fairly small group. In the interviews, the tension between those opposing wolf protection and those accepting the animals' return was evident. Vocal wolf conservationists are often ostracised and retaliated against in Lieksa and neighbouring municipalities: in the most extreme instances, properties have been vandalised by breaking windows and contaminating wells with sewer sludge, and on multiple occasions known conservationists' dogs have been killed.

The two main groups affected by wolves are livestock producers and hunters. Although much of the literature on HWC focuses on economic losses suffered by individual residents (Dickman et al., 2013; Marchini, 2014; Dondina et al., 2015; Fabbri et al., 2018; Herzog, 2018; Zimmermann et al., 2005), in North Karelia material damages caused by wolves are rare. Losses are compensated in full by the state, and the total amount of compensations paid outside of the reindeer management area in Finland in 2018 was 150,000 Euros (Maa- ja metsätalousministeriö, 2019). However, livestock producers, most of whom operate on a small scale, experience stress whenever there are wolf sightings near their farms. They do not wish to "raise food for wolves", while damage prevention also increases their workloads. An even bigger source of conflicts are yearly hunting dog losses: around 5–10 dogs are attacked by wolves each hunting season in Lieksa. The number is high enough for all of the hunters in Lieksa to personally know several people who have lost their dogs. These losses are compensated through government payments, but the value of years required for training is unquantifiable, and money does not compensate for emotional loss. Hunting dogs are often described by hunters as members of the family, and for many of the interviewed hunters one of the foremost reasons for hunting is to be able to train and work together with the dogs, whose development and enjoyment brings great joy to their handlers.

² In the reindeer management area, wolves belong to a different annex of the EU directive, and criteria for getting killing permits is more lax.



Map 3. Brazil study site.

A pervasive feature of these conflicts is a perceived lack of governmental attention and support for mitigating local concerns. Many residents feel that their worries and needs are not considered in relation to wildlife management nor to overall livelihood conditions. The conflicts surrounding wolves are inseparable from many rural people's strong resentment towards *Helsingin herrat* – the “lords of Helsinki” – and the EU authorities, who are accused of making decisions affecting lives of residents in Lieksa and other rural areas without really listening to local people, as we recount in more detail below. These experiences are deeply embedded in the historical and current political-economic structures that frame rural livelihood opportunities and living experiences in North Karelia, commonly considered one of the most peripheral regions in Finland. The political-economic conditions also influence clashing values related to wolves between (and among) local people and nationally stated objectives, helping to explain current conflicts and antagonisms (Komi and Kröger, 2022).

Modern mechanised agriculture and forestry require large-scale investments and increased risk-taking, at the expense of investment-poor smallholders. The profitability of agriculture has decreased for decades in Finland, and, for example, the average hourly pay for dairy farm entrepreneurs was just 3.2 Euros in 2020 (Latvala and Väre, 2020), compared to the national median of over 19 Euros (tilastokeskus.fi). Interviewed dairy farmers and sheep herders described their difficulties in balancing the time that domestic animals must spend outdoors according to EU regulations, and making sure animals are safe from predators as snow and vegetation often complicate the functioning of electric fences. Farmers and livestock producers feel a deep sense of betrayal since Finland joined the EU and the preconditions of their livelihoods became controlled by Finnish authorities' strict interpretations of EU directives. Consequently, the same technological

developments that facilitate wolf and other species conservation within the larger society (Bruskotter et al., 2017), often simultaneously increased precarity for those earning their living from agriculture or forestry.

Moreover, as an outcome of outsourcing primary production to cheaper, more peripheral areas, livestock production in the EU today relies on imported soybean for feed (Karlsson et al., 2021). Thus, one of the conditions facilitating the return of a permanent population of wolves in Finland is the externalisation of production of certain products. This has reduced the role of agriculture as a source of living in North Karelia, and thereby generated more indifferent attitudes towards predators.

Finland's position within the overarching world-system also influences HWI through processes that turn “nature” into natural resources for export. The importance of commercial forestry in the economic development of Finland after World War II led to centralized state control over the industry, and eastern Finland with its abundant forests became a special resource frontier for the country's development (Borg, 1992; Kuisma, 1993; Raitio and Rannikko, 2006). In the 1950s, 90% of Finnish exports were forest products; today they still comprise around 10% of all exports (Söyrinki, 1954; Borg, 1992; Kuisma, 1993; metsäteollisuus.fi).

In Lieksa and similar rural areas, the structural transformations described above have resulted in feelings of societal alienation, loss of control, and of being left out of the economic gains perceived to be enjoyed by the “city-elites” and large-scale forest industries. Rural livelihoods have been forced to repeatedly adapt to the drastically changing conditions of global capitalism, which causes feelings of bitterness and exhaustion, as people try to earn their living and modify their lifeworlds and livelihoods within changing political-economic

conditions and altered landscapes.

7.2. Tanzania

The Ruaha-Rungwa landscape comprises several protected areas (PAs) under different management regimes. These include national parks (Ruaha), game reserves (Rungwa, Muhesi, and Kizigo), a game-controlled area (Lunda Mkwambi), and wildlife management areas (WMA) such as Idodi-Pawaga and Waga. Together, these PAs harbour around 10% of the world's total remaining lion population, making the landscape a vitally important focus of global lion conservation (Dickman et al., 2014). Yet this conservation has also precipitated substantial conflict between lions and local residents. Historically, humans and wildlife coexisted within the landscape before people were subsequently evicted to pave the way for creation of Saba Game Reserve in 1910 and the current Ruaha National Park in 1964 (Barnes, 1983; Dickman, 2009). Resettlement of people outside the PAs thereafter led to increased human pressure on the edges of the landscape (Barnes, 1983), with increasing conflicts between humans and wildlife, particularly large carnivores (Dickman, 2015; Hariohay et al., 2020). Livestock depredation by large carnivores, particularly lions but also leopards, cheetahs, wild dogs and spotted hyenas, comprising 792 cases between 2012 and 2019 alone, has been shown to cause economic losses of up to 18% of herders' annual income (MNRT, 2020). Lions are reported to attack and injure people too, being responsible for 60% of all wildlife attacks on humans and those most likely to result in human death (MNRT, 2020; Dickman, 2009). This has led to retaliatory killings of lions and other species that contributes to the predators' decline; in one 18 month period, for instance, more than 35 large carnivore killings were recorded in just 3 villages (Dickman, 2009; 2015).

In our study site, lions are ranked second after spotted hyenas in terms of livestock depredation (Ibid). They usually carry out attacks on livestock corrals during the night (Kissui, 2008; Dickman, 2009). Generally, perceived costs (livestock lost, avoidance behaviours and threat to human life) of living alongside lions are estimated to be around US\$ 180 per person per year in agro-pastoral communities such as those in our study area (Jacobsen et al., 2022). Research thus shows that antagonism towards the protected areas due to perceived lack of benefits and restricted use by local communities forms a significant underlying cause of HWC (Dickman, 2015). Efforts to encourage coexistence, such as via payments to encourage coexistence (PEC), are common in the area, particularly in relation to large carnivores (Dickman et al., 2011). On the other hand, the landscape is increasingly integrated into the overarching world-system via intertwined processes of: (1) production fuelled by national plans for improved food security, multinational agribusinesses and development partners' interests for agricultural intensification; and (2) protection of wildlife ecosystems for tourism and global efforts to address biodiversity loss. This increasing integration calls for novel approaches to understanding the complex political-economic forces that shape HWI, beyond local ecological factors.

Communities occupying the landscape comprise smallholder farmers who engage in both agricultural and livestock keeping as their economic mainstay. Livestock keeping is practiced mainly by pastoralists and agro-pastoralist ethnic groups that have immigrated into the landscape from northern and northwestern Tanzania. These include the *Maasai* and *Barbaig*, who are predominantly pastoralists, and the *Sukuma*, who are agro-pastoralists (Dickman, 2009). These groups are regular participants in HWC, due to their frequent movements from one area to another with their cattle, and their proximity to the core PAs. *Barbaig* pastoralists were forced to move into the landscape following dispossession of their land by the predominantly agro-pastoralist *Iraqw* people (Dickman, 2009). State appropriation of *Barbaig* land to allow for large-scale wheat cultivation through the Tanzania Canada Wheat Programme in the 1970s exacerbated the people's expulsion and subsequent settlement in marginalized landscapes (Dickman, 2009; Williams, 2007).

In addition to local smallholders, both local and foreign investors

own large-scale irrigated farms in the Iringa district (IDC, 2013). The foreign investors own about 34% of the large-scale irrigated farms, while local investors own around 50% of the farms (religious institutions own the remaining 16%). Additionally, rice cultivation has long linked the landscape with urban dwellers in the Iringa municipality, who have relatively better access to capital and agricultural inputs than rural residents. The rice is usually sold within the district and beyond, including in foreign markets such as Uganda, Kenya, Burundi, Rwanda and the Democratic Republic of Congo (Wilson and Lewis, 2015). Intensive rice production threatens the integrity of the Idodi-Pawaga WMA as encroachment for more agricultural land and charcoal production intensifies, in defiance of the recognized WMA boundary (Kiwango, 2017). Similarly, national level policies aimed at improving agriculture and food security – such as the Southern Agricultural Growth Corridor, funded by the World Bank, UKaid, USAID, and Norwegian and Tanzanian governments³ – promote further agricultural intensification within the landscape. Moreover, these development partners engage in processes of conservation, as they fund initiatives to sustain and improve ecological integrity elsewhere in the country. For instance, Norway funds sustainable forest management initiatives (Lund et al., 2017) and USAID is a key financial supporter for WMAs (USAID, 2013).

The system of PAs traversing the landscape epitomizes the transition in the historical relationship between conservation and capitalism from a strict protectionist approach to a “flexible conservation” promoting community-based management supported by MBIs (Büscher and Fletcher, 2015). Tourism, as a main source of economic support for conservation, has long been central to this transition. In Ruaha National Park for example, tourism visitation reached 28,341 tourists pre-Covid-19 pandemic (2017/2018) generating 4.76TZS (2 million USD).⁴ After the pandemic, tourist visitation has picked up significantly to 14,199 visitations for the year 2022/2023 (March), generating 4.17 TZ (1.8USD).⁵ Lifting of the covid-19 restriction is largely responsible for the increase in tourist visitation and revenue. However, the Resilient Natural Resource Management for Growth and Tourism project (REGROW) currently implemented in the southern circuit is envisaged to contribute to more growth in tourism through the improvement of infrastructure including roads and airstrips to improve accessibility. Wildlife- and nature-based ecotourism are commonly considered “non-consumptive” uses of nature, while sport hunting is a consumptive form, involving the off-take of game. Funding for PAs largely comes from international tourism revenue, which indeed constituted almost 11 percent of Tanzania's pre-pandemic GDP and its largest source of foreign exchange (WTTC 2022).

National and international policies shape the process of tourism visitation in these areas. For example, Tanzania aims to reach 5 million tourists by 2025 (CCM, 2020).⁶ Benefits from tourism revenues have long been a contentious issue. Nelson (2012) contends that tourism benefits remain a privilege to political elites and their allies, who control access to tourism investments and shareholding in properties and developments, while creating significant barriers to rural communities accessing such opportunities through weaknesses in land tenure and property rights. Yet other sectors, such as mining, have increased their economic contribution to the region and threaten to further marginalise nature-based tourism. On the one hand, therefore, foreign development partners influence the state to increase numbers and size of PAs (cf. Koch, 2017), in part to increase tourism revenue. While on the other hand, at the same time, the government uses its resource sovereignty to

³ See <https://sagcot.co.tz/index.php/who-we-are/>; last accessed 08/07/2022.

⁴ 1 USD=2,356TZS.

⁵ Ruaha National Park visitation and revenue statistics, 2023.

⁶ Meanwhile, the Covid-19 pandemic has affected international tourist arrivals and hence a decline in revenues for the sector and its overall contribution to national GDP.

promote mining as an important land use for revenue generation and national development.

These economic activities have changed over time in response to national and international policies. During the colonial era, local people were widely dispossessed of their arable land and turned into labourers in state farms. Communities resisted these injustices through various protests, such as the *Majimaji* uprising of 1905–1907 (Sunseri, 2009). After independence, the government adopted the *Ujamaa* (African socialism policy) implemented through the 1970s villagisation programmes. However, the policy largely failed and paved the way for a transition to neoliberal capitalism through adoption of structural adjustment programs in the 1980s. Neoliberalism continues to shape domestic economic policies through its logics of commodification, marketization, decentralization and privatization (Fletcher and Toncheva, 2021). These logics also influence conservation in the landscape. Even strict PAs such as national parks and game reserves follow the logics of marketization in selling their tourists “products” and in privatizing some of their services such as buildings and operation of tourist facilities. These neoliberal logics associated with PAs mostly exclude the local communities who would otherwise stand to benefit more from this potential revenue. Local people living on the edge of PAs are thus increasingly caught between processes of production and protection, both of which expand in concert to force them into competition with lions and other predators for occupation of the remaining space.

7.3. Brazil

The Brazilian Atlantic Forest (BAF) is one of the world's most biodiverse and fragmented dense tropical forest ecosystems. Originally covering more than 1,450,000 km², its deforestation started with the arrival of European colonizers 500 years ago, as forest was replaced by different commodities (e.g., sugar cane, coffee, cocoa, *Eucalyptus* plantations, cattle ranching) and urbanization (Dean, 1995). Nowadays, only 30% of the original vegetation cover remains, all located inside PAs, with 9% under strict protection (IUCN Categories I–IV) and 21% designated for sustainable use (IUCN Categories V and VI) (Rezende et al., 2018). Although deforestation processes have remained relatively stable over the last 30 years, a very dynamic process of isolation of remaining fragments is ongoing (Rosa et al., 2021). This history of disturbance led to rapid shifts in the frequency and abundance of particular animal groups (Joly et al., 2014), with severe defaunation in functional groups including apex predators (Bogoni et al., 2018). The jaguar (*Panthera onca*), the top predator of the BAF, is amongst the most critically endangered species in the BAF, with a population of fewer than 300 individuals scattered in small sub-populations (Galetti et al., 2013; Paviolo et al., 2016). Jaguars are frequently categorized together with pumas in research and conservation policy under the banner of “big cats”, since the pumas tend to occupy a similar role as jaguars as apex predators in the latter's absence and can generate similar forms of interaction with human populations.

Most of the research on human-jaguar interactions in the BAF follows the general debate in Brazil, focusing on local perceptions as drivers for conflict and possible solutions for stakeholder engagement and conservation management that could change attitudes towards jaguars to avoid killings (Conforti and Azevedo, 2003; Palmeira and Barrella, 2007; Santos et al., 2008; Marchini and Crawshaw, 2015; Engel et al., 2016; Marchini et al., 2017; Marchini and Macdonald, 2018). Two social factors are considered the main drivers of negative attitudes towards the animals: impact on livestock and impact on human safety (Marchini and Macdonald, 2018). Although fatal jaguar attacks on people are extremely rare, intentional killings are still a main source of jaguar mortality (Marchini et al., 2017), even outside cattle-ranching communities (Knox et al., 2019). While “cowfight” is much more frequent with pumas than jaguars in the BAF, conservationists predict that, once the latter's population grows, these types of encounters will probably happen more often and therefore it is considered important to pre-empt

future conflict undermining coexistence. This conflict has spurred production and translation of a significant number of manuals and policy briefs regarding compensation for jaguar predation as well as measures to diminish the latter, such as light fences and keeping cattle out of forested landscapes.

There is thus a general tendency to investigate and explain individual killings rather than to situate these within overarching political-economic processes that influence jaguar population decrease and human-jaguar conflict (cf. Engel et al., 2016; Bredin et al., 2017). Yet a broader political-economic perspective suggests that the processes previously described are embedded in deeper structures that cannot be understood separately from the historically contested landscape of the BAF. In addition to harbouring big cats, the overarching BAF is home to more than 125 million people and to the most economically dynamic cities in the country (Rezende et al., 2018). Founded upon successive commodity cycles that each drove the frontier further westwards, Brazil's predatory economic development has had a devastating impact on this forest and the people who occupy it (Dean, 1995). The succession of extensive plantations entailed the near eradication of the biome, with forest cover declining from one million square kilometres in 1500 to half that amount by the 1930s.

Around that time, consequently, efforts to foster *in situ* conservation also began to appear, initiating the protection-production nexus in Brazil. The industrialising dictatorship of Getúlio Vargas (New State – 1937/46), implemented the first Parks in Brazil, including Iguazu. On the one hand, this strategy aimed to protect what was threatened, but on the other it asserted that saving a small fraction of nature could somehow justify large scale extractive removal of the rest. This pattern continued during the subsequent decades: throughout the whole 20th century the periods of largest economic growth were also the periods when more conservation infrastructure was established. During the 1970s, for instance, the military dictatorship intensified both sides of the protection-production nexus in concert. State actions were primarily based in the so-called national-development model, the continued and widespread implementation of extractivist activities. The state of São Paulo, where the Serra do Mar Biodiversity Corridor is located, now represents more than 30% of Brazilian GDP although less than 3% of the country's territory (IBGE, 2021). Intensive cycles of sugar cane and coffee plantations since the sixteenth century have led to soil erosion, and most highly biodiverse remaining patches are in steep slopes less suitable to crops (Ribeiro et al., 2009). Conservationists report that conflicts between local residents and pumas due to predation of domestic animals have not been rare, leading conservationists to consider cowfight a main issue in a possible scenario of increased jaguar populations. Sugar cane plantations, however, are owned by large companies that appeal, paradoxically, to the protection-production nexus to legitimize their intensive use of soil, water and agrochemicals, promoting sugar cane plantations as a suitable habitat for native fauna, including the puma, and possibly the jaguar.⁷

However, conservation aiming to counter this productive expansion also expanded during this same period. The first forest code of Brazil was implemented in 1965, just one year after the coup, and the “miracle decade” was also a turning point for the implementation of PAs in the country both in number and extent. A large number of PAs in the SMBC were implemented at this stage (Felix and Fontgalland, 2021). By the 21st century, the BAF had only around 30% of its original cover mostly inside PAs or private areas strictly protected by law (Rezende et al., 2015). In this new context, the institutional structure of Brazilian environmental state agencies and the NGO sector was then better established and ecological restoration started to be seen as an opportunity, including for tourist enterprises.

Therefore, the extractivist history of the BAF and its connections to

⁷ <https://www.revistacanavieiros.com.br/projetocana-conviver-quer-proteger-onca-parda>; last accessed 08/07/2022.

efforts to protect biodiversity are fundamental to understand why there remain so few jaguars, but also why they are nonetheless seen as a key species by conservationists. This example shows that the particular way that the protection-production nexus manifests over time directly influences both jaguars' persistence and their relations to humans. Although isolation of territories and habitat loss are considered main threats to jaguar survival (Paviolo et al., 2016, Marchini and Macdonald, 2018), most research on human-jaguar interactions in the BAF does not address the historical process of territorial occupation that generated the extremely fragmented landscape within which interactions between people and the animals occur (or do not, given jaguars' diminishing numbers), and how specific economic activities within this fragmented landscape occurring at present generate greater or lesser possibilities for both coexistence and social justice.

8. Conclusion

By exploring the links between political economy and HWI in three diverse contexts, our study demonstrates the importance of attending to broader political-economic and historical factors in order to understand and influence HWI within a given context. More specifically, our comparative analysis emphasizes four key, interconnected dynamics.

Firstly, it reinforces recent research highlighting the important ways that broader political-economic forces directly influence local HWI. In Finland, conflict between people and wolves has been stoked by both the region's insertion in global commodity chains for forest products and supranational (EU) directives concerning agricultural production and nature conservation. In Brazil, dramatic expansion of urbanism, large-scale agriculture and cattle ranching for global export markets has diminished habitat for endangered jaguars and thereby increasingly forced them into conflict with local residents in competition for remaining space and resources. In Tanzania, both forces promoting large-scale agriculture interests and those promoting (market-based) conservation have exerted differential influences on interactions between people and wildlife in diverse local spaces.

Going beyond current understanding, secondly, our analysis reveals the importance of comparative research across several case studies to understand patterns of HWI at the intersection of multiple scales. Widening the political-economic lens to examine how different societies are situated within the overarching world-system demonstrates the extent to which different societies are intimately interconnected and organised via common global processes into spaces of production and/or protection. Our study has shown how Brazil's status as one of the world's most significant loci of land displacement for agricultural export to global commodity markets (Weinzettel et al., 2013) has affected conservation spaces and the jaguars they harbour. Meanwhile, intensification of commercial forestry in Finland for global timber and paper markets has afforded space for wolves, but simultaneously reduced opportunities for local residents to earn their living from agriculture or small-scale forestry and consequently strengthened urban-rural divides. By contrast, in Tanzania our analysis has shown how international pressure and funding to create and expand conservation spaces exerted by elite actors from high-income societies has in some cases reduced potential for conflict between people and wildlife, but with socially differentiated benefits and burdens. From a world-systems perspective, comparison across different cases reveals the ways that production-protection nexuses are differentially distributed in different spaces throughout the world.

Third, a UGD analysis reveals how particular places can be simultaneously both core and peripheral, depending on the scale of analysis, and how this paradoxical situation in turn affects HWI. While Finland is clearly within the core of the overarching world-system, Lieksa is in the periphery of the country itself, which helps explain its political-economic marginality and local people's contradictory valuations of wolves. Simultaneously, Finland's overall status as part of the global core facilitates and is facilitated by highly capitalised forest industry,

producing value-added timber and paper products for global markets through production networks that require high investments and intensive technologies, which paradoxically further marginalises peripheral communities like Lieksa. By contrast, while Brazil is in general considered semi-peripheral to the world-system, São Paulo is one of the country's core regions, and the convergence of these positions serves to augment productive pressure on the BAF in particular. Tanzania's Rungwa-Ruaha, meanwhile, stands as something of a double periphery (periphery within a periphery), which helps account for the substantial international attention focused on the region by both extractive industries and conservation organizations.

Finally, our analysis demonstrates the importance of a historical perspective in understanding how the production-protection nexus changes over time in relation to shifting political-economic forces. Within Brazil, successive waves of resource extraction has progressively augmented pressure on natural resources and diminished jaguar habitat from the colonial period until recently, when expansion of conservation spaces has now begun to reverse this trend to a degree. In Tanzania, by contrast, a historically dominant emphasis on securing conservation spaces from perceived threats by the subsistence livelihood pursuits of local residents has given way to multi-faceted interconnections between conservation as a form of global "green grabbing" (Fairhead et al., 2012) and renewed attention to the region by large-scale extractivism. While in Finland, intensified insertion of the region's forests into global community markets over time, and particularly since EU integration, progressively marginalizes local smallholders and fuels their sense of being less important than the wolves now protected via the same EU integration.

In sum, our research evidences the importance of directly confronting and dismantling dominant political-economic structures in pursuing axial rather than mere circular transformation in HWI governance as well as in conservation policy and practice more broadly. In the different cases of HWI explored herein, it is clear that a common factor in persistent HWC are long histories in which the lives and livelihoods of local residents are perceived to have been less valued, and subject to less support, than the interests of either large-scale extractive industries or the wildlife endangered by these industries' expansion. However, in all cases conservationists' efforts to mitigate HWC focused more on changing locals' perceptions and behaviour than addressing these larger political-economic forces posing the far greater threat to persistence of both people and animals within these spaces. This analysis thus suggests that, in addition to research concerning locals' attitudes and behaviour and interventions to change these (in a circular manner), fostering positive HWI in these and other spaces also demands a more (axial) transformative approach to rural development, entailing concerted efforts to curtail expansion of large-scale extraction and instead support local community development enabling people and wildlife to coexist.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

The data that has been used is confidential.

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