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Breaking through disciplinary barriers: Human–wildlife interactions and multispecies ethnography

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Human–wildlife interactions and multispecies ethnography

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ABSTRACT

One of the main challenges when integrating biological and social perspectives in primatology is overcoming interdisciplinary barriers. Unfamiliarity with subject-specific theory and language, distinct disciplinary-bound approaches to research, and academic boundaries aimed at ‘preserving the integrity’ of subject disciplines can hinder developments in interdisciplinary research. With growing interest in how humans and other primates share landscapes, and recognition of the importance of combining biological and social information to do this effectively, the disparate use of terminology is becoming more evident. To tackle this problem, we dissect the meaning of what the biological sciences term studies in ‘human–wildlife conflict’ or more recently ‘human–wildlife interactions’ and compare it to what anthropology terms ‘multispecies ethnography’. In the biological sciences, human–wildlife interactions are the actions resulting from people and wild animals sharing landscapes and resources, with outcomes ranging from being beneficial or harmful to one or both species. In the social sciences, human–nonhuman relationships have been explored on a philosophical, analytical and empirical level. Building on previous work, we advocate viewing landscapes through an interdisciplinary ‘multi-species lens’ where humans are observed as one of multiple organisms which interact with other species to shape and create environments. To illustrate these interconnections we use the case study of coexistence between people of the Nalu ethnic group and Critically Endangered western chimpanzees (*Pan troglodytes verus*) at Cantanhez National Park in Guinea-Bissau, to demonstrate how biological and social research approaches can be complementary and can inform conservation initiatives at the human–primate interface. Finally, we discuss how combining perspectives from ethnoprimateology with those from multispecies ethnography can advance the study of ethnoprimateology to aid productive discourse and enhance future interdisciplinary research.

Keywords: Multispecies ethnography; Human–wildlife interactions; Human–wildlife conflict; Conservation conflict; Ethnoprimateology; Primate conservation; Interdisciplinary research

Humans have presumably coexisted with nonhuman primates (hereafter primates) throughout our evolution, yet there can be little doubt that today humans and primates share landscapes to an unprecedented extent (Paterson and Wallis 2005; McKinney 2015; Humle and Hill 2016). Identifying strategies to overcome constraints to sustainable coexistence must become a priority for conservation if primates are to survive the Anthropocene (the current geological epoch of human dominance of geological, biological and chemical processes on earth, usually dating from 1945 in ecology and conservation; Corlett 2015) (Fuentes and Wolfe 2002; Hockings et al. 2015; Estrada et al. 2017; McLennan et al. 2017). To develop effective, locally appropriate strategies to conserve primates and other wildlife, it is essential to understand human social and cultural variables alongside wildlife behavioral and population patterns. This requires a combination of social science and biological science methods of inquiry (Mascia et al. 2003; Redford 2011; Jost Robinson and Remis 2014; Wolverton et al. 2014; Bennett et al. 2017a,b; Dore et al. 2017; Setchell et al. 2017). Conservation biology increasingly engages with social science, including anthropology, sociology, political ecology and psychology (Daily and Ehrlich 1999; Mascia et al. 2003; Newing 2010; Teel et al. 2018), yet interdisciplinary barriers to communication can hinder development of productive discourse (Decker et al. 1987; Fox et al. 2006; Fuentes 2006; Bennett et al. 2017b). Potential collaborations are restricted through disparate academic terminologies and use of vocabulary often understood only by those with subject-specific knowledge (Moon and Blackman 2014). In the biological sciences humans are considered part of nature in an evolutionary sense, but are traditionally viewed as separate from nature in an ecological sense (Sponsel 1997). In accordance with this perspective, until recently primatologists and other biological scientists interested in the adaptive significance of behaviors sought to study animals in so-called 'natural' environments, supposedly free of human influence. Consequently, there was less interest in the bidirectional interactions between people and wild animals, despite the fact that humans have long been a part of most ecosystems where primates and other wildlife are studied (Tutin and Oslisly 1995; Riley 2006; Hockings et al. 2015). In contrast, social scientists among other scholars in the humanities (e.g. Rose et al. 2012; Wilkie 2013; Gillespie and Collard 2015; Keil 2016), have considered the multiple possible realities perceived by diverse human communities and individuals which are shaped by religious and cultural beliefs, historical and social backgrounds, and ontological reasoning. Among human societies, people's associations with wildlife range from ambiguous species boundaries and holistic concepts of nature which unite people, plants, animals and supernatural beings to much more dualistic understandings whereby humans and

animals, including primates, are considered as very separate entities, occupying distinct spaces (Aisher 2007; Aisher and Damodaran 2016).

Ethnoprimateology has taken steps towards combining social and biological science approaches to develop a more holistic understanding of primate ecology and conservation (e.g. Sponsel 1997; Hardin and Remis 2006; Riley 2006, 2013; Remis and Hardin 2009; Fuentes 2010a, 2012; Jost Robinson and Remis 2014; Malone et al. 2014; Remis and Jost-Robinson 2017), but disciplinary barriers persist. To tackle this problem, we examine differences in the meanings of some commonly used terminology in the biological and social sciences. Specifically, we dissect the meaning of what the biological sciences (including primatology) term studies in ‘human–wildlife conflict’ or more recently ‘human–wildlife interactions’ (e.g. Woodroffe et al. 2005; Hockings 2016; Humle and Hill 2016) and compare it to what the social sciences term ‘multispecies ethnography’ (e.g. Haraway 2008; Kirksey and Helmreich 2010). Using examples from ethnoprimateology we highlight the ‘distinct’ approaches of biological and social science and discuss how combining them can enhance our understanding of shared landscapes and advance research at the human–primate interface. As we demonstrate using research examples below, the distinction between these two approaches is increasingly blurred as biologically-trained scientists seek qualitative nuance, and as socially-trained scientists seek quantitative data on the non-human agents living among and influencing the behavior and lives of their human neighbors (Rust et al. 2017). We then critically interrogate a number of key concepts and advocate for an integration of multispecies approaches with ethnoprimateology (Fuentes et al. 2010a; Malone et al. 2014; Remis and Jost-Robinson 2017; Palmer and Malone 2018). Finally, we illustrate these links using a case study of coexistence between people of the Nalu ethnic group and Critically Endangered western chimpanzees (*Pan troglodytes verus*) at Cantanhez National Park in Guinea-Bissau, West Africa, to demonstrate how disciplinary theories, descending from biological and social science, can be combined and applied practically through interdisciplinary research approaches.

Biological sciences: Recognizing the value of social science to conservation

Biological approaches to understanding human–wildlife interactions and ecological relationships are grounded in the disciplines of behavioral ecology and conservation biology, originally the domain of ecologists and

zoologists. Behavioral ecology is concerned mainly with the causes, evolution, and adaptive variation in behavior of individuals, whereas conservation biology has an interest in populations, especially their response to disturbance or environmental changes caused by humans (Caro and Eadie 2005; Sih et al. 2011). Using principles from ecology, population genetics and systematics, conservation biology seeks to describe biological diversity and identify ways to conserve species and ecosystems (Simberloff 1988; Mascia et al. 2003). In the biological and conservation sciences, there has been a predominant focus on the ways in which wildlife ‘conflict’ with the interests of humans (Treves and Karanth 2003; Paterson and Wallis 2005; Messmer 2009; Angelici 2016), often with a goal to identify general ‘large-scale’ trends in the nature of interactions (e.g. Inskip and Zimmerman 2009; Seoraj-Pillai and Pillay 2017). For the last 20 years or so some primatologists (especially those who received their training within Anthropology departments), and some biologists, have approached human–wildlife interactions as dynamic and bidirectional (e.g. Wheatley 1999; Fuentes and Wolfe 2002; Redpath et al. 2013; Humle and Hill 2016; Hurn 2017; McLennan et al. 2017), though this remains a minority approach. While identifying large-scale trends is important, ‘small-scale’ site-specific data are also needed to fully understand the diverse ways in which humans and wildlife interact in shared heterogeneous landscapes (Hockings 2016). Today, conservationists increasingly recognize that the success of conservation policies and practice inherently depends on understanding and addressing human social phenomena (Berkes 2004; Redford 2011; Redpath et al. 2013; Bennett et al. 2017b), and where conservation interventions pay inadequate attention to social factors they fail to conserve target species and ecosystems (e.g. Rönnbäck et al. 2003; Agrawal and Redford 2006; McLennan and Hill 2013; Rust et al. 2016).

Social science disciplines include subjects such as anthropology, psychology, sociology, politics and international studies, and therefore have analytical tools that explain and predict patterns of human behavior and attempt to find meaning behind cultural or subjective phenomena. These offer unique and important insights into a given society’s understanding of their associations with wildlife, which has strong relevance for conservation practice and outcomes (Mascia et al. 2003). For example, social and cultural anthropology methods of inquiry can document the spiritual value of biodiversity to people. In primatology, this can be applied to identify conservation-relevant cultural beliefs and values that serve as foundations for formal regulations that protect primate species and habitats, or help guide locally-appropriate conservation initiatives (Wheatley 1999;

Köhler 2005; Jones et al. 2008; Hardin and Remis 2009; Etiendem et al. 2011; Yamakoshi and Leblan 2013; Baker et al. 2014; Jost-Robinson and Remis 2014). While government and nongovernmental organizations increasingly take steps to integrate social science information into conservation decision-making and long-term environmental management, success is still hampered by economic and institutional challenges. These include conflicts between stakeholders, inadequate financial support for local monitoring and governance (Sandker et al. 2009), and legal frameworks (specifically tenure and economic laws) which can present significant constraints to the longevity of such interventions (Pasquini et al. 2011). Barriers to effective collaboration and understanding between social and biological scientists and conservation practitioners further impede these developments (Fox et al. 2006).

Social Sciences: Embracing the complexity of human–animal relationships

Anthropologists have repeatedly challenged environmental discourse that over-simplifies the complex relationships between humans and nonhuman species (e.g. Descola 1994; Atran 1999; Ingold 2000; Kohn 2007, 2013). Some of the earliest scientific studies addressing the intersection between biology, culture and sociality originate in the discipline of ethnobiology. Ethnobiology encompasses botany, zoology and ecology, and is broadly defined as the study of how living things are treated or used by different human cultures (Ellen 2006). While ethnobiology once focused largely on studies of folk classification (Conklin 1954; Bulmer 1967; Hunn 1977; Ellen 2006), today it is recognized essentially as the study of how people from different cultures conceptualize, represent, use, and manage their knowledge of environments and living organisms. As Ellen suggests, “ethnobiology – like anthropology more broadly – seeks to go beyond the local, to compare such knowledge and its consequences between different human populations, and to establish generalizations that are valid at the regional, global, and species level” (2006: 3).

There has been a proliferation of interdisciplinary terms and fields of study by anthropologists, sociologists and human geographers particularly, as they explore ways of incorporating nonhuman species into social science research. From Lestel’s ‘ecoanthropology and ethnobiology’ (Lestel et al. 2006; Lestel and Taylor 2013) to Haraway’s (2010) ‘companion species’ researchers have endeavored to develop innovative frameworks for conceptualizing relationships between human and nonhuman species. For example, ‘anthrozoology’ draws

from various disciplines including anthropology, psychology and zoology to examine human–animal relationships in relation to animal representations, symbols and stories, and their physical presence in human societies (York and Mancus 2013). Meanwhile, ‘zooanthropology’ explores relationship dynamics between humans and animals with a focus on animal sentience and wellbeing (Aerts et al. 2016; Marchesini 2016). As the name suggests, ‘ethnoethology’ explores the methodological overlap of ethnology and ethology, examining the characteristics of different peoples and their relationships with animals and ecosystems (see glossary of terms for further examples). Early examples of interdisciplinary research in primatology include the work of Barbara Smuts and Shirley Strum whose accounts of baboon groups in Tanzania and Kenya transgress the positivist norms of ethology as an observational science (Strum 1987; Smuts 2009; Despret 2013). Although these fields of study adopt differing perspectives, they offer useful methods for overcoming nature–culture duality and have been used to examine human–primate interactions and social representations of primates (for examples with African great apes: Richards 1995; Köhler 2005; Giles-Vernick and Rupp 2006; Lingomo and Kimura 2009; Oishi 2013; see also Jost Robinson and Remis 2014). Such studies provide insights into local understandings of nature that are highly relevant to establishing locally appropriate conservation practices. For example, interdisciplinary studies have revealed how Western-dominated ideals versus local perceptions of wildlife influence support, or lack thereof, for conservation (Jalais 2008), and how the choice of conservation flagship species needs to be appropriate to the target audience, taking into account local attitudes towards, beliefs about, and experience of local species (Sousa et al. 2017a).

Ethnoprimateology as an interdisciplinary study

Traditional Western primatology (compared to Japanese primatology; Asquith 1986 and de Waal 2001 provide comparisons of the two) has strived to adopt an objective view of the biological and psychological similarities between humans and primates. In contrast to the approach of traditional field primatology, ethnoprimateology aims to acquire an anthropological understanding of primates through examining their associations with human cultures and societies (Sponsel 1997; Fuentes and Wolfe 2002; Paterson and Wallis 2005; Papworth et al. 2013). Ethnoprimateological research employs mixed-methods and embraces a multidisciplinary theoretical perspective to examine the multifarious interactions and interfaces at integrated and shared ecological and

social spaces (Sponsel 1997; Fuentes 2012; Hockings et al. 2015). The goal of many ethnoprimateology studies is to engage with the needs of local human populations to enhance primate conservation and ensure the longevity of conservation projects by understanding the biological and social dynamics between humans and primates (Wheatley 1999; Cormier 2010; Lee 2010; Fuentes 2012; Riley 2013; Papworth et al. 2013; Jost Robinson and Remis 2014; Malone et al. 2014). The ethnoprimateological approach is described by Fuentes and colleagues as “a mosaic of approaches that is developing, and reshaping, the ways in which humans position themselves relative to nonhuman primates (NHPs), and the ways in which NHPs are seen as agential in human-dominated landscapes, ecologies, and lifeways” (2017: 297). Social anthropologists have sought similar understandings of human–primate relationships. For example, ethnographic studies of traditional people’s understandings of African great apes incorporate local knowledge systems into conservation narratives (Richards 1995; Köhler 2005; Giles-Vernick and Rupp 2006; Lingomo and Kimura 2009; Etiendem et al. 2011; Oishi 2013). As with other interdisciplinary approaches discussed above, ethnoprimateology demonstrates an epistemological affinity between biological and sociocultural anthropology by acknowledging humans as active and integral members of biological communities (Riley 2006, 2010, 2013; Leblan 2013).

Growing enthusiasm for the ethnoprimateology approach, and recognition among conservation funding agencies that (for ethical and practical reasons) conservation in most instances is unsuccessful without integrating the needs of local people, has encouraged recent developments in primatology. The predominant emphasis on conflict and competition in studies of human–primate interactions (Paterson and Wallis 2005; McLennan et al. 2017) is gradually giving way to a greater appreciation of the complexities of these relationships, including ‘positive’ interactions (Frank 2016). For example, research at Bossou in the Republic of Guinea, showed how consumption of cultivated cocoa by western chimpanzees, and subsequent dispersal of seeds, led to the widespread distribution of cocoa plants in the habitat, benefitting both local farmers and chimpanzees (Hockings et al. 2017). In parallel, there have been calls for a linguistic shift in how human–primate interactions are framed and described (for example, from ‘crop raiding’ with its aggressive connotations to a more neutral ‘crop feeding’ or ‘crop foraging’; Hill 2015, 2017; Hill et al. 2017). It is now broadly accepted that humans are key components of ecosystems where primates live (Fuentes and Wolfe 2002; Hockings et al. 2015; McKinney 2015; McLennan et al. 2017). Rather than viewing human communities and practices as uniformly damaging to natural habitats, the traditional methods that local people have used and adapted over millennia to manage

and monitor landscapes are increasingly acknowledged as potentially useful foundations for developing practical conservation strategies (Berkes et al. 2000; Thompson et al. 2008; Yamakoshi and Leblan 2013).

Studies examining the social constituents of primate conservation have revealed that people's views of primates are influenced by political, social and economic factors, which are not fixed but change over time (e.g. Hill and Webber 2010 in Uganda; Parathian and Maldonado 2010 in the Colombian Amazon). Other studies demonstrate how unique belief systems and human–primate associations can support protection of primate species (e.g. Wheatley 1999 and Fuentes et al. 2005 for long-tailed macaques (*Macaca fascicularis*) in Bali; Riley 2007, 2008, 2010; Riley and Priston 2010; Riley and Fuentes 2011 for Tonkean and booted macaques (*Macaca tonkeana* and *Macaca ochreata*) in Sulawesi). For example, a study by Etiendem and colleagues discusses how traditional totemic beliefs about Cross River gorillas (*Gorilla gorilla diehli*) in southwest Cameroon can be revived and promoted to foster positive attitudes to gorilla conservation (Etiendem et al. 2011). While significant progress has been made in the field of ethnoprimateology, further developments are essential in terms of primatologists adopting mixed epistemologies and methodologies. Moreover, until recently there have been few sources of funding available to provide graduate training to link disparate fields or offer financial support to projects that study complex interactions through interdisciplinary concepts and practice (Palsson et al. 2013; Fuentes et al. 2017).

Barriers to inter-disciplinary communication

Recognizing that conservation is as much about people as about other species and habitats requires significant modifications to how science is used and applied in conservation. Bennett and colleagues (2017b) outline major barriers to the meaningful integration of social science into conservation science, stemming from unfamiliarity with subject-specific principles, limited collaboration, and academic boundaries aimed at 'preserving the integrity' of subject disciplines. Academic researchers are usually trained in traditional disciplines and may lack the tools or willingness to make bridges between fields. They may have differing "theories of knowledge", including their philosophies, worldviews and epistemologies, which can lead to incompatible ways of perceiving human–wildlife interactions or approaching research into these phenomena (Moon and Blackman 2014; Rust et al. 2017). For example, in a study exploring the environmental impacts of deforestation the social

scientist may begin by talking to people in a local village to understand the effects on human behaviour, while the natural scientist may begin by exploring ecological indicators (Bennett et al. 2017b). Furthermore, discipline-specific language and the different theories applied to understand particular topics can be inaccessible to nonspecialists or specialists in other subjects. Issues of familiarity with the diverse literature and associated nuances in language can present additional obstacles (Lemke 2001), while subject-specific discourse used by social scientists and biologists presents boundaries to cross-disciplinary collaboration. The language used by social scientists can be intentionally ambiguous, to reflect alternative worldviews of cultures which oppose Western dichotomized notions of nature (Kohn 2007; Descola 2014), and/or to challenge preconceived ideas and assumptions about the world which characterize a Western scientific approach. For these reasons, biological anthropologists trained to be objective, realist and positivist in their research approach, can find these concepts difficult to grasp. They may view social studies as too time-consuming (when conservation decisions often need to be made rapidly), or vague and ‘esoteric’. Conversely, social anthropologists tend to consider biological methods as overly pragmatic and rigid in their application (especially as real-world problems are complex). This can lead to important but not immediately visible information being overlooked. The core beliefs and ideas of these disciplines can appear so different, that biological and social scientists have been said to come from different ‘academic *cultures*’ (Morris 1969; Sutherland 1998; see glossary). This may indeed be true, but as Kohn reminds us: “The goal [in multi-species ethnography] should not just be to give voice, agency or subjectivity to the nonhuman—to recognize them as others, visible in their difference—but to force us to radically rethink these categories of our analysis as they pertain to all beings [March 29, 2010]” (in Kirksey and Helmreich 2010: 563).

In biological anthropology sympatric species are viewed as individuals engaged in bidirectional dyadic relationships, that meet temporally or have some impact on each other’s lives, for example by affecting the availability of certain resources or shaping forest habitats in certain ways. These ‘human–wildlife interactions’ result in either positive or negative outcomes for one or both species. By comparison, in social anthropology humans and wildlife (including nonhuman organisms broadly) are considered as close companions (Haraway 2010, 2016), innately and immutably linked through complex ecological, historical, social, cultural and political networks; for examples, see Locke’s (2013, 2017) exploration of human–elephant relations in Asia, and

Jost Robinson and Remis's (2014) analysis of the mutual ecologies of 'the hunter and hunted' in Central Africa. These ideas describe the long-term mutual exchange and emergence of human and nonhuman companions including other primates.

In the social sciences the term 'multispecies ethnography' refers to a methodological approach and theoretical perspective proposed to enable the understanding of habitats as 'multispecies landscapes' (see glossary). Multispecies ethnography introduces a post-humanist perspective which deconstructs the 'humanism' of landscapes. It recognizes that 'other-than-humans' exist, and explores human social and cultural phenomena with respect to people's relationships with other species through a network of interspecies encounters. Kirksey and Helmreich's (2010) proposal for a 'multispecies ethnography' has gained considerable support as it allows broader manifestations of nonhuman organisms to appear alongside humans as animated beings (Lestel and Taylor 2013; Baynes-Rock 2013). Multispecies studies perceive nonhumans acting with 'agency and intent' (see glossary), while some definitions draw on understandings from Actor-Network-Theory that considers agency as an effect rather than the product of subjective intentionality (Ogden et al. 2013 provide a detailed explanation) (Locke 2017). In this perspective, "creatures previously appearing on the margins of anthropology – as part of the landscape, as food for humans, as symbols – [are] pressed into the foreground of recent ethnographies" (Kirksey and Helmreich 2010: 545). Similar ideas have been described as "a more-than-human approach to ethnographic research" (Locke and Münster 2015: 1) and "an anthropology beyond the human" (Kohn 2013).

Viewing humans and nonhuman species as interacting organisms that shape and create ecosystems reflects the worldviews of many animist communities (Descola 1994; Ingold 2000, 2011; Kohn 2013). For some human groups, such as the Nyishi people of upland Arunachal Pradesh in northeast India, 'animated beings' extend to include natural entities and supernatural beings as well as living organisms (Aisher 2007; Aisher and Damodaran 2016). Therefore, approaching primate conservation through a multispecies lens and understanding habitats as multispecies landscapes not only supports the conservation of wildlife for its intrinsic value, regardless of function or value to humans (Pearson 2016), it also promotes the cultural diversity of local communities. It acknowledges alternative realities that guide a conceptual shift towards environments being

viewed and managed with respect to the ontologies of local people, which could improve the long-term outcomes of conservation initiatives (Keil 2016).

The idea that humans and nonhuman species shape environments through their interactions with each other is also explored in the biological sciences through niche construction (Day et al. 2003; Odling-Smee et al. 2013; Barker and Odling-Smee 2014) and through *natureculture* ‘contact zones’ – terms adopted from the social sciences (Fuentes 2010a; Riley and Fuentes 2011) (see glossary). In ethnoprimateology, Fuentes (2010a) employs the biological ‘niche construction model’ and theory of ‘mutual ecologies’ (Odling-Smee et al. 2003; Barker and Odling-Smee 2014) alongside Haraway’s (2008) ‘contact zones’ (see glossary) to describe the interface between tourists and long-tailed macaques (*Macaca fascicularis*) at temples in Bali. His description of ‘natureculture contact zones’ (Fuentes 2012) recognizes that broad species characteristics as well as individual idiosyncracies are both the cause and outcome of the ways in which individuals act and interact. Sympatric primate species maintain their individuality, yet their destinies are united through historical events and embedded in shared environments (Haraway 1997, 2010). In doing so, he argues that the boundaries separating humans and macaques are broken down as the overlapping ecologies of these coexisting species generate coproduced niches. Ecological interactions are incorporated alongside social, historical, political and economic drivers demonstrating that the inclusion of anthropological elements is core to primatological inquiry.

Ethnoprimateology deepens our understanding of human–primate coexistence by exploring overlapping ecologies at the human–primate interface, and integrating multispecies approaches with ethnoprimateology takes this concept a step further (Fuentes 2010a; Malone et al. 2014; Remis and Jost-Robinson 2017; Palmer and Malone 2018). Combining ideas from multispecies ethnography (such as viewing environments as *multispecies landscapes*) with terminologies already applied in ethnoprimateology (such as the coexistence of sympatric species in shared ecological and social spaces) encourages researchers to revise the way they think and talk about environments and nonhuman species. This perspective helps deconstruct deep-seated preconceptions about the ‘humanism’ of places and habitats and allows focus on the connections between multiple species (including people and primates) (Locke and Münster 2015). The case study that follows describes research carried out by three of our authors (KH, AM and HP) between January 2012 and November 2013 to explore coexistence

between humans and other primates in Guinea-Bissau, West Africa. It illustrates how combined methods and theories from ethnoprimateology and multispecies ethnography can be applied through interdisciplinary research approaches to explore the connections between humans and primates sharing ecological and social spaces, and how this information can be used to inform conservation guidelines.

A cross-disciplinary understanding of human–chimpanzee coexistence at Cantanhez National Park, Guinea-Bissau

Cantanhez National Park (CNP) is located in the southern Tombali administrative region of Cubucaré in Guinea-Bissau (Fig. 1). Covering an area of 1,067 km², the park is a mosaic of settlements, agricultural fields, subhumid and secondary forest, mangrove and savanna. Six ethnic groups live within CNP with a total human population of approximately 22,500 individuals (Temudo 2009). Historically, all ethnic groups apart from the Balanta (who adopted Christianity alongside animism) were Islamized during the late 19th and early 20th century. This led to the regional assimilation of Islamic and animist beliefs and practices (Frazão-Moreira 2009, 2010; Sousa et al. 2017b). The Nalu ethnic group was among those people who were Islamized. The Nalu practice swidden agriculture and harvest wild resources for a range of uses, and their traditional practices link spirits (*irã*) and ancestors to local territory and Nalu homeland (see Frazão-Moreira 2009, 2016b). The forests of CNP are also inhabited by western chimpanzees whose range covers part of the protected area legally recognized as Nalu homeland (including the population of chimpanzees which were the focus of our study; Hockings and Sousa 2012, 2013; Bessa et al. 2015). As occurs elsewhere in tropical Africa (Hockings and McLennan 2016; McLennan and Hockings 2016), people and chimpanzees at CNP encounter each other frequently on roads, paths, agricultural fields, and the forest, and overlap in their use of wild and cultivated resources (Fig. 2a-c) (Sousa 2009; Sousa and Frazão-Moreira 2010; Hockings and Sousa 2012, 2013). Following the formation of CNP in 2008 the Nalu maintained ownership over part of the forest and have continued to play a role in its management, including the distribution of land to incoming settlers (Frazão-Moreira 2009, 2010). Therefore, our research focused on interactions between chimpanzees and Nalu people in particular. The known complexity of factors influencing the availability and management of resources in CNP, as well as limited data on overlapping habitat and resource use by people and chimpanzees, impelled us to design and

implement a mixed-methods approach. We explored these dynamics from a multispecies perspective, combining ethnoprimateology with multispecies ethnography, which further integrates anthropological and biological approaches.

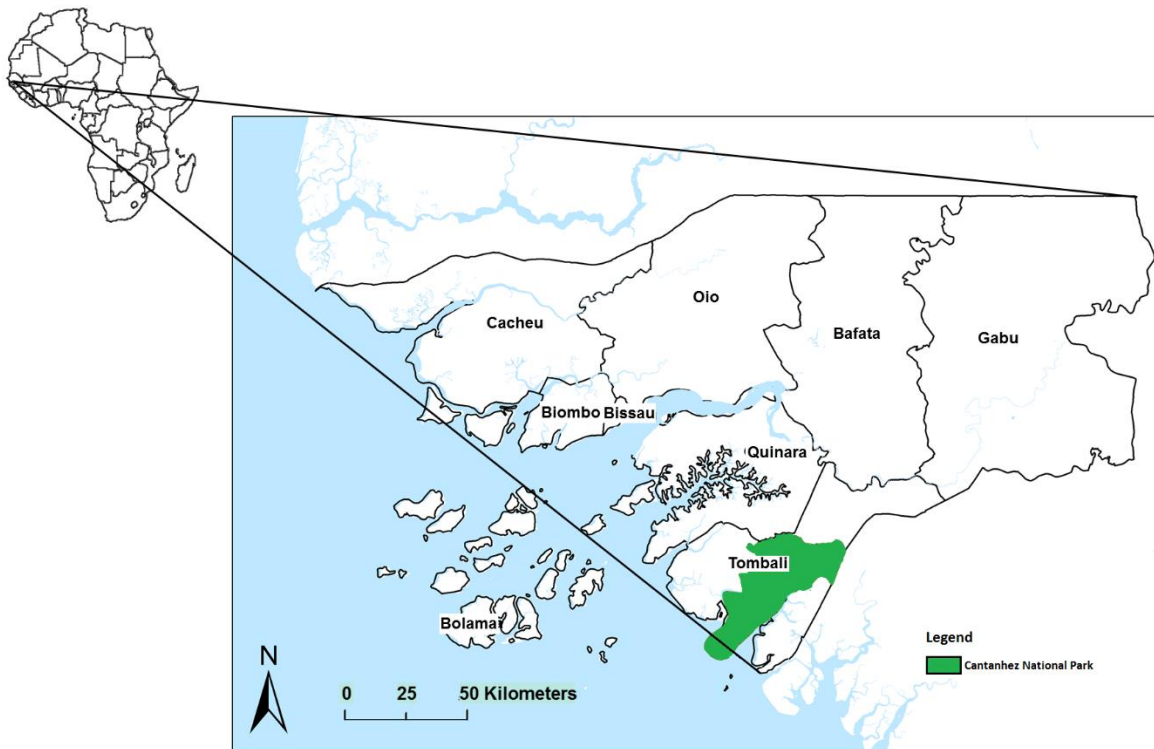


Figure 1. Map showing Cantanhez National Park in Guinea-Bissau, West Africa



Figure 2. (a) Local people and chimpanzees encountering each other on a road in Cantanhez National Park (photo by K Hockings), (b) A cyclist passing a chimpanzee that is crossing the road in Cantanhez National Park (photo by K Hockings), (c) An adult male chimpanzee transporting cultivated oranges next to the village (photo by J Bessa)

Previous studies in CNP

Previous ethnographic and botanical accounts among Nalu people have resulted in in-depth and insightful publications on indigenous plant use (Catarino et al. 2008; Frazão-Moreira 2009, 2010, 2016a,b), while ethnoprimate studies have explored Nalu relationships with chimpanzees in CNP (Sousa and Frazão-Moreira 2010; Hockings and Sousa 2013; Sousa et al. 2014, 2017a,b; Costa et al. 2017). These studies show that Nalu people have a syncretic Islamic-animist view towards animals, which combines the idea that '*dari i pekador*' ("the chimpanzee is human") and the general belief that all nonhuman species have reputed access to resources in ancestral lands, with Muslim 'aram' which prevents the killing and eating of any animal with canine teeth, including primates. The Nalu recognize the similarities chimpanzees share with humans both physically and behaviorally (e.g. "*Dari are like humans because they walk without putting their hands on the ground*" and "*They are like us. They use the same plants that we use*") (Sousa and Frazão-Moreira 2010). Other ethnographic accounts suggest Nalu people's attitudes towards chimpanzees in CNP stem from an animist ontology which guides local beliefs that nonhuman species exist either as 'true animals', or some other animal form transformed by *irãs* (Sousa et al. 2017a,b). This idea that humans and great apes shape-shift into each other's physical forms is shared by people elsewhere in West and Central Africa (Richards 1995; Köhler 2005; Giles-Vernick and Rupp 2006; Hockings et al. 2010; Leblan and Bricka 2013; Oishi 2013). The underlying components of a pre-Islamic ontology combined with Muslim beliefs is key to understanding human–chimpanzee coexistence in CNP (Sousa and Frazão-Moreira 2010; Costa et al. 2017).

As well as processes of religious and cultural syncretism, local perceptions have evolved in CNP with conservation and ecotourism development supporting the protection of chimpanzees (Sousa et al. 2014, 2017a,b; Costa et al. 2017). Despite strict beliefs that prevent chimpanzee hunting and consumption of their meat, according to some Nalu people conflicts between people and chimpanzees occurred in the past over highly valued agricultural resources (e.g. cultivated fruits and cash crops such as oranges and papaya). This reportedly led to potentially accidental killings of chimpanzees, where chimpanzees were shot at by local people to keep them away from crops (specifically during harvest and fruiting seasons) (Sousa and Frazão-Moreira 2010). However, since the active promotion of chimpanzee conservation and 'ecotourism' by outside agencies and local NGOs, villagers claimed they no longer shot at chimpanzees for fear of retribution from the authorities (Sousa and Frazão-Moreira 2010). Other social science research suggests tensions exist between local people and

NGOs, and that the sense of an urgent need to conserve wildlife in CNP – conveyed by National Park authorities and conservationists working in the region – is not always shared by local people (Temudo 2012; Sousa et al. 2017a). For example, Temudo (2012) argues that outside agencies have constructed a need for conservation intervention in CNP based upon inaccurate predictions (of the rate of deforestation, and the growth of human population densities) and the oversight of Nalu natural resource management institutions and practices, resulting in negative consequences for local people.

Our research team and field study approach

Our field research team comprised primatologists with broad experience in human–chimpanzee coexistence in Africa (KH, C Sousa) as well as social scientists with long-term fieldwork experience among rural communities in Guinea-Bissau (AM, HP), and three of our researchers had designed and implemented mixed-methods studies in previous research projects (KH, AM, HP). Combining multispecies ethnography with ethnoprimateology we began by carrying out an in-depth ethnography of Nalu beliefs and practices associated with the forest and primates to examine the connections between Nalu people and chimpanzees in CNP. Qualitative social data added context to quantitative findings and provided information about current local attitudes towards chimpanzees. This provided a strong starting point from where we were able to explore the influence of individual species behaviors, and the impact of interspecies interactions, on the local landscape from a multispecies perspective. To further explore human–chimpanzee coexistence and resource-sharing at a social, historical and ecological level, and the influence of local Nalu cultural and religious beliefs on these dynamics, we employed tools from ethnoprimateology and ethnobotany. Over 11 months the social science researchers (HP and AM) and biological science researchers (KH, C Sousa and J Bessa) conducted complementary research on the use of wild and cultivated resources by sympatric humans and chimpanzees using comparative methods. We collected quantitative data (through direct observation, feeding traces, and faecal analysis) to determine which plants and plant parts were consumed by chimpanzees. We compared these data with quantitative data on human plant use (collected through participant observation, semi-structured interviews and all-occurrence sampling). Finally, we carried out spatial mapping to identify overlapping areas where humans and chimpanzees used plants, providing a visual representation of the CNP forest as a multispecies landscape shared and shaped by sympatric species.

Openness, trust, and good communication among our field team were key to the smooth-running of our study. Project planning took place with input from our biological and social science researchers to limit misunderstandings and prevent disciplinary disputes between researchers from different academic fields. We held regular meetings to share data and discuss the progress of each component of the research. All members of the team were motivated to work together despite differences in disciplinary training, because of a common concern for conservation, alongside enthusiasm for the research proposal, and mutual respect for the value of each other's work. While the primatologists were concerned mainly with understanding the behavior and ecology of chimpanzees, and how these are influenced by people (data important for chimpanzee conservation in CNP), they recognized the value of local concepts of forest management, and the importance of understanding plant use overlap between villagers and chimpanzees to predict the sustainability of their interactions in this shared environment. For the social scientists, their motivation was guided by an interest in supporting indigenous advocacy and establishing the rights of local people to access natural resources in CNP. An integral part of supporting people's access to resources, involved exploring local environmental perceptions, including understanding people's representations of wildlife. For the Nalu, chimpanzees and plant use form a central part of explaining their perspectives of, and attitudes towards wildlife, and our research team appreciated the interdisciplinary focus of the study was a vital component to interpreting this accurately.

Summary of findings

Our study showed that Nalu people and chimpanzees 'meet' frequently in CNP and overlap extensively in their use of wild resources, including important chimpanzee foods such as oil-palm (*Elaeis guineensis*), velvet tamarind (*Dialium guineensis*) and saba (*Saba senegalensis*) (Hockings et al. unpublished data). The regular overlap of land and resource use between these sympatric species has led to a degree of mutual tolerance. The chimpanzees have adapted their foraging behavior in response to changes in human foraging and cultivating patterns; for example, the chimpanzees frequently consume cultivated foods (Bessa et al. 2015). For their part, Nalu people have moved away from using rifles and some have adopted alternative strategies and precautions to prevent crop damage and reduce negative interactions with chimpanzees, with some people reporting that they intentionally did not cut important chimpanzee wild food species. When people encounter chimpanzees on roads, in their gardens or near their homes, they generally respond calmly to their presence. Only on occasions when chimpanzees are in close proximity to children or women are people likely to shout and throw

objects such as sticks in an effort to deter chimpanzees from approaching. Such behaviors reportedly can incite retaliatory aggression from chimpanzees elsewhere (McLennan and Hockings 2016); however, harmful behavior by chimpanzees towards people has rarely been reported at CNP (Hockings and Sousa 2013; Sousa et al. 2017b). Moreover, Nalu people coexist with chimpanzees with relatively low levels of hostility as compared to reported interactions in some other regions (e.g. parts of western Uganda where chimpanzee habitat has been converted to agricultural land and spatial overlap with villagers is exceptionally high: McLennan 2008; Hockings and McLennan 2016). This relative tolerance of Nalu people towards chimpanzees arises from complex cultural, economic and ecological factors which may be resource specific. For example, our findings show that chimpanzees are not considered to cause significant damage to the main cash crop, cashew (*Anacardium occidentale*), as chimpanzees feed only on the cashew pseudofruit, leaving the economically valuable cashew nut undamaged. According to Nalu people, chimpanzees leave the nuts in piles, thus helping them with the cashew nut harvest; the cashew fruit consumed by the chimpanzees in the process is regarded as fair pay-off in exchange (Hockings and Sousa 2012; Bessa et al. 2015).

While local people are tolerant of chimpanzees, these interactions may not be quite as straightforward as they first appear because of associations with sorcery, where chimpanzees are incorporated into local cosmologies via their association with witchcraft. Other studies show that the complexity of local people's relationships with chimpanzees (and some other wild animal species) has consequential, sometimes unforeseen outcomes for conservation. For example, Sousa et al. (2017b) reported that the stories and descriptions about chimpanzees shared by local people with outsiders do not always represent their true sentiments about these great apes or certain local conservation initiatives. Despite no attacks being reported during our research period, local descriptions of chimpanzee attacks on people recorded by Sousa and colleagues, distinguish between attacks by 'clean' animals and attacks by 'unclean' or 'shape-shifted' individuals. Attacks by 'unclean' chimpanzees, i.e., sorcerers who practice shape-shifting and have taken on the appearance of chimpanzees, to further their own interests, are associated with situations of perceived abuse of power, and expressions of greed. Attacks by 'clean' animals, i.e., chimpanzees responding to an antagonistic situation/stimulus, are interpreted as animals defending themselves or their group members, against a tangible threat, and therefore are regarded as 'natural' and a reasonable response on the part of the animal. Therefore, under certain circumstances local people perceive chimpanzees as akin to humans who commit socially or culturally harmful behaviors to others.

In recent years this analogy has been extended to include the abuse of power that sometimes exists between NGOs and local people, suggesting a degree of unease among the local population, directed at conservation more generally rather than towards the chimpanzees themselves (Sousa et al. 2017b).

Furthermore, while some studies at CNP indicate a degree of resistance among local people towards conservation initiatives (Temudo 2012; Sousa et al. 2017 a,b), our findings suggest that cultural and religious beliefs alongside economic and ecological factors result in conservation outcomes that protect chimpanzees in CNP to some extent. We held a participatory workshop in December 2016 to share research findings and consult with local people on chimpanzee conservation. Participants, including young people, women, men, male and female leaders, and guides working for the National Park not only indicated tolerance towards chimpanzees feeding on plant species that are highly valued by people, but also suggested a general acceptance and acknowledgement over conservation concerns among researchers and NGOs developing chimpanzee conservation in the region. These findings, along with our data on human and chimpanzee plant use in CNP, are currently being used to inform decisions going forward for chimpanzee conservation at a local and national level in Guinea-Bissau.

Summary

Merging various methodologies enabled us to advance beyond more typical ethnoprimateology techniques (discussed previously) and adopt a multispecies approach, viewing CNP from a Nalu perspective and acknowledging chimpanzees as compatriots living alongside them with ancestral and historical links to Nalu territory (cf. Jost Robinson and Remis 2014; Robinson and Jost Robinson 2017). This approach allowed us to begin to explore the local landscape and the sustainability of human–chimpanzee coexistence in CNP, giving equal weight to both species, within changing environmental, social and economic conditions. We have shown how humans and chimpanzees are constituted in and by their relations to each other where they meet and ‘mingle’ (Haraway 2008, 2010), sharing habitat and resources. As human populations expand, in part due to migration from nearby countries, pressure on key resources such as land and certain wild plants will increase in CNP, which may again cause changes to human–chimpanzee relationships in response to new conditions, as seen elsewhere (for example in Uganda; McLennan and Hill 2012, and in Central African Republic; Jost Robinson and Remis 2014). Understanding human–primate coexistence alongside different interest groups’ agendas and

priorities becomes critical if environmental and conservation policies are to be effective and keep pace with these changes. Studies that explore advanced approaches in ethnoprimateology and encourage mixed-methods research, such as ours, provide new possibilities for locally-appropriate conservation in shared landscapes.

Conclusions: Mainstreaming the multispecies approach in primate conservation

As major niche constructors, humans have had a consequential impact on the lives of other primates (Fuentes 2010a), just as living with primates has likely characterized much of our own evolutionary history (Tutin and Oslisly 1995; Riley 2006) and continues to do so. Integrating social science with conservation science approaches is crucial to understanding when and under what conditions human–primate sympatry is sustainable (McLennan et al. 2017). We have described how the multispecies approach is part of a broader aim by social scientists to overcome anthropocentrism in the study of human–nature interactions by theoretically integrating relational perspectives into Western science (Locke and Münster 2015). Continuing to apply a multispecies lens to ethnoprimateological research and maintaining the shift in focus from a *conflict* to *coexistence* narrative has the potential to produce more positive long-term outcomes for people and wildlife (Hardin and Remis 2006; Fuentes and Hockings 2010; Hill and Wallace 2012; Fuentes et al. 2016; McLennan et al. 2017). This entails bridging theory between the biological and social sciences and integrating our efforts to ensure productive conservation discourse for the benefit of both people and wildlife. We have shown that a more cohesive study of human–primate worlds can inform our understanding about interspecies interactions and multispecies landscapes. Our case study presents one example of how promoting engagement between the social sciences and disciplines traditionally grounded in the biological sciences can further develop the ethnoprimateology approach to deepen our understanding of environments from a multispecies perspective. Supporting a perceptual shift towards interdisciplinary research which combines multispecies ethnography with ethnoprimateology will further advance the development of these ideas, helping establish a more integrated and holistic biological and cultural conservation.

Working to improve interdisciplinary collaboration presents a challenge for academics and practitioners alike, but may be crucial to avert the extirpation of primates among other wildlife across the globe (Estrada et al. 2017). The true mainstreaming of social science in conservation needs visionary leadership and a dramatic

change in organizational behavior (Mascia et al. 2003; Bennett et al. 2017a,b), potentially including the reorganizing of academic communities, funding, and institutions as a way of increasing avenues for collaboration between the different sciences (Palsson et al. 2013; Teel et al. 2018). This requires building social science capacity into conservation agencies, promoting engagement between the social sciences and disciplines traditionally grounded in the biological sciences including primatology, overcoming the associated political challenges that cross-disciplinary engagement often incurs, and willingness among social scientists to engage with biological scientists and share knowledge, insights and recommendations in an open and constructive way (Redford 2011; Palsson et al. 2013). Methodological expertise and skilled practice are not easily acquired, providing a further incentive for cross-disciplinary collaboration. If done well, this could produce positive results in the field of primate conservation. Primate researchers must rise to the challenge and become skilled at bridging disciplinary boundaries to provide a better understanding of the complexity in which conservation occurs (Fuentes and Hockings 2010; Riley and Fuentes 2011; Fuentes et al. 2016; Setchell et al. 2017). As Castree and colleagues write, “interdisciplinary dialogue [we suggest] should engender plural representations of Earth’s present and future that are reflective of divergent human values and aspirations” (2014: 763).

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Glossary of Terms

Academic culture The totality of socially transmitted behaviors, beliefs, institutions and other products of human work and thought, with respect to a particular field, subject or mode of expression (Morris 1969; Sutherland 1998).

Commonly used terminology in biological anthropology

Biological anthropology ‘Biological’ (or ‘Physical’) anthropology is concerned with the biological and behavioral aspects of humans, nonhuman primates, and their extinct hominin ancestors. It provides a biological perspective to the systematic study of primates. As a subdiscipline of anthropology, biological anthropology is divided into several branches united in their common application of evolutionary theory to understanding human morphology and behavior, such as paleoanthropology and primatology (Fuentes 2010b).

Co-existing/sympatric species Species that occur at the same time period and in the same place and can potentially interact (Wheatley 1999; Fuentes and Wolfe 2002; Cormier 2010).

Ethnoprimateology Interdisciplinary study developed by primatologists, combining primatological and ethnographic practice to examine the multifarious interactions and interfaces between humans and nonhuman primates living in integrated and shared ecological and social spaces (Sponsel 1997; Fuentes 2012; Hockings et al. 2015). The goal of many ethnoprimateology studies is to understand the perceptions of local people and engage with their needs to enhance primate conservation and ensure the longevity of conservation projects (Wheatley 1999; Lee 2010). It adopts a mosaic of approaches that develops and reshapes the ways in which humans position themselves relative to human-dominated landscapes and ecologies (Dore et al. 2017).

Human–primate interface	Description of overlapping ecologies of human–nonhuman primate communities, viewing humans as literal and figurative kin to other primates. This term plays a core linking role in ethnoprimateology, between anthropology and primatology studies (Wheatley 1999; Fuentes 2012; Leblan 2013).
Human–wildlife conflict	Negative interactions between humans and wildlife where one or both species suffers as a consequence (Woodroffe et al. 2005). Researchers are increasingly moving away from this term when referring to scenarios in which wildlife impact on people’s livelihoods, security, or personal safety. Its use obscures the fact that these ‘conflicts’ often stem from differential values, needs, priorities, and power relations between the human groups concerned (Redpath et al. 2013; Hill 2015, 2017; Hill et al. 2017).
Human–wildlife interactions	Traditionally understood in biology as people and wildlife sharing landscapes and resources, ranging from being beneficial or harmful to one species or the other. In ethnoprimateology human–wildlife interactions are increasingly understood as being dynamic and bidirectional (Wheatley 1999; Lee 2010; Humle and Hill 2016).
Niche construction	The creation and destruction of environments by organisms, and their interactions with other individuals (comprising synergistic interactions between organisms and environments). Through these processes the selective pressures that impact organisms are shaped (Day et al. 2003; Odling-Smee et al. 2003; Odling-Smee et al. 2013; Barker and Odling-Smee 2014). Specifically, in terms of anthropology, this perspective suggests ways in which behavioral and symbolic systems construct and interact with social and ecological niches and how, in turn, these systems interact with genetic systems (Fuentes 2010a).

Commonly used terminology in social/cultural anthropology

Agency/intent	Having an independent capability or ability to act on one's will. The capacity of individuals to make their own free choices and their reasons for acting are affected by cognitive belief structures which form through experiences, and societal/individual perceptions. This contrasts with structure, which describes factors of influence (such as social class, religion, gender, ethnicity, ability, customs, etc.) that determine or limit an agent and his or her decisions (Barker 2005).
Companion species	A term used to describe the historical emergence of wild and domestic animals in human lives. Nonhuman species are recognized as individuals who are part of historical relationships with individual people and human communities (Haraway 2010, 2016; Baynes-Rock 2013).
Contact zone	Places where humans and nonhumans share physiological, ecological and social spaces across scales of ecological intersection. It signifies how subjects are constituted in and by their relations to each other (Haraway 2008).
Interspecies mingling	A term used to describe the mixing or bringing together of different human–nonhuman species without the individual's fundamental loss of identity (Haraway 2010).
More-than-human /Anthropology beyond the human	These terms introduce perspectives which extend anthropology to a post-humanist inquiry through the application of multispecies ethnographies (Kirksey and Helmreich 2010; Kohn 2013).

Multispecies ethnography	A methodological approach and theoretical perspective rooted in anthropology which deconstructs the ‘humanism’ of landscapes (Kirksey and Helmreich 2010) and enables the understanding of habitats as ‘multispecies landscapes’. Multispecies ethnography is concerned with the connections between humans and other life forms (which also have agency and intent or whose actions are the result of agency as an effect, rather than as the product of subjective intentionality; see above). It acknowledges that the human condition cannot be understood in isolation from nonhuman species (Ogden et al. 2013; Locke 2017).
Multispecies lens	Examining human–nonhuman interactions where humans are viewed as one of several organisms that shape, create and form an integral part of their environment, because of engagements and interactions with nonhumans. In this context environments are viewed as ‘multispecies landscapes’ through a ‘multispecies lens’ (Aisher and Damodaran 2016).
Social/cultural anthropology	‘Social’ and ‘cultural’ anthropology overlap to a considerable extent. Broadly, the term ‘cultural anthropology’ relates to an approach prominent in French tradition and the US. It stresses the coherence of human cultures, including their rules of behavior, language, material creations and ideas about the world. ‘Social anthropology’ developed in the UK during the early years of the 20th century is a scientific discipline with an emphasis on human social institutions, their interrelationships, and the organizing principles of social and cultural life (Erikson 2001).