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Dossier Déroutants primates : approches émergentes aux frontières de l'anthropologie et de la primatologie

Special section on Disconcerting primates: emerging approaches in the anthropology/primatology borderland

Dossier proposé et édité avec le concours de la revue par Vincent Leblan

Introduction: emerging approaches in the anthropology/primatology borderland[1]

Introduction : approches émergentes aux frontières de l'anthropologie et de la primatologie

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1 Primates caught in disciplinary uncertainty

1 *Primates*. The purpose of this *Revue de Primatologie* section is to put forward the multiple ways of looking at these disconcerting creatures across disciplines which are commonly thought to be (and which, for the most part, actually are) academically and epistemologically very remote from one another. Indeed, while primatologists and anthropologists sometimes use the same words (environment, culture, behavior, society, language, etc.), one cannot help but observe that they have been working and elaborating their research questions separately for decades. As a consequence, a vast area of conceptual misunderstandings has arisen between them. This special section is intended to provide a kind of sketch of this ever-widening gulf and to locate some of the major crosscurrents which constantly drive them apart, as well as to look for a few possible interdisciplinary crossing points.

2 First of all, we must remember that this opposition cannot be properly understood unless it is placed within the age-old framework of divergence and antagonism between natural and social scientists since the end of the 19th century. The categorization of scientific facts along the divisions of nature and culture (Descola, 2002) and of humanity and animality (de Cheveigné and Joulian, 2008) initially structured and stabilized new fields of inquiry during the 20th century. This characterizes anthropology as much as any other field, which logically relied upon a notion of human uniqueness in order to define and to

study the phenomena, claimed as its prerogative, dealing with social and cultural processes. In establishing humanity as its primary field of investigation, anthropology then focused on animals as elements of social meaning within political institutions, subsistence production systems, rituals, and so forth. References to primatological research, in particular, have often been sporadic and usually allude to social hierarchies within nonhuman primate societies, the goal then being to look for a contrast that would allow a clearer outlining of the dynamics and specificities of politics in human societies (e.g. Balandier, 1974). A consequence of confining animals to human societies' environment and material culture has been to exclude the social, cognitive, and even "cultural" animal which may interact with humans.

3 At the same time, the relegation of this conception of animals to the margins of social sciences cannot be understood if it is not also considered as the reverse side of natural scientists' habit of favoring working away from any anthropogenic influence exerted on the beings that they observe. Once enclosed within "outdoor laboratories" like parks and reserves, living things and their environments can be studied there as "research and documentation archives of species' evolution" (Curry-Lindahl, 1968, my translation). In primatology, the selection of habitats where the spontaneous reproduction of natural resources and living beings was undisturbed by humans was one of the prerequisites to grant a scientific status to field observations (Reynolds, 1975). It was also one of several criteria used to define any nonhuman primate behavior as "cultural", where the emergence, spread, and maintenance of a given behavior were concerned (McGrew and Tutin, 1978).

4 Much of the motivation for this anthropology/primatology section lies in the multiple effective and potential overlapping research areas which have unfolded between the two disciplines over the last 15 years. The more relational approaches to conservation which have emerged during this time have propelled field primatology, like many other biological and ecological disciplines, beyond the limits of parks and reserves. This movement is in line with the Parks Congress held at Durban (South Africa) in 2003, which can be considered as a political landmark in the development of biological and ecological research within these "open" contexts. As a consequence, contemporary human societies currently occupy a much more central position on the discipline's agenda. It is within this conservation-driven context that the term "ethnoprimatology" was coined, initially referring to a research field meant to bridge different approaches to the ecology of human and nonhuman primate relationships: comparative ecology, predation ecology, conservation ecology, ethnoecology, etc. (Sponsel, 1997). Quite soon afterwards, the program of ethnoprimatology was enlarged to the study of primate behavior in conjunction with its social and political meanings in human societies, as traditionally studied in ethnology. Hence, a new interest in the ecology, ethnography and history of primate coexistence with (modern) humans, in various regions of the primate order's range, has been reaffirmed across several programmatic primatology- or biological anthropology-based publications (Fuentes and Wolfe, 2002; Patterson and Wallis, 2005; Fuentes and Hockings, 2010; Fuentes, 2012).

5 However, as in the emergence of any new interdisciplinary arena, concepts and research perimeter definitions are still far from being settled. Some line up the ethnoprimatology program with pre-existing areas of anthropological research, defining it as "the study of human-nonhuman primate interaction, at a local level, in terms of behavior, knowledge, emotion, and meaning. In this sense, it resembles ethnomedicine, ethnohistory, and so

on" (McGrew, 2007). Another definition outlines ethnoprimatology's interdisciplinary dimension outside of any pre-established research tradition, describing it as "a fusion of sociocultural anthropology and primatology [which] focuses on the interaction between usually traditional peoples and the nonhuman primates with whom they coexist in daily life, in contexts that are positive (e.g., ceremonial), negative (e.g., crop-raiding), or both (e.g., ecotourism)" (McGrew, 2010). This categorization of interaction outcomes indicates that, in this second sense, ethnoprimatology is less governed by anthropological issues than by adaptive approaches to biological conservation. A third definition comes even closer to a traditional primatological standpoint on human/animal interactions: "the 'ethno' prefix marks the inclusion of anthropogenic aspects, including the social, economic, and political histories and contexts as core components of inquiry into the lives of other primates and their interfaces with humans" (Fuentes, 2012). Others have proposed to replace "ethnoprimatology" in this sense by "anthroprimatology" because of the confusion it generates with the more established first definition (Papworth *et al.*, 2013). However, human-primate relationships as studied in field primatology (in this case, considering the cultural meaning of such or such animal group as a thing that can be computed) still seem epistemologically remote from the psychology/psychiatry and public health orientation of most articles published in *Anthrozoos*, the journal of the International Society for Anthrozoology. In any case, this third kind of approach takes on a more dualistic perspective in which human societies become part of the animals' environment, rather than stressing common human/animal worlds as they unfold through interactions (as in the first two definitions).

6 Such conceptual fuzziness may actually be considered as an underestimated sign of heuristic effervescence. But before going any further, one may ask, after all, why we should aim to elaborate an "ethnoprimatology" rather than, say, an "ethnocarnivorology" or an "ethnorodentology", just to mention examples imagined from two other mammal orders. The answer, of course, lies somewhere in the recurring problematic and disconcerting ontological status of primates. On one hand, many primate species often seem to be granted a near *person* status among a wide variety of human societies. Here, anthropologists and primatologists will usually resort to arguments unfamiliar to one another in assessing this ontological lability, the first emphasizing the changing symbolic and political meanings of animals across societies and social groups (e.g. Giles-Vernick and Rupp, 2006; Oishi, this issue), and the second insisting on their evolutionary proximity, supposedly making primates the most likely animals to be assimilated to any notion akin to "humanity" in various humans societies (e.g. Fuentes, 2006). On the other hand, primates are disconcerting in the order of anthropological discourse and practice, as they are considered ethnological subjects of inquiry by many field primatologists, and even by a few socio-cultural anthropologists who have however critically engaged with primatologists' observations and methods (Joulian, 2005; Nakamura, 2009; Jankowski, 2011; Servais, this issue). Of course, these two areas of epistemological transgression may equally apply to carnivores or rodents if we remember, for instance, that anthropologist Lewis Morgan is the author of a classical monograph on beavers, and that their dam building techniques have at times served to discuss anthropology's limits of investigation, from Alfred Kroeber to some of the most recent research in the discipline (Strivay, 2010).

7 The disciplines which claim nature and culture as their prerogative have come a long way in institutional and epistemological differentiation, and even segregation, since Morgan's

time. However, through many of its present research themes, primatology unveils relevant contexts and matters for the social sciences. They range from questioning primates' ability to perceive and understand the intentions of their fellow creatures, to the social and cognitive mechanisms involved in learning, communication and technical innovation for instance, to the issue of nonhuman culture. The recent conservation-based approaches addressing issues of behavioral adaptation in relation to human-induced environmental change open another area for potential collaboration between the two fields. In the current scientific context, one may reasonably assume that primates will, more efficiently than many other animal groups, engage us to move back and forth systematically across disciplinary boundaries. They will polarize both sides of the nature/culture divide *at multiple levels of inquiry*: from ethnographic and ethological field observations all the way to the elaboration of a unitary anthropology of humans and animals living in society, including a comparative approach of human and animal societies.

2 Disciplinary versus epistemological gaps

8 In fact, each of the three definitions of ethnoprimatology quoted above carries different implications for interdisciplinary collaborations, and consequently different assumptions about the epistemology of human-animal interaction studies and ontologies. Here it is suggested, at least for the time being, that this conceptual and empirical instability is to be widely investigated rather than canalized, by bringing primates *between* researchers with different goals, research questions and methodologies. As mentioned above, field primatology has begun to include contemporary human societies in studies of primate behavior as an answer to the increasing fragility of numerous primate populations whose habitat becomes more or less transformed and/or reduced by anthropogenic environmental processes. More recently, ethnoprimatology has started to expand its ambitions beyond this applied horizon by standing as a frame of reference to help overcome the divisions of biological and cultural anthropology. This second objective is to create a new field for the development of "synergistic methodologies involving aspects of field primatology, behavioral ecology, human ecology, ethnography, ethnology, folklore, history, geography (including landscape analyses), economics, surveys, and interviews, [...] all components of the ethnoprimatological *tool kit*" (Fuentes, 2012, emphasis added; see also Riley, 2006). Thus unprecedented opportunities for the collaboration of primatologists with anthropologists, and even beyond with a wide variety of social scientists, are becoming apparent from within spaces that are open to human and animal interactions.

9 A quick glance at some of the divergences between primatology and anthropology which still exist can help to put this second claim of ethnoprimatology back into a broader perspective. Let's consider, for instance, the study of intraspecific behavioral variation, which has become one of the main research issues in primatology. The discovery of original behavioral repertoires which are transmitted across generations and which vary between social groups has led many (but not all) biologists to qualify as cultural any behavior which is considered free from ecological or genetic constraints on its expression. The study of this behavioral variation has become clearly established in the biological sciences during about the last two decades, under the label of "cultural primatology" (Wrangham *et al.*, 1994; de Waal, 1999; McGrew, 2004). However, it should be

remembered that the reference to the notion of culture is an integral part of the beginnings of systematic field research in the behavioral study of monkeys and apes (Frisch, 1963). "Cultural primatology" is granted by its practitioners a status analogous to that of cultural anthropology in the field of naturalistic ethology (McGrew, 2007).

10 Interestingly, it is nowadays within field primatology more than anthropology that the notion of culture unites a majority of researchers. This is due as much to the well-known growing body of evidence for the existence of behavioral traditions mentioned above, as to the fact, less often considered, that anthropologists were simultaneously having the biggest difficulties in reaching a consensus about the meaning and the utility of the notion of culture within their own areas of investigation. In other words, the notion moved from ethnology to primatology while it was being abandoned by the former, at least in its most essentialist and ahistorical expressions (Fox and King, 2002; de Cheveigné and Joulian, 2008; Nakamura, 2009; Leblan, 2011). As a consequence, the minimal requirements for interdisciplinary dialog disappeared. Additionally, the conception of *ethnography* found in primatology, methodologically seeking to isolate cultural facts in opposition to the nature of organisms (genetic heritage, environmental constraints), is quite far from what anthropologists presently do (Ingold, 2001), and corresponds to a gap between the two fields which seems to be now generally accepted within primatology (McGrew, 2010). This is a case in point which should alert us to the necessity of epistemological negotiation if we are to move towards holistic approaches of human/animal relationships.

11 However, usually not considered as well is that these oppositions do not match disciplinary boundaries as strictly as often thought. Debates over the role of biological versus socio-cultural factors in the expression of behavior also occur across internal epistemological frontiers: anthropology is partly characterized by dissents similar to those described here in its opposition to primatology, while a few voices from the field of primatology may, for their part, be characterized as anthropological ones. For instance, it is certainly within the subfield of cognitive anthropology that comparisons of human and animal cognitive and behavioral processes are the most frequently called upon. Here, the continuity of human cognitive abilities with those of higher primates is clearly stated. An example is the assumption of the existence of elementary innate faculties which come into play in the recognition of a minimal self among humans, apes and more widely among social species (Bloch, 2012, p. 124-134). But it should be noted that the kind of continuity emphasized in this evolutionary approach is based on the consideration of observational contexts whose compatibility is not taken as an issue. On the one hand, the anthropology of cognition rightly points the cognitive sciences' ignorance of social and historical factors in describing and analyzing cognitive processes (*ibid.*, p. 137-141). On the other hand, the "animal" which serves as a point for comparison with humans is usually a laboratory individual, deprived of any significant relationships with his fellow creatures (at least at the precise moment when the experimental task is carried out) and therefore of any socially meaningful environment. In this case, the social properties of cognitive processes in animals are not deduced from the observation of their social interactions and their history. Thus they inevitably appear as fundamentally biological (cerebral) faculties.

12 These naturalistic approaches in anthropology stressing the continuity of all primate minds (including humans) through evolutionary processes, nearly always taking laboratory apes as a focus for comparison with human learning and communicative

abilities, are opposed by other brands of anthropology which instead emphasize how animal cognitive processes emerge in social situations, through interactions. In this case, cognition is considered as constantly redistributed between the members of a given social group. In studies taking place on the human-primate interface, this approach has been carried out "in the field" through a study of functional and social meaning generation of places and objects (affordances) which emerge between baboons and scientific observers during "habituation" processes and which contribute to organize and stabilize an interspecific interactional context (Jankowski, 2011). A similar re-evaluation of social cognitive processes has also been carried out by looking at the knowledge produced in cognitive science laboratories as the outcome of particular relational and emotive situations rather than "pure" cerebral processes (Servais, 2007 and this issue; Takada, this issue).

13 On the other hand, anthropological critics who are *internal* to primatology or familiar with its methodologies, and who therefore occupy a marginal position within the general economy of current human-primate interface studies, have equally insisted on the overly reductive stance consisting of slicing elements of behavior off from the integrated social whole in which they were generated. These authors insist instead that behavior stems from and belongs to an uninterrupted flow of social interactions occurring at the place and time of its expression (e.g. King, 2004). Actually, this perspective is not completely absent from all primatological writings. It is quite developed in the rich personal narratives written by field workers about their experience (e.g. Goodall, 1990), describing how they not only remotely observed but very much interacted with monkeys and apes. These "popular science" essays constitute prime materials for those who adopt an anthropological perspective on nonhuman primate behavior (Nakamura, 2009; Asquith, 2011).

3 The issue of disciplinary integration

14 With respect to these past and ongoing oppositions, the illustration of ethnoprimatology's disciplinary and methodological breadth through a "tool kit" metaphor raises more questions than it answers, especially about epistemological inclusiveness and the overlapping of their respective ontological presuppositions. How could ethnologists and primatologists truly and durably cooperate without discussing how they conceive and use central notions such as 'behavior' or 'knowledge', for instance? Do they describe and analyze human and nonhuman socialities and agencies in compatible ways? Is there any common ground for their involvement in conservation issues? The ethnoprimatological turn has been considered within primatology as the expression of a major paradigm shift aimed at the integration of the human/animal, social/biological and nature/culture dualisms. However, the future of ethnoprimatology appears to be still strongly tied to its original discipline, i.e. field primatology, and one may wonder if it didn't grow too fast, at the risk of becoming prematurely specialized.

15 For instance, some calls for joint studies of relationships between primates and people through active primatology/ethnology collaborations remain primarily justified by their phylogenetic, biological and behavioral proximity. The persistent dominance of this evolutionary framing of social and cultural aspects of relationships to animals makes it possible to conceive human-animal social hybridity as more frequent with primates than with other species. "These human-nonhuman primate [evolutionary] similarities increase

both the likelihood of cultural association/inclusion of other primates by humans, and certain primates' potential to co-exist with humans" (Fuentes, 2006: 1; see Cormier, 2003: 129 for a similar statement on the ethnological side of ethnoprimatology). This proposal assumes that the social and cultural distance between people and animals, whether in America, Africa or Asia, is primarily modelled along the scale of systematics. This approach subsuming the social and the cultural under the biological actually dismisses what ethnology and the social sciences can bring to the study of human and animal relationships, leaving aside for example the territorial and political issues which organize them. This will, in turn, inevitably lead to further disciplinary misunderstandings. In addition, it must be noted that this emphasis on the phylogenetic relatedness of nonhuman species with the human genus, when characterizing the formers' "evolved" aspects of behavior, is not unanimously followed within biology. For example, a review of social learning propensities within a wider range of animal taxa shows that their importance in the life of any given species cannot be correlated to species' evolutionary distance from humans in a simple manner. These propensities rather seem to appear in species equipped with large brains, whether they are taxonomically close to humans or not, and to depend on a range of social and ecological variables for their development (Fragaszy and Perry, 2003).

16 This is not to say, though, that anthropology is completely ignored in current ethnoprimatology. A synthesis about the potential and future of this emerging interdisciplinary arena discusses various possibilities for the rapprochement of primatology with the vast amount of research concerning human-animal relationships in the social sciences (Fuentes, 2012). The latter increasingly deal with the actions and schemes through which humans identify and relate to a multitude of nonhuman beings, demonstrating how the extension of human ontology to other categories of (living and non living) things is operated, including within scientific laboratories (Latour, 2005; Descola, 2013). Parts of the social sciences have thus legitimately emancipated themselves from the epistemological constraints inherited by the constitution of disciplines, integrating animals' agency and perception of the environment to their studies. For instance, this is the case of another subfield labeled "ethnoelephantology", claimed to be modeled after "ethnoprimatology", although in a perspective different from that of mainstream ethnoprimatology since this time "[...] it carries the ethno-prefix to suggest the mediating role of cultural factors in cross-species encounters" (Locke, 2013).

17 These contrasting definitions stemming from such different epistemic communities raise the question of the intelligibility of each other's research agenda and should lead us to ask how their integration should be implemented. Under the label of "multispecies ethnography" for example, also seeking to bring cultural and biological anthropology together, one will find the argumentation of ethnoprimatology coexisting with propositions considering that "animals may act as anthropologists themselves, studying the behavior of humans who feed, shepherd and breed them" (Kirksey and Helmreich, 2010: 552). It seems uncertain how this kind of extremely relativist stance can be compatible with current research on the human-nonhuman primate interface stemming from field primatology. Apart from a mere lexical resemblance, there appears to be very little common ground between ongoing research in "ethnoprimatology", and "multispecies ethnography" and other similar relativist trends in anthropology coming under various neologisms ("anthrozoology", zooethnography", "humanimal" ; see

Kirksey and Helmreich, 2010). As the latter tend to leave open the issues dealing with the subjectivity and the intentionality of the nonhuman beings (animals or material things) which contribute to organize and stabilize patterns of interactions between humans (Candea, 2010), i.e. as they grant an equal *nonhuman status* to both animals and non-living things, there actually seems to be little space left for methodological and epistemological agreements between the two fields.

18 While current ethnoprimatology has certainly provided us with a wider understanding of the constraints and opportunities met by nonhuman primates living in close(r) contact with humans, methods and fundamental notions (environment, culture, behavior...) remain defined within the conceptual range of the natural sciences. Overall, the admission of contemporary humans into the field of primatology has not led to a transformation of its epistemology by taking into account how anthropologists analyze the diverse nature and culture arrangements in human societies. The "reconciliation of biological and cultural anthropology" (Riley, 2006) has taken place under the banner of applied biology and ecology, leaving the upper hand to nature in a perpetuated cleavage with culture. Ethnoprimatology is thus better understood, for now, as the integration of field primatology within conservation biology, i.e. as a new kind of ecological engineering of human-wildlife interactions, than as an epistemological bridging of primatology with ethnology and the social sciences.

19 In a certain sense, this comes as no surprise. The definitions of this disciplinary junction reviewed above are, for the most part, rooted in biological approaches, following a global tendency which was already well underway in many American university departments during the 1980's and 1990's. It is thus difficult to imagine how a few declarations could reverse the biology/culture tendency to split apart which has been growing stronger for the past 30 years, in North American anthropology as elsewhere, resulting in the multiplication of university departments focusing on one of these two subfields (Morell, 1993; Gibbons, 1997). Nowadays, cultural and biological anthropology (Segal and Yanagisako, 2005; Hardin and Remis, 2006), or more globally anthropology and biology (Ingold, 2007), have by and large become mutually unintelligible. How to practice methodological bridging between them, and how to explore human and primate relational histories, have remained open questions, in the USA and elsewhere, at least for the past twenty years (Guille-Ecuret, 1994; Ducros *et al.*, 1998; Joulian, 1997 and 2009; Yamakoshi, 2011; Servais, 2012; Leblan, 2012). This context helps to understand why, until now, the wording of "ethnoprimatology" comes closer to adding the "ethno" prefix to a well established field of research (as the Fuentes, 2012 definition suggests) than to laying out flat the methodological principles of both research areas and reorganizing them.

20 The goal of this special section is not so much to enlarge the disciplinary frame of studies concerning human-nonhuman primate interactions as to raise the issue of disciplinary integration. Of course, the idea of reorganizing our disciplinary foundations is much too ambitious in view of the vast amount of theoretical, methodological and empirical matter that needs to be critically examined. Setting up a research process at the interface of the social and natural sciences which reflects the concerns of both sides and allows mutual identification with each other's goals will undoubtedly require further meticulous comparisons of paradigms, research programs, methods and definitions of our study objects, as well as some level of institutional change. This collection of articles purports to be a horizon which, by definition, always eludes us, but will help us to begin thinking about what ethnologists and primatologists actually do; the goal here is to understand

how various field situations are perceived, whether by scientists, by the people relating to nonhuman primates in their everyday life, and/or by the primates themselves. Before any future plans for epistemological "fusion" of ethnology and primatology are made to address either fundamental or more policy-oriented issues, knowledge procedures and methodological principles must be tamed by their respective practitioners. Perhaps such a necessarily progressive process is broadly similar, in terms of cognition, interactions, and power relations, to the one faced by scientists, local social groups and environmental administrations as they are drawn into arenas of natural resource "participatory" management (see Yamakoshi and Leblan, this issue ; Matsuura *et al.*, this issue).

4 The contents of this issue

21 This perspective is where lies the motivation to invite researchers from both disciplines to contribute to this *anthropology/primatology borderland* issue. At this stage, it seems essential to emphasize the great diversity of human/primate relationship contexts, as well as the multiple reasons to mobilize primates or not when thinking of human/animal boundaries and links. Primates are represented by over 200 species which can be found in many parts of tropical America, Africa and Southeast Asia, as well as in a variety of non-range countries where they can be seen in zoological parks (and more confidentially in scientific laboratories), and where many species receive the prominent status of a "world heritage" to be preserved. This issue certainly does not represent this interspecific diversity, not even the main geographical zones outlined above, since it is quite heavily biased towards African great apes. Perhaps, though, one may wonder if a chimpanzee living in captivity in a Japanese cognitive science laboratory may still be qualified as "African" (not beyond a restrictive evolutionary sense; see Takada, this issue). However, all the contributors aim to move between or beyond the contexts and the kind of field where the established "parent" disciplines originated (protected versus non- protected areas, for instance). This has obvious consequences for the social, spatial and/or temporal framing of the objects under scrutiny. This movement is accomplished in different ways, from extracting the significance (methodological, political, etc.) of one's own research for the other "opposing" disciplines, to proposing minute field descriptions of human/nonhuman primate interactions. The field, here, should be understood as the space of "free-ranging" animals, as well as the context of captivity in scientific laboratories as studied by ethnologists.

22 Current ethnoprimatology studies usually favor a "socio-ecological systems" approach to the integration of disciplines, which models flows of beings, resources and genes across borders delimiting human and nonhuman spaces, to the extent that they sometimes become analytically blurred. It is essentially through the notion of *space* that this systemic approach is formalized. The first three articles offer a shift in perspective on the localities and regions where humans and primates coexist by dealing, with varying emphasis, with some of the *territorial* issues involved in living side-by-side with great apes and "conserving" them. This is quite apparent in the opening article by Takanori Oishi, although it is not the main focus of his paper. Acknowledging the lack of anthropological (versus biological) knowledge about nonhuman primates, he focuses on the ontological significance of gorillas in Southeast Cameroon among the agricultural Bakwele and their less-settled Baka neighbors. Clearly stepping aside from resourcist perspectives, he reveals how gorillas and man-gorillas get caught in various webs of meaning according to,

in this case, ethnic membership, and to the activities in which people engage. These beings cannot be assimilated to any unequivocal positive or negative symbol somehow abstractly circulating in the minds of the region's inhabitants. These hybrid creatures, never quite easy to identify, are involved in hunting activities of course, but they also enable one to maintain unworried relationships with the dead. They also serve to express certain features of power relationships, from competition among village neighbors to the regional implications of ethnic membership in the Northwest area of the Congo basin. Each group distributes analogical features of humans and gorillas in socially specific ways. Through this approach, Oishi shows that any enterprise of boundary demarcation between humans and gorillas, in this region already comprising three national parks and a strictly protected area, necessarily goes against local axioms of well-being.

23 The next article is more focused on the land rights issues which contribute to shaping a diversity of perceptions and meanings about animals. Gen Yamakoshi and Vincent Leblan analyze the changing policies of human-chimpanzee coexistence at Bossou, Guinea. This locale is known to primatologists as one of the ten major sites for the longitudinal study of chimpanzee behavior. Bossou (which is the name of a village) had always been portrayed by natural scientists as a place of peaceful coexistence between people and chimpanzees. Locally considered as the ancestors of the founding clan, as in other places of this ethnographically under-studied region, the chimpanzees were receiving protection long before the arrival of scientists and state administrations in the village. However, an uprising in the form of a swidden preparation campaign took place in 2002 and subsequent years, in an area of the village which had been labeled as a Unesco "world heritage" site. Although this label does not imply any real legal force, it probably contributed in the long term to modifying the context for the legitimacy of various arguments concerning the management of Bossou chimpanzees and "their" habitat. The uprising likely expressed a desire to return the vegetative landscape of the village, which had been transformed under the pressure of academic research, to its prior state. The agricultural fields between the village and the forest are valued by the villagers. They paradoxically seem to act as a "buffer zone" (to borrow the Unesco terminology) which keeps the chimpanzees ranging away from the village and helps to prevent accidents resulting from encounters with them. Yamakoshi and Leblan compare the implications of both "management" models for the maintenance of enduring relationships between chimpanzees and (a variety of) humans in this locality.

24 The next paper, written by ecological anthropologist Naoki Matsuura and his primatologist colleagues Yuji Takenoshita and Juichi Yamagiwa, is a collective reflection about their ongoing and future collaborations at their study site located both inside and outside Moukalaba-Doudou National Park, Gabon, where gorillas are being habituated to scientific observers. Here, the general socio-territorial situation is structurally quite different from the two previous case studies, since the Park covers an area which was previously exploited by an international logging company. Consequently, the regions' inhabitants migrated there from all over the country, and do not necessarily settle there for a long time by founding strong and "sustainable" territorial links to the place. This is of prime concern for the involvement, in the Moukalaba-Doudou scientific and conservation project, of those whom development agencies and conservationists usually refer to as "the local population". But their article takes territorial issues one step further by emphasizing how they shape scientific practice. The Moukalaba river which materializes the park frontier, they say, also becomes by extension a line dividing

anthropologists and gorilla ecologists. Here, disciplinary boundaries appear in all their glory. It is Matsuura *et al.*'s mindfulness about the inhabitants' practice of navigating and crossing the Moukalaba for their own purposes, as well as the latter's forest-dwelling skills which appear essential to the production of primatological knowledge, which leads the researchers to cross the river for themselves. It is thus near-literally that they call for bridging the two disciplines, their goal being to implement a "narrative ecotourism" founded both on scientific and local knowledge about gorillas.

25 The two next articles are broader than the first three in their regional scopes, adopting a biogeographical lens to look at various aspects of relationships between human and nonhuman primate populations. As increasingly seen in primatology during the past decade, Thibaud Gruber resorts to historical observations and hypotheses concerning a given locality or region, allowing to retrace the demographic history of particular primate populations (e.g. Isbell and Chism, 2007), or to account for behavioral variation on durations which exceed personal research projects (e.g. Nishida et *al.*, 2009). The author places himself essentially within this second theme, using multi-temporal scale evidence from palaeoecology, population genetics, history of forest uses under different political regimes, forest ecology, and behavioral observations. By so doing, he accounts for the emergence and stability of chimpanzee activities involving the manipulation of sticks (in this case, for the extraction of honey from tree holes) among several Ugandan communities. Recent focus on behavioral and environmental historical processes in primatology has usually translated into considerations about their present-day outcomes. Gruber rather chooses to focus on the historical processes *per se* and to set forward a number of historical hypotheses that relate to ongoing debates in primatology over the role of environmental constraints and opportunities in technical innovation and behavioral change. Hence, despite working from behavioral observations (some of them experimental) within parks and reserves, he is not analytically constrained by the "outdoor laboratory" paradigm outlined at the beginning of this introduction. On the contrary, he considers the role of human influence on chimpanzee behavior, and does so over time periods that are unusually long in primatology.

26 Mary Baker, for her part, looks at the distribution of capuchin, spider and howler monkeys in a region of Mesoamerica. Her main geographic frame, though, is not biogeographical zones or contemporary state borders as is often the case, but the contemporary and historical Maya settlement zone, including ancient Maya trade routes when relevant. For this, she constantly moves between the "four fields" of anthropology, weaving together a range of methods and sources in order to trace the past distribution of capuchin monkey populations. She refers to written sources (late 19th century excavation accounts of an archaeologist working in the area), archaeological data (potential monkey bones excavated at various sites, depictions of monkeys on ceramic material, using her knowledge of fur colour and behavior to identify monkey species) and linguistic data (compiling evidence from various Mayan dictionaries to determine the existence of a "capuchin monkey" concept in various ancient dialects). Subsequently, she comes up with firm hypotheses for the historical distribution of capuchin monkeys and raises research questions for each of the anthropological subfields.

27 The last two articles propose innovative pathways for social scientists to engage in the study of nonhuman primate behavior. Véronique Servais's contribution circumscribes the reasons why natural and social science collaborations in this field are so infrequent and proposes new directions to make this possible. Her plea for a social science-based

approach to monkey and ape social behavior is grounded in the observation that biological explanations, notably those of evolutionary psychology, literally misplace these organisms' cognitive and behavioral competences inside their brain. She departs from this view which, according to her, over-emphasizes the role of adaptation and natural selection in the expression of behavior and cognitive faculties, and demonstrates how social cognition is partly shaped by an emotional environment through ongoing social interactions, according to patterns which are socially transmitted and that she terms "affective cultures". This argumentation, based on a series of concrete examples dealing mainly with studies about cooperation, does not lead her to replace the integrality of biological explanations by social ones, however. It rather points to the limitations of the former, thus opening an avenue for the social sciences to make their case and engage methodologically in the study of animal behavior. Under her scrutiny, the cognitive science laboratory becomes a socially meaningful environment in which the social shaping of emotions partly accounts for the absence of certain behaviors and cognitive abilities which primatologists expect primates to display.

28 Servais's approach is very close, in objectives and demonstration, to the contribution of Akira Takada which closes the volume. Reviewing current cognitive psychology studies of apes' abilities to communicate through gestures such as "hand pointing", the author stresses that much of this research is based on the assumption that these abilities are species-wide characteristics. He then questions this assumption by emphasizing how little we actually know about how and precisely what kind of contexts enable such performances in communication to occur. Having regularly immersed himself among the chimpanzees and caregivers of the Great Ape Research Institute of Tamano, Japan, he approaches their behavior through an interaction analysis based on video recordings. By describing how actions unfold second by second in a confined space where two, then three chimpanzees, including an infant, are subjected to a session of physical measurement by several caregivers, he focuses on the vocal, gestural and postural cues that allow both categories of beings to express their desires and concerns as the session proceeds. He makes apparent, for instance, how they cope with the uncertain meaning of cues, or how objects (in this case, food) are used to organize the interaction. Takada makes a strong empirical case for grounding the study of laboratory chimpanzee behavior and cognitive abilities in interindividual and interspecific patterns of sociality, rather than in individuals.

29 Methodological bridging between the natural and social sciences concerning nonhuman primates can only be achieved through an understanding of the opposing point of view. These varied contributions on and about primates will hopefully assist those interested in the same enterprise to clear up a few interdisciplinary misunderstandings. In turn, it could enable us to further question disciplinary, epistemological and ontological boundaries in order to think more efficiently about how and to what extent it may be desirable to transcend them.

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NOTES

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ABSTRACTS

The purpose of this *Revue de Primatologie* issue is to put forward the multiple ways to look at primates across the fields of anthropology and primatology which are commonly thought to be (and which, for the most part, actually are) academically and epistemologically very remote from one another. It is intended to provide a kind of sketch of this ever-widening gulf and to locate some of the major crosscurrents which constantly drive them apart, as well as to look for a few possible interdisciplinary crossing points. The first part of this introduction briefly describes how primates are caught in disciplinary uncertainty between the social and the natural sciences and between the various brands of "ethnoprimatology" which have emerged over the past 15 years. The second part proposes a slightly different perspective on the conceptual fuzziness surrounding primate studies and their relation to anthropology by emphasizing epistemological rather than disciplinary gaps: anthropology itself is partly characterized by dissents similar to those usually described in its opposition to primatology, while a few voices internal to primatology may, for their part, be characterized as anthropological ones. The third part explores some implications of the use of a "tool kit" metaphor to characterize the kind of interdisciplinarity which is practised in current ethnoprimatology, especially about the epistemological integration of the two fields and the overlapping of their respective ontological assumptions. The fourth and last part introduces the articles of this issue, each of them enabling us to consider how and to what extent it may be desirable to transcend these various disciplinary, political and epistemological boundaries.

L'objectif de ce dossier de *Revue de Primatologie* est de rendre compte des multiples façons d'appréhender les primates aux frontières de l'anthropologie et de la primatologie, deux disciplines qui sont généralement pensées comme étant (et qui en fait, pour l'essentiel, sont) académiquement et épistémologiquement très distantes l'une de l'autre. Il vise à fournir une sorte de cartographie de ce gouffre qui s'élargit sans cesse et à localiser quelques-uns des courants qui les éloignent constamment, ainsi qu'à chercher quelques points de passage interdisciplinaires. La première partie de cette introduction revient brièvement sur l'incertitude disciplinaire dans laquelle sont pris les primates, entre sciences sociales et sciences naturelles et entre les différents styles d'« ethnoprimatologie » qui ont émergé depuis une quinzaine d'années. La seconde partie propose une perspective légèrement différente sur le flou conceptuel des études sur les primates et leurs rapports à l'anthropologie en mettant l'accent sur les discontinuités épistémologiques plutôt que disciplinaires : l'anthropologie elle-même est partiellement traversée par des tensions semblables à celles généralement décrites dans son opposition à la primatologie, tandis que quelques critiques internes à la primatologie peuvent quant à elles être qualifiées d'anthropologiques. La troisième partie explore quelques implications de la métaphore de la « boîte à outils » qui est utilisée pour qualifier le régime d'interdisciplinarité de l'ethnoprimatologie actuelle, notamment à propos de l'intégration épistémologique des deux disciplines et du recouvrement de leurs présupposés ontologiques respectifs. La quatrième et dernière partie introduit les articles de ce dossier, chacun d'entre eux nous permettant d'envisager comment et jusqu'à quel point il peut être désirable de transcender ces diverses limites disciplinaires, politiques et épistémologiques.

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VINCENT LEBLAN

Human-Gorilla and Gorilla-Human: Dynamics of Human-animal boundaries and interethnic relationships in the central African rainforest[1]

Homme-gorilles et gorille-hommes : dynamiques de la frontière homme-animal et relations interethniques dans la forêt d'Afrique centrale

Takanori Oishi

1 Introduction

1 Primates occupy a "privileged" position between humans and nature because of their similarity to humans (Haraway, 1989). African great apes (chimpanzee, bonobo, and gorilla) especially show an enormous similarity to humans not only in external appearances but also in internal traits (behavioral and emotional expressions), which attracted the pioneers of field primatology. Field study of African great apes based on long-term direct observation has developed since the 1960s to produce a great deal of scientific knowledge about great apes in their natural environment.

2 Our knowledge of local peoples' perceptions of and interactions with African great apes, however, remains poor (e.g. in central Africa, see Lingomo and Kimura, 2009 [bonobo]; Giles-Vernick and Rupp, 2006; Köhler, 2005 [chimpanzees and gorilla]; Lewis, 2002 [gorilla]) as compared with the enormous amount of scientific knowledge produced by primatologists. Local peoples, such as the Pygmy hunter–gatherers who are autochthonous to the African tropical forest and some of west Bantu farmers have coexisted with African great apes for hundreds to thousands of years. In the context of

modern conservation, however, local people are considered as only harmful in terms of the survival of wild animals, although a few environmental sociology studies have considered them from other points of view (for example, Yamakoshi and Leblan (2013) look at human-chimpanzee politics by analysing how indigenous and scientific concepts of landscape management for wildlife conservation oppose one another). In other ecoregions such as marine coral ecosystem, many attempts have emerged to apply local traditional ecological knowledge to the field of modern conservation and natural resource management (Drew, 2005; Drew and Henne, 2006; Fraser *et al.*, 2006). However in central Africa, local people have still been regarded as poachers or potential poachers in the context of conservation practices. Their hunting activities are considered to be a major factor in the potential extinction of African great apes. However, we should also recognize that most cases of accelerated decrease of great apes have occurred as a result of local people's forced involvement in drastic socioeconomic changes brought about by external powers. These changes include the rapid commoditization of bush meat driven by mining and logging operations, as well as severe food crises caused by civil wars and armed violence (Ichikawa, 2008).

3 This paper aims (1) to describe the perceptions of the western lowland gorilla (*Gorilla gorilla gorilla*) by forest dwellers of southeastern Cameroon and (2) to reconsider the sociocultural dimension of human–ape relationships and its reflections on human-human relations (i.e. farmer and Pygmy hunter-gatherer interactions) based on the ethnography of the gorilla–human and human–gorilla concepts.

2. Research area, people and methods

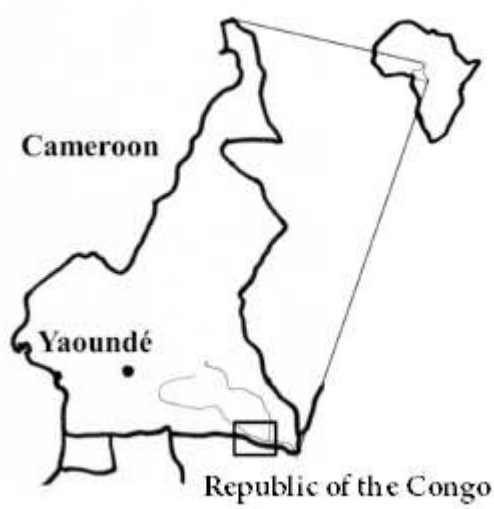
4 Southeastern Cameroon, a part of the Congo basin forest, is covered by dense tropical rainforest with an annual rainfall of 1500-1600mm. The research area is located on the international border between Cameroon and the Republic of the Congo, 650 km southeast of Yaoundé, the capital of Cameroon (Fig. 1). Four gorilla sub-species are known to inhabit central tropical Africa today: the mountain gorilla (*G. g. beringei*), the eastern lowland gorilla (*G. g. graueri*), the western lowland gorilla (*G. g, gorilla*), and the Cross River gorilla (*G. g. diehli*). The southeastern Cameroonian tropical forest constitutes a part of the western lowland gorilla habitat. Recent studies revealed similarities and differences in the ecology and sociology between eastern and western gorillas. Earlier studies on eastern gorillas revealed the multi-male/multi female free ranging goups (Yamagiwa, 1999). Western gorillas form similar social group units to those of eastern gorilla in size and structure, but show differences in group transition and fewer multi-male groups (Robbins *et al.*, 2004). For diets, western gorillas are more frugivorous than eastern gorillas (Breuer *et al.* 2008).

5 Southeast Cameroon holds 3 National Parks (Lobéké, Boumba-Bek and Nki) and a part of the Dja faunal reserve where wild animals are strictly protected. Dupain *et al.* (2004) reported a high density of chimpanzees and gorillas in both protected and nearby non-protected areas whereas Muchaal and Ngandjui (1999) claimed high hunting pressure on wildlife, such as duikers, in the hunting zones in the reserve area. Most parts of the forest in the regions other than the Dja reserve and the other National Parks experienced selective logging since 1970s. Gorillas avoid most recent logging areas, but they nest in all sorts of forest vegetation including young secondary forest (Arnhem *et al.* 2008). Willie *et*

al. (2013) also demonstrated western gorilla's remarkable preference for habitats rich in herbaceous plants such as light gaps, swamp forests, and young secondary forests.

6 Diverse ethnic groups inhabit the study area: Baka hunter-gatherers, Bakwele farmers, and Hausa, Bamileke, and Bamoun merchants. In this paper I focus on the Baka hunter–gatherers and the Bakwele farmers, who have a longer history of living in the area than the other peoples.

Figure 1



Location of the study area.
Localisation du terrain de recherche.

7 The Baka are Pygmy hunter–gatherers living in southern and eastern Cameroon, northeastern Gabon, and northwestern Republic of the Congo (Hewlett, 1996). Baka's population in southeast Cameroon is estimated at around 30,000 (Tegomo *et al.*, 2012). They are in transition, however, and began to adopt a more sedentary and agricultural lifestyle in the 1950s (Althabe, 1965; Hewlett, 1996). The Baka of southeastern Cameroon cultivate plantains as a staple food (Hayashi, 2000; Kitanishi, 2003). Since about the 1970s, they also cultivate cacao trees as a cash crop (Oishi, 2012a). Most of the Baka, however, have not yet abandoned hunting and gathering activities in the forest (Yasuoka, 2006), and many currently participate in both a sedentary farming life in villages and a seminomadic foraging life in the forest (Hayashi, 2000; 2008).

8 The Bakwele number about 12,000 and live in northwestern Republic of the Congo, northeastern Gabon, and southeastern Cameroon (Lewis *et al.*, 2013). Although their subsistence economy is primarily based on shifting cultivation, they also regularly engage in fishing activities during the dry season (Oishi, 2010; 2014).

9 The Bakwele and the Baka historically developed a pseudo-kinship system in the form of patron-client relationships between certain lineages of both ethnic groups (Joiris 2003), but these relationships have deteriorated considerably (Oishi, 2010, Oishi and Hayashi, 2014). They do not share the same native tongue; the Baka speak the Baka language from the Adamawa-Ubangian family, whereas the Bakwele speak a Bantu language. Official marriage between the two is rare: 1% for Baka women and 0% for Baka men in the study area (Oishi, unpublished data). The two groups have ambivalent attitudes about each

other, varying from mutual hatred to cooperation (Bahuchet and Guillaume, 1982; Takeuchi, 2005).

10 Most of the narratives and other evidence considered in this paper were obtained through participant observation among the Baka and the Bakwele from 2002 to 2012. Intensive field research took place in January and February 2012. I conducted (1) semi-structured interviews on gorilla ethnozoology, and (2) open-ended interviews about experiencing encounters with gorillas, with Baka and Bakwele informants, most of whom were adult males. Each interview was conducted individually. Throughout the research, I used the Baka, Bakwele, and French languages, with Baka translation assisted by a Baka research assistant.

3 Ethnoecology of human/ape encounters

3.1 Elements of gorilla ethnozoology

11 Fifty-six species of wild mammals are locally recognized by both the Baka and the Bakwele. There are no differences in the recognition of mammal diversity between them. In Baka terminology, humans and animals are expressed as *bo* and *so,* respectively; for the Bakwele, the terms are *mot* (plural form: *bot*) and *tit* (plural form: *be-tit*). *So* and *tit* both also mean meat. Terrestrial animals are loosely classified into nine categories in Baka: *so na yu* (hunting net animal), *so na mbenga* (spear animal), *so na ye* (arboreal animal), *so na tolo* (ground animal), and so forth. Among these classifications, apes (gorillas and chimpanzees) are classified into an independent category, *so na susu* (hairy animal). This category is clearly distinguished from *kema* (the group that corresponds to the monkey species of the *Cercopithecus* genus).

12 The generic names for gorilla are *ebobo* (Baka) and *dzil* (Bakwele). The Baka have at least 10 terms for specific types of gorilla, depending on sex, age, and companionship status (Table I). The only other animal with a similarly large number of descriptive terms is the African forest elephant (*Loxodonta africana cyclotis*), the most important Baka hunting game species in terms of symbolic thinking and cultural identities (Joiris, 1998; Köhler, 2000: 63; Hayashi, 2010). Experienced Baka hunters, who are referred to as *tuma* in Baka language, recognize that gorillas form groups known as *bufa*, which consist of a silverback leader (*ngille*), several young males, several females of different age categories, and children. Gorillas make nests every day from plant materials of tree twigs and herbs. *Te-ebobo*, which can be translated as "gorilla village", indicates areas in the forest where gorilla nests are concentrated. The Bakwele also have several terms to classify gorillas of various types, but they are less detailed than those of the Baka (Table I).

Table I

Baka term	Bakwele term (plural form)	Description
ebobo	*dzil (bɛ-dzil)*	gorilla (generic)
la ebobo *libambi*	*mɔ-dzil (bɔ-bɛ-dzil)*	baby juvenile
mokolo a ngille *ngille*	*dzil (bɛ-dzil)*	young adult male silverback
ndonga	*ɛ-bɔn (bɛ-mɛ-bɔn)*	solitary male
Nyagole *wose ngille*	?	juvenile female young adult female
nyao	*a-da:ba (ba-da:ba)*	mother
nyandaba	?	adult female accompanying silverback
bufa ebobo	*lɔ:g-ɛ-dzil*	group
te ebobo	*njɔk-dzil (ɛ-njɔk-bɛ-dzil)*	nests

Baka and Bakwele terms for gorilla individuals of different sex and age.
Terminologie Baka et Bakwele pour les individus gorille de sexe et âge différents.

13 Baka hunters share an understanding of single-male/multi-female or multi-male/multi-female gorilla groups, which is consistent with that of primatologists (Breuer *et al.*, 2008; Robbins *et al.*, 2004). The hunters recognize that gorilla groups change with the development of juveniles as well as with the aging of dominant males. For example, an adult male living and foraging alone (*ndonga*), which seems to correspond to the "solitary male" in modern primatology terms, is considered to be an old *ngille* (mature silverback) that has been driven away from his troop by younger adult males (*mokolo a ngille*). These Baka hunters' narratives demonstrate that they have also accumulated their own empirical knowledge (Richards, 1993; Hattori, 2007), although some of the knowledge is consistent with modern primatologist's findings and some is not (e.g., primatologists have a different interpretation of the solitary male phenomenon).

14 Apes are also objects of symbolic thought for the Baka. Although no diseases that would prohibit people from eating apes' meat have been recorded (Sato, 1998), many Baka, especially women, avoid eating gorilla and chimpanzee meat. When they are asked the reason, they often reply that "apes are so similar to the Bakwele, our Bantu neighbors" or simply because "the apes have hands" (Hattori, 2008; Hayashi, 2010). Gorilla body parts are usually named in composite forms of words referring to those of humans, such as *botekpa-ebobo* ("palm" of gorilla) and *njo-ebobo* ("head" of gorilla). Gorillas also play an important role in Baka traditional song stories (*likano*). Most of the main characters of *likano* are animals, including gorillas and chimpanzees. Apes in these stories practice the same activities as the Baka (e.g., raising children and gathering food) and are endowed with human emotions (Hattori, 2008: 87–89). Bakwele men and Baka men share the circumcision ritual of *bɛka* (Joiris, 2003: 62-63). *Dzil* and *ebobo* terms are also used to refer to circumcisors (i.e. the operators of circumcision who cut off the foreskin of the penis). Bakwele also use the term *dzil* to refer to a midwife. Circumcisor and midwife are both considered to be with special skill and puissance.

3.2 Human and gorilla habitats

15 Gorillas depend on terrestrial herbal vegetation, which can easily be found in agricultural fields and young secondary vegetation (Willie et al, 2013). Secondary vegetation is also a preferred habitat for local people's daily hunting and gathering activities because densely

vegetated forest floor is adequate to set snare traps (Fongnzossie and Oishi, 2010; cf. Wilkie, 1989). Thus habitats of humans and gorillas overlap and this increases the frequency of encounters with gorillas. Frequent encounters between local people and gorillas might not be only recent phenomena as we can easily find such examples in oral tradition as well as in historical documents written by European tourists or colonial officers (for example, the *sous-préfet* of Moloundou, a city near the research site, recorded the appearance of a male adult gorilla on the grounds of his office in the 1950s (Rigo, 1951)). Furthermore, gorillas are crop raiders who prefer food crops, especially plantain stems. Following the other small animals such as rodents or cane rats, elephants and gorillas can severely damage the small-scale shifting cultivation that the Bakwele and the Baka practice (Naughton-Treves and Treves, 2005). Elephants frequent areas near National Parks and other conservation areas and can completely destroy farms in a short time (Hagiwara, 2005). I observed a case that a single gorilla damaged more than 50 plantains in one night at a farming extension camp close to Nki National Park. Bakwele farmers use several methods to try to keep gorillas away from crop fields, including making sounds by hitting metal pots and firing blank shots. Such attempts, however, often have little to no effect. Gorillas also cause damage at cacao farms, which contribute precious cash income to the local people. Gorillas like sucking the sweet fruit pulp of cacao beans, much like human children do. Gorillas also disperse cacao seeds into the forest far beyond the village, and tiny patches of cacao trees can be found in remote primary forest far from the sedentary villages where cacao farms are located. Local Baka and Bakwele informants state that these cacao trees are not planted by humans, but by gorillas, so that they can taste cacao bean pulp in their home forest.

3.3 Danger and excitement of gorilla hunting

16 Gorillas have been hunted by both the Baka and the Bakwele for generations but the frequency of gorilla hunting has declined over the years (Hattori, 2007). Gorillas are not targeted. Hayashi (2008) reports that only one adult gorilla was killed by 5 gun hunters during 55 days of direct observation of a migratory hunting camp at the research area. Gorilla hunters use dogs to help track gorillas and use guns or spears to kill them. When a hunter finds traces of gorillas, the hunting dogs follow the scent to find the target. Once located, the dogs bark loudly, and the hunters run in direction of the spot. When a Baka hunter approaches the animal and identifies it as a gorilla, he touches his thumb and index finger to form a circle and places that hand on his eyebrow to indicate it is a gorilla to the other hunters (Fig. 2). This sign is said to be an imitation of a gorilla's bulging brow.

Figure 2

Sign indicating gorilla at hunting scenes (photograph by Takanori Oishi).
Signal de gorille à la chasse (photographie de Takanori Oishi).

17 Baka boys start to hunt rats using bow and arrows, crossbows, and small traps at about 5–6 years of age. Then they gradually move on to hunting small- to medium-sized animals. Only experienced hunters (*tuma*) hunt large and dangerous animals such as gorillas and elephants (Hayashi 2008; Hayashi 2010).

18 Yamagiwa (2005, 2008, personal communication) described the advantages of hunting gorillas using guns: (1) the group composition, (2) the large body and terrestrial residence, (3) the sleeping ecology (land nesting), and (4) the adult male's approaching behavior towards humans. Especially, male gorillas which perform drumming behavior in a standing position provide an easy target for hunters with a gun.

19 Despite the use of these hunting techniques, Baka hunters do not think that gorilla hunting is an easy task. They believe the gorilla is a dangerous, strong, and intelligent animal, and the roles of the hunter and the hunted can change quickly. In addition, some gorillas are particularly aggressive and attack people unexpectedly in the forest. Koji Hayashi, a fellow researcher at the study site, has conducted research on Baka elephant hunting since the late 1990s (Hayashi, 2000; 2008; 2010). In 2002, he collected a detailed narrative from a Baka hunter (Billy, a pseudonym) about his experience being attacked by a gorilla (Fig. 3).

Figure 3

A Baka hunting expert recounts his experience about a gorilla fight. The scar on his nose is the result of a gorilla bite (photographie de Koji Hayashi).
Un maître de chasse raconte ses expériences de combat avec les gorilles. La balafre sur son nez résulte d'une morsure de gorille (Photographie de Koji Hayashi).

Case 1: A Baka hunter and the attacking gorilla

20 *Billy is a tuma, as was his father. Once, when Billy was sleeping at a forest hunting camp, he woke suddenly as a gorilla approached his mongulu (a traditional mobile Baka dwelling made of Marantaceae leaves). He tried to drive it away, but the gorilla held him down and repeatedly bit him on his face and hands. Although he survived, he was seriously injured and scarred for life. Since the attack, he has hated gorillas and desires to kill them. Tuma hunters are usually most proud of elephant hunting, but Billy puts much more efforts on hunting gorillas (Koji Hayashi, personal communication).*

21 A gorilla can injure and kill a human in many ways, as well as kill hunting dogs. Some hunters, such as hunter Billy, had a strong hatred of gorillas beause of these personal experiences with them. The gorilla is generally perceived as the most dangerous animal after the elephant. Gorilla hunting with a spear puts the hunter's life at risk, implying that successfully hunting a gorilla in this manner raises the hunter's prestige in the eyes of others (Hattori, 2007). Baka hunters use gorilla and chimpanzee skin to make daily necessities, such as a sawala container that holds flint fire-making kits and other miscellaneous items. These types of objects can be seen as a sign of the hunter's expertise (Hattori, 2008).

22 Most Baka in general emphasize the "danger" and "ill nature" of gorillas. Gorillas are different from chimpanzees in that they are not afraid of encounters with humans, even those armed with machetes, spears, or guns. They try to keep people out of their territories (cf. Köhler, 2005: 419-420). They pay special attention to human odors, and make loud sounds in attempt to scare them away when they sense them approaching. As stated previously, they also sometimes ambush humans unexpectedly. Thus the Baka are very careful to avoid unwanted encounters with gorillas. They often stop walking and listen for any unusual sounds in the forest when they detect any suspicious changes in the environment. This careful avoidance of gorillas is especially true for Baka women and

children who carry a special plant medicine to drive gorillas away, even more so when they enter the forest without a male adult (Giles-Vernick and Rupp, 2006; Hattori, 2007).

23 In addition to acknowledging the dangers of gorillas, Baka hunter's narratives often refer to their intelligence and cognitive abilities. Gorillas are "clever" and "cunning" by comparison with the other animals, including chimpanzees. For example, gorillas recognize individual hunters and provoke only specific hunters during some encounters. Gorillas also set traps so that a hunter will follow a fake trail on the ground only to be attacked by the gorilla from above. Baka hunters are aware of gorillas' abilities to move both on the ground and through trees and that they can baffle their pursuers by changing the mode of locomotion. Baka hunters become very excited when discussing these types of intelligent behaviors, and their narratives often present hunting gorillas as an intellectual game. In Baka hunting tales, gorillas are often portrayed as personal agents who hold individual characteristics.

4 Ethnography of gorilla–human and human–gorilla

4.1 Farmers as gorilla–humans

24 Two hunter-gatherer groups in central Africa, the Baka of Cameroon and the Aka of the central African Republic, have traditions that regard neighboring farmers as apes (hereafter referred to as gorilla-humans) and believe that they will be reincarnated as gorillas. Hattori (2007: 136) recorded an interesting episode of a gorilla killing event by a Kounabembe (farmer) hunter that was popular among her Baka informants of southeastern Cameroon. They laughed excitedly when telling the story, saying "Look! A gorilla [i.e. gorilla-human] killed another gorilla!". Takeuchi (2001; 2005) also described how an Aka informant described the death of a mutual farmer friend by saying "he became a gorilla".

25 The Efe of the Democratic Republic of the Congo believe that they will move far inside the forest and continue hunting and gathering after death (Sawada, 1998). The Baka also believe that the dead continue to live in the forest and sometimes emerge in living people's dreams to give them ideas about new plant medicines or songs (Tsuru, 2001). However, the Baka do not think neighboring farmers move to the forest in the form of a human after death. They regard the Bakwele as reincarnated gorillas. The Bakwele look like men when they are alive, but return to their gorilla state, which is their essential nature, when they die (Takeuchi, 2005).

26 When Baka informants point out the similarities between gorillas and the Bakwele, they often refer to physical traits and gestures. Bakwele and gorillas share common attitudes, gestures, and behaviors against the Baka; for example, they are both loud when they become excited, and they are both harmful. The Baka consider the Bakwele's posture of "sticking out their chests" and their "patronizing" way of walking to be comparable to those of gorillas. The silverback's standing position against a hunter is considered to be especially similar to that of the Bakwele looking down on the Baka. In addition, the danger of Bakwele sorcerers is perceived to be as harmful as the killer instinct of gorillas.

27 The Bakwele regard the Baka as half-human and half-animal. This can be seen from the Bakwele term for the Baka, *mo-titt*, which literally means "meat–human" or "animal–human". The Baka move camps after someone dies, and the Bakwele believe that the dead

Baka is reincarnated as a yellow-backed duiker (*Cephalophus silvicultor*) and hides near the abandoned camp. Because of this belief, many Bakwele avoid eating this species.

28 Baka hunter–gatherers and Bakwele farmers not only use terms to negatively represent each other. They also consider each other as occupying the borderline between human and animal. But such discriminatory stigmas attached to ethnicities are not equally expressed in everyday relationships between the Baka and the Bakwele because the latter tend to consider the former as subordinate to themselves (Takeuchi, 2005).

29 Jerome Lewis, who has conducted field research among the Mbendjele Pygmies in the northern Republic of the Congo, reported a different type of interaction between hunter–gatherers and farmers concerning gorillas (Lewis, 2002). The Mbendjele use "*ebobo*", a local name for gorilla, to refer to neighboring farming villagers (*bilo* is the plural form) among them. When a Mbendjele hunter killed a gorilla, the dead gorilla was referred to as "*milo*", which means "villager". Most of the Mbendjele don't eat gorilla meat because they consider the gorilla to be a metamorphosed farming villager. In a camp where both the Mbendjele and villagers live together and do wage labor for a logging company, Lewis observed how a Mbendjele hunter shared gorilla meat with villagers. The Mbendjele hunter continued to refer to the butchered gorilla meat as *milo* in front of the farmers. Farmers were troubled, but they did not complain because they were getting the meat for free (Lewis, 2002).

30 The Aka, who live next to the Mbendjele, depend on farmers' agricultural output for staple foods (Takeuchi, 2005), while the latter in Lewis's research site depend on Mbendjele hunters for animal protein. It is likely that these opposite manifestations of interethnic representations can be explained by the different balance of power in terms of ecological interdependency between hunter–gatherers and farmers.

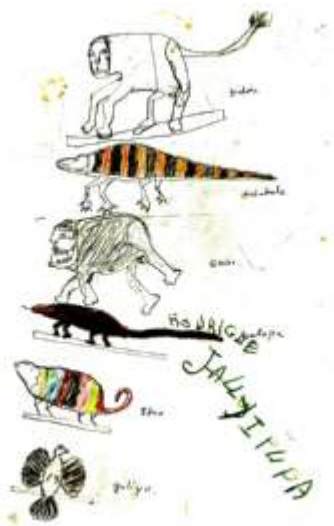
31 Among the Baka, even children share the image of the farmers' gorilla nature. I often bring sketchbooks for fieldwork, and both the Baka and the Bakwele like drawing, so sometimes I let them draw whatever they want. One day in February 2008, a 10-year-old Baka boy gave me some penciled drawings. Among them, I found something quite similar to a human child (Fig. 4).

Figure 4

Drawing of a gorilla by a Baka boy.
Dessin de gorille par un garçon Baka.

32 I asked him about what he drew and he replied innocently, "*ebobo*" (gorilla) and then added "*kaka*" (a derogatory term for farmers) in a quiet voice. Figure 5 shows more drawings of animals by another Baka boy of almost the same age. An image of a gorilla with a human-like face and human male genitals is drawn among various other animals. These drawings provide clues as to the Baka's physical conceptions of their farming neighbors.

Figure 5



Drawings of animals by a Baka boy. The third one from the top is the "gorilla" with human features.
Dessins d'animaux par un garçon Baka. La troisième figure en partant du haut est le "gorille" avec des caractères humains.

33 Stephanie Rupp, who has conducted fieldwork in the Bangando area adjacent to my research area, reported that some Baka think that they will be reborn as the " the whites" (Westerners) after their death (Giles-Vernick and Rupp, 2006). International

organizations and NGOs recently came to recognize the Baka as an indigenous minority, and many development projects financed by the Western countries, such as nature conservation projects and social welfare improvement programs, have limited benefit recipients to the Baka. Giles-Vernick and Rupp suggested that the Baka discourse of their reincarnation into "the whites" may reflect the recent changes in local power relationships between hunter–gatherers and farmers caused by the outside world's biased commitment to local peoples (Giles-Vernick and Rupp, 2006). Jerome Lewis described another variant of the reincarnation tale among the Mbendjele of northern Congo. The Mbendjele believe that "the whites" may reincarnate into red river hogs (*Potamochoerus porcus*), which can be sold at good prices. This view may be a representation of the monetary economic value brought into the society by Westerners (Lewis, 2002).

34 Axel Köhler noted that the Baka and their neighboring farmers (Bakwele, Njem, and Fang) in the northwestern Republic of the Congo believe in each other's reincarnation into different species of apes: the Baka into chimpanzees and the farmers into gorillas (Köhler, 2005). Köhler's Baka informants believe that gorillas and chimpanzees are quite different in their behavioral manifestations towards humans despite their similarities. Contrary to chimpanzees that tend to avoid human territory, gorillas are curious about humans and challenge humans to claim territories. These perceived characteristics of gorilla behavior can be interpreted as comparable to those of authoritarian farmers, whereas the chimpanzee's behavior aligns with the more timid attitudes of the Baka, who behave in a retiring manner when interacting with the others (Köhler, 2005).

35 As briefly reviewed above, folk theories of human reincarnation into wild animals seem to be a cultural stereotype throughout the northwestern Congo basin. These folk theories demonstrate both contiguity and opposition between humans and animals as well as between different groups of people. Symbolic thought behind these folk theories have been shaped by human–animal and human–human interactions in people's everyday lives. In previous studies, these types of human–animal mixtures have been treated as comparable to post-colonial "zombie" tales. They have been regarded as local representations reflecting people's experience with the wider world in relation to past colonialism and forced labor (Geschiere, 1982) and to development projects conducted by external actors such as Catholic missions, logging companies, and conservation NGOs (Giles-Vernick and Rupp, 2006). The considerable variation of man–animal reincarnation folk theories has also been interpreted as a culturally constructed phenomenon that sensitively reflects social changes among local people under the influence of interventions brought by the outside world (Lewis, 2002: Chapter 7; Giles-Vernick and Rupp, 2006).

4.2 "Crop raiding" by animal–humans

36 Conflict between hunter–gatherers and farmers intensifies over the hunter–gatherers' "thefts" of farmers' slash-and-burn field crops (e.g. Wilkie and Curran, 1993; Hanawa, 2004). The Baka have developed a variety of hunting ritual associations based on the relationship to tutelary game spirits (Joiris, 1996). Baka hunters enter those ritual associations to develop a privileged relationship with the game spirits which may teach them how to "walk side by side" with the animals, and only the initiates and their family can metamorphose into game spirits (Joiris, 1996). According to the Bakwele, the Baka have sorts of *elizaliza* (which refers in Bakwele to a witchcraft ability to metamorphose

into wild animals). Different from the Azande (Evans-Pritchard, 1937), the Bakwele and the Baka have a sole term for super-natural powers, *elieeb* and *mbu* respectively, which corresponds to the French word "sorcellerie" in its use and includes all of witchcraft (spontaneously acquired, unconsciously harming other people), magic (acquired through intentional learning of a special kind of knowledge), and sorcery (magic which brings bad effects). The Bakwele and the Baka believe that it can dwell inside the human abdomen (Oishi, 2008; cf. Hewlett *et al*., 2013 for the Aka Pygmies and the Ngandu farmers of Central African Republic). Hereafter I use witchcraft to refer these concepts globally, but also sorcery and magic when it is evidently the case.

37 The Baka transform themselves into various animals, such as cane rats, monkeys and elephants to deceive farmers and steal field crops in the night, early morning and evening. Bakwele informants described many cases of gun-fire accidents between Bakwele men and crop-raiding animals (the transformed Baka). The following case illustrates this.

Case 2: Monkey crop raider and a strange cry

38 *One day, a Bakwele man passed in front of his field during the evening. He found a colobus monkey eating his maize in the field. He hurried home to get a gun and returned to the field. The monkey was still there, and the man shot the monkey. The man then heard a strange cry. When he approached the target, he could not find the monkey and instead found a Baka man moaning in pain. Fortunately, the Baka was merely injured, and the farmer brought the Baka to the hospital in a nearby city.*

39 Elizaliza is considered to be a sort of magic employed to trick animals when hunting, deceive plot owners to steal crops, and attack one's enemies in the forest. It is necessary to possess a power of witchcraft, known as elieeb in Bakwele, to exercise elizaliza. Elizaliza allows its holder to retain his or her human body when the holder is transformed. It is the holder's spirit that enters the forest or a crop field and behaves in the form of an animal. If the transformed spirit is injured or killed while in the form of an animal, the holder's human body would also be damaged. A Bakwele informant said that many of the Baka with disabilities were injured when they had been transformed. One of my Baka friends has a disability in his right leg. A Bakwele informant gave the following account of the circumstances surrounding the injury.

Case 3: Mangabey crop raiding and a Baka man's disability

40 *The Baka man spent his boyhood in a village adjacent to the village of the research site where he lives now. One day, the Baka man transformed himself into an agile mangabey (Cercocebus agilis) to steal maize from a field belonging to a Bakwele man. The Bakwele man became aware of the mangabey eating his crop and shot it in the leg. The wounded mangabey then disappeared into the bush. Several days after the event, the Baka man became very sick in his right leg and had a high fever. The effects persist to today.*

41 The Bakwele believe the Baka have supernatural power and are afraid of it. Such anxiety is reflected in the Bakwele's perception that the Baka raid crops by transforming themselves into animals. This also suggests that the Bakwele perceive their conflicts with the Baka over field crops as comparable to those with other animals. The Bakwele regard the Baka as half-human and half-animal and are trying to keep interethnic borders with

the Baka by emphasizing differences between their humanity and the animal nature of the Baka.

4.3 Ethnography of the human–gorilla

42 According to the Bakwele, wild gorilla populations include human–gorillas (*dzil-elizaliza*) whose body is gorilla but whose spirit is human. There are two types of *dzil-elizaliza*: some are revenants and known to be gentle, kind, and tranquil, whereas others are transformed withches and are considered as dangerous, malicious, and violent.

43 The Bakwele believe that any individuals who have *elizaliza* will reincarnate into revenant human-gorillas. When such individuals die, their spirit still lives in a gorilla body through the power of *elizaliza* and will revisit locations with which he or she was familiar with before death. It will appear fearlessly in people's everyday lives and practice mischief, but otherwise does not harm people. Once a gorilla has been perceived as a revenant human-gorilla, people avoid killing it, and it remains free from any human action upon it. In forest encounters, it is difficult for a hunter to immediately distinguish a human–gorilla from other gorillas every time. A revenant human–gorilla does not roar against the dead person's kin (i.e., it is not aggressive). If a human–gorilla is killed, its blood resembles human blood, and the meat may taste very bad, which is another distinctive sign.

44 Interviews with local people conducted near the research site and in the wider region (within approximately 50 km) revealed 6-8 encounters with human-gorillas over the past 20 years. The three following cases exemplify these situations.

Case 4: Deadly fight with a witch-transformed *dzil-elizaliza*

45 *An adult Bakwele man Henry (pseudonym) was seriously injured in a fight with a witch-transformed dzil-elizaliza. Henry lives in his natal village, which is located on the Congo side of Cameroon and Republic of the Congo border. He earns a living by cultivating cacao.*

Early one morning in October 2009, Henry found an owl perched on top of a wooden pole that children were using as a goalpost to play soccer. In many societies of central Africa, the owl is a strongly avoided animal that is thought to be a messenger of sorcerers. The owl had a large outstanding projection on its throat. Henry was immediately reminded of an old woman from his neighborhood who was famous for being a witch because she also had a projection on her throat. Henry decided that the owl was the transformed old woman. Henry asked employees Alan and George to shot the owl. When the owl was killed, the old woman cried and screamed "Henry killed me! Henry killed my owl!" and became sick shortly thereafter. After she recovered, a bullet wound was found in her upper left arm.

Sooner after the owl killing, people reported frequent problems created by a female gorilla just outside of the village. Henry sensed danger and thought that the old woman transformed into a dzil-elizaliza to attack him. Henry then had Alan and George chase the female gorilla. They shot at the gorilla more than 10 times, but the gorilla escaped. Over the next couple of days, the gorilla continued to emerge and to wander close to the village, but any attempts to kill it failed. The old woman teased Henry by telling him "Your hunters are useless. It's pitiful that you can't kill an animal walking in the village that isn't even hiding." Henry got angry hearing the old woman's words and decided to follow the gorilla himself. Henry encountered the gorilla in a banana plantation. Feeling frightened, Henry shot twice as the gorilla charged him and knocked him down. Henry could no longer use his gun and was repeatedly bitten on his arms, thighs, and calves. As Henry was about to be killed by the gorilla, another villager arrived with a shot gun and shot it in

the neck, and it finally died. Henry was seriously wounded but recovered (Fig. 6). The gorilla was then butchered, and the meat shared among villagers. Everyone ate it except for the old woman. Five days after the attack, the old woman disappeared and suddenly returned 3 months later.

Figure 6

The wounds of a Bakwele man (Henry in the case 4) two weeks after a gorilla attack (photograph by Ryota Yamaguchi).
Blessure d'un homme Bakwele (individu Henry du cas 4) deux semaines après une attaque par un gorille (photographie de Ryota Yamaguchi).

46 The emergence of *dzil-elizaliza* is often related to the practice of witchcraft and sorcery. Case 4 is a typical example in that its emergence was identified as being caused by a specific person's sorcery. When talking about the absence of the old woman, inhabitants of the village said that she might have gone to a witch doctor to have the bullets removed from inside her body. They also speculated about why Henry had been attacked. He had gained benefits from rental contracts of cacao plantations with other villagers and had many friends among the merchants of a nearby city. People hypothesized that the old woman was afraid that the "development" brought to the village by Henry would harm the traditional practice of witchcraft.

Case 5: A gorilla calmly staying at a water source in an old village

47 *Around 1985, a farmer was living at the forest camp Diwala as a logging company's employee, along with with several Baka colleagues. Diwala is an abandoned village where the Bakwele and the Baka used to live, but there were no permanent residents at that time. They encountered a gorilla every morning at the water source. When they fetched water, the gorilla turned its back to the people and stayed calm. The gorilla was not afraid at all. People in the camp thought that it must surely be a dzil-elizaliza and decided not to kill him.*

48 Encounters with the revenant human-gorilla usually happen around villages after someone's death, but this case was somewhat unusual because it occurred in the forest. Diwala had been abandoned since about 1950 and was covered by forest vegetation at the time.

Case 6: A gorilla waved his hands and danced at a funeral ritual

49 *In 1988, Baka man Bernard (pseudonym), the "son" (in terms of traditional pseudo-kinship) of Bakwele man Daniel (pseudonym), died. As people gathered in front of Bernard's house to prepare dance ceremonies for the funeral ritual, a gorilla appeared. The gorilla wandered around and then entered the baaza (men's gathering space) and waved its hands. The gorilla was immediately recognized as a dzil-elizaliza, the revenant human-gorilla of the dead man Bernard. When a drum was played, the gorilla danced to the beat. People left the gorilla alone because it was a dzil-elizaliza. The gorilla stayed around the village for nearly a month after the funeral and then disappeared suddenly.*

50 Gorillas that appear soon after people's death tend to be perceived in an especially personified way. They repeatedly appear close to the places, things, and people with which the dead person was familiar. Case 6 is unique in that it shows that some dead Baka are also thought to be reborn as human–gorillas by the Bakwele. Unlike the Bakwele, the Baka do not think that they will reincarnate into gorillas. Daniel's family is one of a few Bakwele lineages that maintain pseudo-kinship relations to a particular Baka lineage, in this case Bernard's family. In this example, the Bakwele informant applied the folk theory of dzil-elizaliza to the Baka man. Although the Bakwele usually emphasize what differentiates them from the Baka, they sometimes include the Baka in their cultural practices.

51 As these examples show, there are considerable variations in the ways in which human–gorillas appear. Witch-transformed human–gorillas are viewed as dangerous and causing intentional harm to humans. Bakwele informants also say that witch-transformed dzil-elizaliza can kidnap females and children. Bakwele parents are very cautious of kidnapping by such malicious dzil-elizaliza. In contrast, revenant dzil-elizaliza are viewed as humorous human-like creatures.

52 The gorilla is a unique and special animal, not only in the eyes of the Bakwele but also for other Bantu and Oubanguian speaking farmers along the Sangha river system, which is part of the northwestern Congo basin (Giles-Vernick and Rupp, 2006). Human–gorilla tales have been reported for the Mpiemu of southwestern Central African Republic (Giles-Vernick, 2002; Giles-Vernick and Rupp, 2006) and the Bakwele, Djem, and the Fang of the Souanké district of the Sangha Department of the Republic of the Congo (Köhler, 2005). Giles-Vernick and Rupp noted that the emergence of the human–gorilla concept is related to the farmers' notions of witchcraft, and its liminal manifestation at indistinct position between human and animal may represent the concerned person's ambiguous position in the local society (Giles-Vernick and Rupp, 2006).

53 Killing a dzil-elizaliza is thought to be equivalent to a homicide by the Bakwele. Closer family members of the dead may feel strong affinities with the revenant type dzil-elizaliza and, at the same time, are the only people who can kill one. This paradox may reflect the Bakwele's view of family relationships, because they believe that killing a person by witchcraft is easier as the level of kinship is closer. As a mirror of human society (Mullin, 1999), these ambivalent characteristics of dzil-elizaliza seem to reflect variation of Bakwele's self-image (Oishi, 2010). It is difficult to distinguish dzil-elizaliza from other gorillas, a situation which echoes relationships in Bakwele society where it is difficult to identify who practices witchcraft such as elizaliza. In theory, all gorillas could be dzil-elizaliza, and all Bakwele individuals may be witches (hold elieeb). In this context,

the Bakwele view the gorilla not as an animal but as a human being, whereas the Baka view the Bakwele as approximately equivalent to gorillas.

5 Conclusion

54 The dynamic social-emotional relationships of Pygmy hunter–gatherers and farmers are complex and are poorly understood (Kitanishi, 2010). Both groups manifest strong dislikes of each other while at the same time regularly interacting and depending on each other (Bahuchet and Guillaume, 1982; Takeuchi, 2005). Whereas hunter–gatherers behave on an egalitarian basis and do not accept coercion or control over by other people, their farming neighbors regard them as subordinate and often try to influence their behavior (Takeuchi, 2005). Hunter–gatherers relationships with farmers can be beneficial to them so that they generally try to keep them as fluid as possible (Lewis, 2002; Hanawa, 2004; Takeuchi, 2005).

55 Both hunter–gatherers and farmers want to maintain differences between them. The mode of coexistence they each seek is, however, very different. Farmers want to maintain and reproduce hierarchical relationships with hunter–gatherers, whereas the hunter–gatherers do not accept this imposed structural hierarchy. Their strategies of coexistence are almost completely opposite, and the interethnic dichotomy is maintained on an equilibrium between equality and inequality.

56 According to Lewis (2002; 2010), the Mbendjele Pygmies treat neighboring farmers in a similar manner as wild animals. The Baka do the same when confronted by the Bakwele who do not understand their egalitarian way of living, communicating, and sharing. The Bakwele also apply their own strategies of dealing with wild animals to the Baka. The Bakwele regard the Baka, who do not accept a farmer-centered world view and the crop-field ownership system, as if they were wild animal crop raiders.

57 The two peoples' modes of coexistence with wild animals and neighboring peoples intersect with each other. The cases of human–gorilla (*dzil-elizaliza*) incidents and the perceptions discussed here showed that gorillas are not only the subject of cultural constructions that reflect specific people's sociocultural conditions, but that they are also active actors that sometimes intervene in people's actual social relationships. Thus the human and gorilla interaction is partly bidirectional, making humanity and nature indistinct. As human's ontological counterparts, gorillas are much more than a food or a symbol for humans. The position of humans (and gorillas) in nature, and the position of an individual in culture are determined and redefined at every encounter. In this system, the gorilla occupies a unique position that crosses both the interethnic boundaries between the Baka and the Bakwele and the interspecies boundaries between humans and animals. From the local people's worldview, maintenance of human and gorilla relationships occupie a significant place in their cultural practices and separation of the two species (human and gorilla) is not desirable. Such nature-culture entanglements should not necessarily be regarded as a barrier for conservation or community-based resource management, but as a potentially positive resource which can contribute to move from conventional top-down conservation efforts to approaches which reflect local concerns.

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NOTES

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ABSTRACTS

This paper (1) describes the perceptions of the western lowland gorilla (*Gorilla gorilla gorilla*) by forest dwellers of southeastern Cameroon and (2) investigates the sociocultural dimension of human–gorilla relationships focusing on folk theories of human–animal hybrids in which the gorilla is deeply embedded, enabling us to deal with the symbolic and social aspects of hunter-gatherer–farmer relations. The Baka hunter-gatherers of the southeast Cameroon–Congo border regions live with their Bakwele farming neighbors. They regard the Bakwele as gorilla–humans that may be reincarnated as gorillas after death. Conversely, the Bakwele regard the Baka as animal–humans that can transform themselves into various animals to raid crops, and believe that there are human–gorillas (*dzil-elizaliza*) in the wild gorilla population whose bodies are gorilla but whose spirits are those of human beings. There are two types of *dzil-elizaliza*: the revenant human-gorilla of the deceased, which is gentle and tranquil; and the witch-transformed human-gorilla, which is dangerous, malicious, and harms people. The dual nature of *dzil-elizaliza* expresses a contrast between the witch-controlled man-eater and the warm-hearted reincarnated ancestral relative in a human-gorilla. Ambivalent representations of *dzil-elizaliza* also seem to reflect variation of Bakwele's self-image.Thus, Bakwele and gorillas can be said to share common properties which circulate across a human-nature landscape in the form of a human-animal hybrid. Local narratives of the human–gorilla demonstrate that gorillas are not only the subject of cultural construction that reflects specific people's sociocultural conditions, but that they are also actors that sometimes intervene in actual social relationships. Here human and gorilla interactions are bidirectional. Much beyond food or symbols for humans, gorillas are human's ontological counterparts. In this system, gorillas occupy a unique position that crosses both the interethnic boundaries between the Baka and the Bakwele and the interspecies boundaries between humans and animals. From the local people's worldview, the maintenance of human and gorilla relationships is significant in their cultural practices and the separation of the

two species is not desirable. This paper is a revised version of a book chapter published by Oishi, in Japanese in 2012.

Dans un premier temps, cet article décrit les perceptions du gorille des plaines de l'ouest (*Gorilla gorilla gorilla*) par les habitants de la forêt du sud-est du Cameroun. Dans un second temps, il examine les relations humains-gorilles en se focalisant sur les théories populaires relatives aux êtres hybrides humains-animaux dans lesquelles le gorille est profondément impliqué, ce qui permet d'aborder les aspects symboliques et sociaux des relations entre chasseurs-cueilleurs et agriculteurs. Les chasseurs-cueilleurs Baka de la frontière sud-est du Cameroun-Congo vivent avec leurs voisins agriculteurs Bakwele. Ils considèrent ces derniers comme des hommes-gorilles susceptibles de se réincarner en gorilles après la mort. Réciproquement, les Bakwele considèrent les Baka comme des hommes-animaux capables de se transformer en petits animaux afin de voler les récoltes, et croient en l'existence de gorilles-hommes (*dzil-elizaliza*) présents parmi les gorilles sauvages, dont le corps est gorille mais dont l'esprit est celui d'êtres humains. Il y a deux catégories de *dzil-elizaliza* : le revenant, gentil et paisible, et le sorcier, dangereux, malveillant et qui fait du mal aux gens. La nature duale de *dzil-elizaliza* est l'expression d'un contraste entre le mangeur d'hommes contrôlé par un sorcier et l'ancêtre affectueux réincarné en gorille-homme. Cette ambivalence semble également refléter des variations de l'image de soi chez les Bakwele. Ainsi, on peut dire que les Bakwele et les gorilles partagent des propriétés qui circulent à travers une limite humanité/nature prenant la forme d'un hybride humain-animal. Les récits locaux montrent que les gorilles ne sont pas seulement le sujet de constructions culturelles reflétant les conditions socio-culurelles des habitants de la région ; ce sont également des acteurs susceptibles d'intervenir concrètement dans les relations sociales. Ici, l'interaction entre hommes et gorilles est en partie bidirectionnelle. Bien plus qu'une nourriture ou un symbole, les gorilles sont les homologues ontologiques des humains. Dans ce système, les gorilles occupent une position unique qui traverse tant les limites interethniques entre les Baka et les Bakwele que les limites interspécifiques entre humains et animaux. Le maintien des relations entre humains et gorilles est significatif sur le plan des pratiques culturelles des groupes locaux et la séparation des deux espèces n'est pas désirable. Cet article est une version révisée d'un chapitre d'ouvrage publié par Oishi, en japonais en 2012.

INDEX

Mots-clés: Baka, Bakwele, ethnographie comparative, Gorilla gorilla gorilla, hybride humain-animal, relations chasseurs-cueilleurs-agriculteurs, sud-est Cameroun
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Conflicts between indigenous and scientific concepts of landscape management for wildlife conservation: human-chimpanzee politics of coexistence at Bossou, Guinea[1]

Conflits entre conceptions locales et scientifiques de la gestion du paysage pour la conservation de la faune : politiques de la coexistence entre humains et chimpanzés à Bossou, Guinée

Gen Yamakoshi and Vincent Leblan

1. Introduction

1.1 (Post-)Colonial environmental conservation policies in Africa

1 The history of modern environmental conservation in Africa has its origin in the colonial era. Large-scale nature reserves were then established throughout the African colonies, with the principal aim of protecting game animals (which were at risk of depletion) for sports hunting, and protecting landscapes for aesthetic motives and recreation (MacKenzie, 1988; McNeely *et al.*, 1994). These nature and hunting reserves were established by colonial governments, which forcibly expropriated land from local inhabitants. This policy expressed a value system and economic motives peculiar to the West, which sought to maintain areas of "untouched nature" (e.g. Nash, 1967).

2 After African countries became independent around the 1960s, this management system was, in many cases, inherited as is by post-independence governments. Even though many of these newly independent countries had lofty ideals about the self-reliance of Africa, there appeared to be no new nature conservation policies to indigenize or transcend philosophies originating in the West. This context was favorable for a massive international broadcasting of numerous campaigns for the creation of national parks. Hence, "untouched" reserves which excluded local inhabitants were preserved and even expanded (Neumann, 1998; Rodary and Castellanet, 2003). For the newly independent countries, one of the incentives to maintain the reserves was the income brought in by sports hunters and tourists from Europe, the U.S. and other northern countries (Yasuda, 2011). These externally-driven policies of environmental conservation are well illustrated by the 1961 "Arusha Manifesto" by Julius Nyerere, then the prime minister of Tanganyika, at an international conference organized by the IUCN which took place in Arusha (Neumann, 1988, p. 140-141). He also stated as follows in the interview by Daily Telegraph: "Personally, I'm not very interested in animals. I don't want to spend my holidays looking at alligators. However, I totally support their continued existence. Just like diamonds and sisal, wild animals can provide a huge income to Tanganyika. Many Americans and Europeans have a strange urge to look at wild animals, and we should provide assurances so that they can fulfill their wishes" (Grzimek, 1962).

1.2 Resistance movements and the rise of community conservation

3 How did citizens in affected areas respond to the conservation policies which were continually forced upon them in a top-down fashion by colonial governments and then post-independence governments? These people whose land rights and land-use systems were ignored, and who in many cases received no compensation in land or money, are generally critical of the establishment and operation of reserves. There is of course a diversity of situations depending on the country, region, socio-political situation and strictness of conservation enforcement measures, but a variety of responses are evident, ranging from large-scale resistance movements such as armed conflicts or political lobbying, to routine practices such as poaching, illegal logging and bushfires, and to superficial apathy and non-cooperation (Iwai, 2009; Matsuda, 2002; Neumann, 1998; Nishizaki, 2004; Kull, 2004).

4 Thereafter, the need to build a cooperative relationship with local inhabitants in order to achieve substantive results in reserves became widely recognized. In designing a reserve, planners have reconsidered the traditional approach of demarcating the reserve with a single borderline and have proposed and carried out supposedly more integrative approaches. This is typified by UNESCO's "Man and the Biosphere Program", where a strictly protected "core area" is surrounded by a "buffer zone" where sustainable livelihood activities are partially recognized (Batisse, 1982). Under this scheme, which came to be called "community conservation" (Barrow and Murphee, 2001), the inhabitants are supposedly encouraged to participate in conservation activities as collaborators. A variety of approaches are used, including employing them as reserve employees for their "traditional ecological knowledge", and/or having them participate as local representatives in organizations which make decisions regarding reserve management issues (Western and Wright, 1994).

5 In many of these "participative" projects, however, the inhabitants participate peripherally in a pre-existing reserve scheme under which administrations and NGOs simply make attempts to enlist local citizens—historically regarded as a "menace"—by presenting them with the carrot of economic profit. Additionally, this mechanism of "participation" still leaves much open space for issues of land dispossession (for a case study in northwest Guinea, see Leblan, 2007). Further critics of this model have underscored how the creation of buffer zones around reserves actually allows States to reinforce their own intervention capacities beyond zones that were established in colonial times. This model, which in fact remains very centralized as much in the way it unfolds in space as in its persisting top-down decision-making processes, also fulfills rarely recognized geopolitical functions by allowing States to catch the attention of western-based development agencies and to control their territorial boundaries more effectively (Giraut *et al.*, 2004).

1.3 A lack of local initiatives and principles?

6 The philosophy of citizen participation assumes that the inhabitants of a given area, to whom ultimate authority has been delegated, are the primary actors of conservation and that they should be provided with minimal support from the outside. However, some of the institutional actors of conservation with a skeptical view of community conservation in Africa make the case that, in the end, all they want is economic gain, and that local residents who do not share the modern philosophy of nature conservation cannot become independent actors. Hence, these critics promote a comeback to the "fortress" approach to conservation, valuing "nature" for its own sake (Hackel, 1999; Oates, 1999). To the contrary, another skeptical view also grounded in institutional approaches to conservation is that international agencies are not internally organized for and actually do not have the will to truly delegate their powers to local citizens (Chapin, 2004).

7 In order to promote more independent participative models, there have been vigorous environmental "education" efforts to transfer Western concepts like "biodiversity" and "ecosystem" to local inhabitants who "do not understand" why "nature", a notion yet usually foreign to African societies (Leblan and Bricka, 2013), needs to be protected (Hattori, 2005). These unilateral policies evidently overlook the fact that relationships to the environment as they unfold in African societies may offer new and more legitimate opportunities to think about and implement conservation practices.

8 This article focuses on a local campaign regarding chimpanzee and forest conservation in and around the village of Bossou in the Republic of Guinea, a place known through naturalistic research for its inhabitants' coexistence with chimpanzees. The purpose of the paper is to critically reconsider approaches which exclude local inhabitants from State conservation policies and which usually deny them the right to be independent actors in conservation policies (the opposing risk then being to fall into the "ecologically noble savage" trap: see Hames, 2007). For this, we examine the stated and possible motives of a swidden preparation campaign in the context of a confrontation with scientists and State employees working at the site. This enables us to establish what appears to be a local "conservation" model, based on Bossou villagers' agricultural practices as well as on their long relational history with chimpanzees maintained through various political regimes. Thus, while adding to the literature on the political-economic contexts of conservation in West Africa which usually takes a landscape approach to

conservation (e.g. Fairhead and Leach, 1996; Basset and Zuéli, 2000; Temudo, 2009), we also consider the important "north-south" cultural differences in understanding what a "chimpanzee" is (see richards, 1993 and 2000 on the ontology of chimpanzees among the Mende of Sierra Leone). This indigenous model is then assessed for its efficiency and acceptability by the various actors living and working at the site regarding three issues related to human-chimpanzee coexistence: reproductive isolation of Bossou chimpanzees from other populations, disease circulation between villagers and chimpanzees, injuries inflicted to villagers by chimpanzees.

2 A paradise of coexistence? People and chimpanzees in the village of Bossou, Republic of Guinea

9 Bossou is a village with a population of about 2,000 people, located in a forested region adjacent to Liberia and Côte d'Ivoire in the Southeast part of the Republic of Guinea, near which lives a well studied chimpanzee community. The "Manon" or "Mano" inhabitants of Bossou are a people who speak a language of the Mande family. The majority of Manon people live within Liberia, less than 100,000 of them living across the border in Guinea. In Guinea, the majority of the population comprises three large ethnic groups—the Muslim Fula, Malinke, and Susu— which make up 90% of the population. The remainder groups are minorities in the Southeastern forest, a majority of them Christians who maintain their traditional animist religion like a majority of Muslims do (Downie, 2003). The inhabitants of Bossou rely primarily on swidden agriculture, their main crops being upland rice, cassava, maize, and banana (Schwab, 1947; Sugiyama, 1978).

10 As for Bossou chimpanzees, their first academic description dates back to 1942. It is then not before the 1960s that a research team lead by Adriaan Kortlandt of the University of Amsterdam visited the area multiple times, conducting original research on chimpanzee anti-predator behavior using an electrically-controlled leopard dummy (Kortlandt, 1972; Albrecht and Dunnett, 1971). In 1976, Yukimaru Sugiyama of Kyoto University initiated long-term continuous research which had continued for a period of 25 years at the time of the conflict reported in this article (Matsuzawa *et al.*, 2011). The first author of this article has conducted research in this village since 1992 as a member of the research team, as well as on the history of scientific research at the site (Yamakoshi 2011a), and retrieved data through interviews and informal discussions with all parties involved in the conflict. A secondary source of documentation used to cross-check these data consists of e-mail reports from G. Ohashi and S. Fujita, who were in the village at the time to study chimpanzees and who had to temporarily cease their research activities during the resistance campaign.

11 Chimpanzees are widely hunted for meat in Southeast Guinea. However, hunting and eating chimpanzees is strictly forbidden in the village of Bossou. Among the villagers, there are various opinions about how this ban came to be established. A common view in the village is that among the 5 main clans that currently comprise the village of Bossou, the founding Keleba (lineage names were changed) had a ban on eating chimpanzee meat which was adopted by the other clans as they migrated into the village later on. Another version is that the chimpanzees are former inhabitants of Bossou who have changed their form and who must not be harmed for this reason (Yamakoshi, 2006b). In any event, both versions provide a reason for protecting the local chimpanzee community which is

embedded in the history and establishment of the village. The extent to which this pattern is unique to Bossou in the forest region overlapping parts of Guinea, Côte d'Ivoire and Liberia is not yet clear. However, the forgotten writings of Etta Donner, a young woman who traveled across the Nimba range (and later on became an ethnologist), provide a short narrative about the origin of chimpanzees retrieved in a Dan village located on the eastern side of the Nimba range. The general structure of this narrative is identical to the one that has been heard at Bossou for decades (Holas, 1952 ; Kortlandt 1986) : an ancestor was killed at war and was reincarnated into a chimpanzee. Since then, it is forbidden to eat the flesh of these creatures and to kill them on the territory of the chief who was himself killed (Donner, 1939). Another narrative reported by a natural scientist working in the area about a decade later also states that "[...] in Kono country, the Traoré (zomian) who have the chimpanzee as their totem used to worship a mountain where chimpanzees lived" (Schnell, 1949, our translation).

12 The main area of chimpanzee habitat at Bossou is centered on the forest of the village spirit called "Gban", comprised of small forests distributed in patches along other hills and creeks. At the center of these forests, which appear at a superficial glance to be "untouched," there are places where the village spirit lives and others where ceremonies such as circumcision are performed. At these places, village customs prohibit tree cutting and field clearing. Unless there is a special reason, the villagers never enter this forest. Some trees like oil palms (*Elaeis guineensis*) which are left uncut in fallow forests make good foraging grounds for chimpanzees (Yamakoshi 2011b). The first academic paper about the palm trees of the area even suggested that they were likely to be primarily disseminated by chimpanzees (Schnell, 1946). Places like these, where vegetation is not used by people, become a primary habitat for chimpanzees. In other words, the living environment of Bossou chimpanzees is deeply embedded in the agricultural and village landscape.

13 The enmeshment of human and chimpanzee habitat is not a recent feature of this locality. In 1941, under the Vichy Government, a group of young naturalists was sent to Dakar in order to take part in a biological survey of the territories of French West Africa. Among them was Maxime Lamotte who spent a few months in the Nimba range. His research project aimed at transferring the methods of phytosociology to the study of the fauna (looking for "animal associations") and at adopting the perspective of biogeography for studying the distribution and ecological relationships of all the tiny animals that could be found in grasses and on the ground itself (Lachenal, 2005). This is certainly the reason why chimpanzees are only briefly mentioned in his academic report. However, he already thought it worth noting that those of Bossou received a form of local protection (Lamotte, 1942). A cultural anthropologist who conducted surveys in the surrounding area also stated that, due to local beliefs, "[...] there is no need whatsoever to protect the chimpanzees here with government measures" (Holas, 1952: 39-40, our translation).

14 The Nimba range was designated as Strict Nature Reserve in 1944, depriving the inhabitants of several villages, including Séringbara which is only a few kilometers from Bossou, of parts of their agricultural lands (Berdoulay *et al.*, 1999). As for the Bossou forest, it was not designated as a reserve by the Guinean state or international institutions until it was added in 1991 to the "Core Area" of the UNESCO Biosphere Reserve (designated in 1981), which itself overlaps with the 1944 Mt. Nimba Strict Nature Reserve (Wilson, 1992). Except for signs posted at two locations in the village, there were

no obvious changes in conditions before and after the 1991 designation (Sugiyama and Matsuzawa, 1993). However, although this UNESCO label doesn't imply any real legal force, it probably contributed in the long term to modify the context for the legitimacy of various arguments concerning the management of Bossou chimpanzees and their habitat, as we will see below. Problems relating to the forest and chimpanzees had always been resolved through discussions by the village's decision-making bodies: they had been protected for endogenous reasons grounded in the worldview, history and landscape configuration peculiar to the place.

15 After the establishment of the Bossou Environmental Research Institute (IREB: Institut de Recherche Environnementale de Bossou), a national Guinean research organization, in 2001, the villagers entered into resistance in 2002 against newly enforced conservation policies by clearing some parts of the forest vegetation located inside overlapping human-chimpanzee ranging areas. The next section deals with this resistance campaign taking place inside this "paradise of coexistence" and its social and ecological background. This context will enable us to consider an alternate local experience-based model for coexistence with chimpanzees.

3 History and background of the field clearing campaign

3.1 Elements of historical background

16 Under the socialist administration of President Sékou Touré, established after independence in 1958, animistic rites were regarded as the expression of pre-civilized savage behavior holding back the "development" of the country and were hence forbidden under the slogan of "demystification" (Rivière, 1969). Among the Manon and other minorities in the forest region of Guinea, there is—even today—a deep mistrust of the government caused by the neocolonial experience of being dominated as minorities and regarded as "savages" by the other majority ethnic groups under the banner of Islam and socialism.

17 It was strictly forbidden for villagers to enter the forest of Gban in Bossou, and of course entry by anyone else was also forbidden. However, after the colonial period, records state that the researchers who frequently visited Bossou climbed to the top of Gban. It appears that the villagers, who originally had a negative attitude towards such behavior, became unresponsive as the years passed (Kortlandt, 1986). At the time when Sugiyama began his investigations, there was no negative reaction to entering the forest (Sugiyama, 1978; personal communication). Sugiyama (1978) also stresses the non-religious character of life in general in the village of Bossou. It thus seems likely that this is a consequence of the aforementioned government policy of "demystification", although we cannot presently rule out the possibility that the people of Bossou found other, hidden ways to maintain and express their beliefs about the sanctity of the forest. The researchers came with a travel order delivered by the government and in many cases entered the study area together with local researchers who were government employees. It probably was impossible for the villagers to oppose these activities by invoking village traditions which were regarded as backwards by the State.

18 With the death of President Touré in 1984, the socialist government collapsed and power was seized by Lansana Conté who pursued a path of economic liberalization. As the policy of "demystification" ended, religious ceremonies were publicly revived in Bossou. The ban on villagers themselves going into the forest of Gban was maintained, but research in primatology continued without any special objections. It is likely that, by this time, unspoken acquiescence to outsiders going to Gban—something which had been pushed onto the villagers during the Touré administration—had become established to a significant degree.

19 Since the beginning of their studies, primatologists have clearly recognized that the Bossou chimpanzee community as well as the forest area of their habitat is small compared to other regions. The researchers who had a sense of crisis about maintaining the chimpanzee population requested in the early 1990s, i.e. at the time that Gban came to be included in the UNESCO "core area" of the Nimba Biosphere Reserve, that the villagers stop cultivating the skirts of Gban which had already been returned to follow for a while. The request was made in the form of lump-sum payments to farmers who would then have the right to use land in other areas, as well as through personal provision by the researchers of funding assistance for construction of bridges and schools.

20 These requests were made *via* villagers who were employed by the researchers as guides. The first villager hired as a guide was a Mr. A belonging to the Mamy lineage. After that, Mr. A personally selected the new guides that were hired. The Mamy are a lineage which was ordered by the Keleba lineage, as a condition for establishing themselves at Bossou, to take care of the rites related to the forest of Gban. In other words, there was a legitimate reason in the political dynamics of the village for Mr. A to being appointed as a guide for the chimpanzees inhabiting the forest of Gban. Mr. A accepted the researchers' requests for forest preservation and handled them *via* the village headman and the council of elders. In the end, the promised bridges were not finished and their construction did not progress according to the original budget that was agreed upon. Nevertheless, cultivation of Gban was postponed. As a consequence, by 2002, the forest reached the foot of the hill (Fig. 1).

Figure 1

Mt Gban, Bossou
Mont Gban, Bossou

3.2 The 2002 field clearing campaign

21 Amid rising international concern for the chimpanzees of Bossou, the Guinean Ministry of Higher Education issued an order establishing the IREB near the village, the aim being to promote environmental conservation and scientific research there as well as in the neighboring Nimba range and the surrounding area. The stationing of State employees began in 1999. In October 2001, the Institute was formally launched with 5 departments: primatology, genetic resources, meteorology, sociology and documents/information. As noted above, there was previously no governmental organization in Bossou in charge of environmental conservation and tourism. Thus the plan for the IREB was, in addition to receiving foreign researchers and conducting research with the Institute's own researchers, to place the various interests related to chimpanzees (such as guide employment, consolidation of infrastructure through individual aid, and allocation of tourism income) under the Institute's control.

22 In the middle of February 2002—the time when the dry season had reached its final phase, and tree cutting for agriculture begins—16 households primarily comprising people who detained cultivation rights at the base of Gban began clearing the forest. These households were distributed evenly among the main clans of the village, and the cleared forest was also distributed evenly in order to geographically cover the village area. The villagers' statement in response to the guides and IREB employees who censured the slashing of trees was that cultivation on their own lands was an ancestral right and that it was unavoidable because of their trouble making a living.

23 As the field clearing activities began, the IREB indicated its disapproval and issued an order to halt. As the conflict between the village and IREB deepened, foreign researchers

were forced to cease their research activities. In the middle of March, the Director of IREB issued an order for research to go ahead, but in response, a white "curse powder" indicating a prohibition to enter was anonymously spread around all the entrances to the forest. The Director issued instructions to ignore the powder and enter anyway, but the villager guides refused to step over it and go onto the mountain.

24 The conflict looked like it would drag on, but a member of national parliament from the village returned home and acted as a mediator. Among the 16 households who conducted the field clearing, 10 households accepted lump-sum payments and abandoned cultivation in the cleared area. The 6 others rejected the lump-sum payment and refused to amicably settle. In July, the Provincial Governor initiated mediation and the leaders of the tree-cutting group were jailed. The dispute was then brought to court. In September, the trial ended with the abandonment of the cultivated land and the release of the involved members.

25 This is how the situation tentatively ended. The IREB had actually only superficially brought the opposing side under control. Mutual distrust between the IREB and the villagers remained unresolved, and in February of the following year (2003), the first IREB Director was removed. A new Director took up the post, and through negotiations with the villagers, addressed the issue of tourism income allocation which was one of the points of contention. The villagers' proposal for a division of village 50%, guides 35% and IREB 15% was accepted, and thus the issue was settled.

26 The intentions of both sides and the details of the various negotiations and deals which likely occurred behind these superficial changes are not clear. However, it is not realistic to think that the conversion of secondary forest back to fields, which had been postponed for 10 years in response to requests from foreign researchers, had suddenly flared up by chance immediately after the IREB's creation simply due to "hardship in making a living." It should rather be understood as a form of defiance displayed at this newly established governmental organization, perceived as threatening an independent system of coexistence with chimpanzees which had been maintained through various political regimes.

3.3 Continuation and transformation of field clearing

27 A consequence of the IREB director's ouster in 2003 was to calm down the resistance campaign carried on by the entire village. However, Mr. B (one of the leaders of the resistance) and his family continued new agricultural activities in the secondary forest around Gban for 3 consecutive years (2003, 2004, and 2005). This time, the axis of confrontation changed to the group surrounding Mr. B versus the majority in the village who accepted the 2002 amicable settlement. With regard to the continuation of field clearing in 2003-2005, Mr. B continued to consistently claim legitimacy based on his ancestral right and his living conditions. As a result, his standpoint was criticized as selfish as much as by the IREB as by the majority in the village. Even so, Mr. B was jailed every year and continued to refuse to take a settlement payment.

28 How can Mr. B's motives, apart from his own statements, be understood? Actually, Mr. B occasionally asserted that turning the secondary forest into cultivated fields is good for the chimpanzees themselves. If fields are cultivated surrounding the area near the well-developed tall forest on top of the Gban hill, where the chimpanzees spend much of their time, then the chimpanzees too can eat the cultivated corn and cassava. As they are the

villagers' ancestors, their "crop theft" is regarded as akin to an offering. This local way of relating to the chimpanzees has a long history: the manager of the first research station established in the Nimba area during the 1940s had already witnessed food offerings to chimpanzees (Kortlandt, 1986). This claim has for a long time been difficult to believe by the outsiders who are usually convinced that even a little more forest is beneficial to the chimpanzees. They have regarded it as a selfish excuse for justifying field clearing activities after the fact. However, it is presently known that nearly 10% of chimpanzee feeding time in Bossou is spent on cultivars (Hockings *et al.*, 2009), allowing to progressively setting up a new picture for conservation.

3.4 A "conservation" model based on local experience and knowledge

29 Now, viewpoints like those of Mr. B are not quite new. Similar ones have been asserted occasionally by village leaders when discussing chimpanzee conservation issues in Bossou before the 2002 field clearing campaign.

30 In March 1998, an 8 year-old boy and a 6 year-old girl circulating along a small path on the forest edge sustained severe injuries as they were bitten by an excited chimpanzee that they happened to encounter (Hockings *et al.*, 2010). The concerned parties in the village gathered and held a meeting to consider how to deal with the incident. Some underlined that events like this one happen once every few decades. But regarding the reason of the encounter with the chimpanzee near the path, a few influential people (including Mr. B) asserted skeptical opinions regarding the research activity itself, pointing out that the forest had increased in size due to pressure from researchers. It seemed to them that chimpanzees got more and more used to humans as researcher and tourist presence increased. Furthermore, some stated that these problems didn't happen when fields were cultivated halfway up Gban: the chimpanzees now come closer to the village because there is no food for them in the forest.

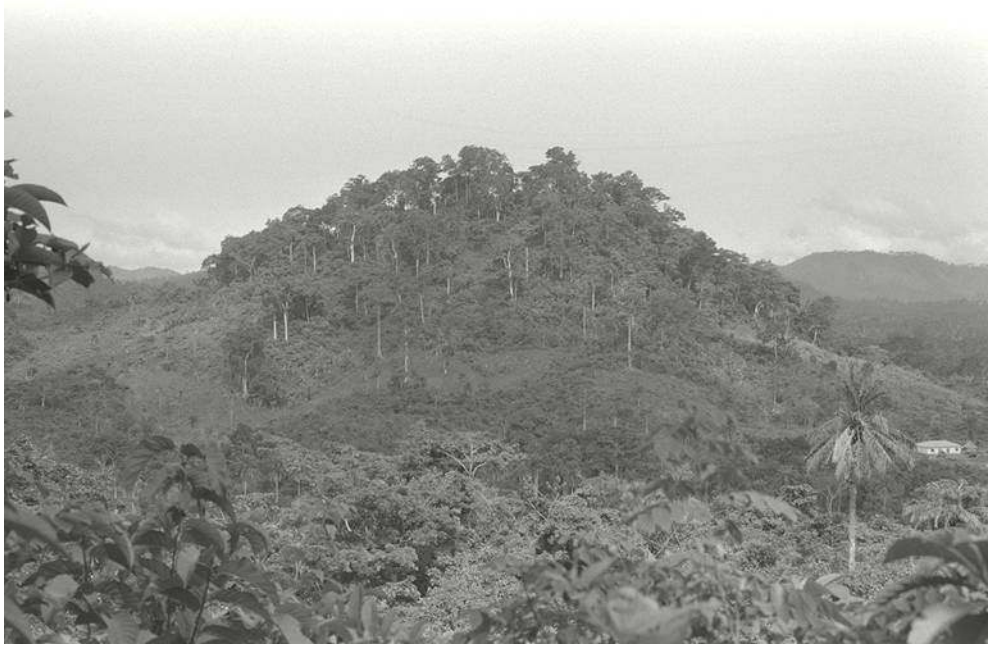
31 These opinions, which have been expressed in the past and the opinions of Mr. B in this case, have the consistency of a conservation model regarding the best approach for coexistence with chimpanzees which are probably shared to a considerable extent within the village. The "scientific" view which is shared by researchers and IREB employees states that, for the survival of a small isolated group like that at Bossou, the forest area of the habitat should be enlarged as far as possible and that interactions with adjoining chimpanzee groups should be promoted (Matsuzawa and Kourouma, 2008). In contrast, the view based on local experience and knowledge states that by turning areas near the main chimpanzee range into fields and by accepting a certain degree of "crop theft," they can improve the foraging conditions of the chimpanzee and at the same time provide a sort of "buffer zone" between the chimpanzees and the village. This assertion has the form of a scientific hypothesis relating to "reserve design", including zoning—stating the cause of the crisis and presenting a solution involving specific types of land-use and land rights.

Figure 2

Mt Gban and its forest “beret” in the 1960s
Le Mont Gban et son « béret » forestier dans les années 1960

32 Furthermore, a “reserve design” model based on this kind of knowledge is well-founded in the empirical memory according to which there were no problems with this way of life until recently. The development of the secondary forest around Gban is a recent change, occurring only in the last 20 years, and prior to that a landscape with cultivated fields midway up Gban is well remembered by many elder villagers. One villager described the past landscape as follows: “It looked like the hill was wearing a beret” (translated from the French). This landscape also appears in the materials left by the Amsterdam University research team of the 1960s, which help to picture the spatial dimension of the conflict analyzed in this paper (Fig. 2). It can also be seen in the oldest photos of the Kyoto University Research Team from 1976 (Fig. 3).

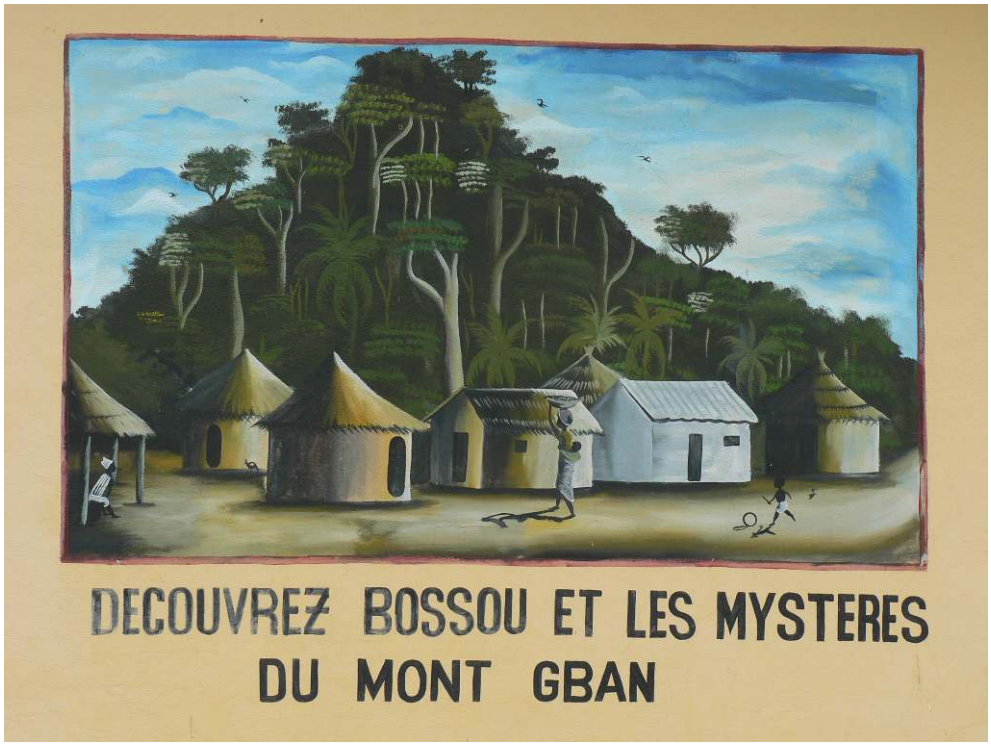
Figure 3



Mt Gban and its forest “beret” in 1976
Le Mont Gban et son « béret » forestier en 1976

33 With regard to changes in land use in Bossou and the forest cover situation, current researchers have begun to reconstruct the situation from sources like these old photographs and aerial photos taken in the colonial era (Yamakoshi, 2003), but there is no consensus between researchers. On this point, the depiction of the village on the IREB Research Building completed in 2001, displaying tall trees all the way down Gban, can be considered as a political statement about what the “normal” landscape should look like (Fig. 4).

Figure 4



Depiction of Mt Gban on the building of the IREB institute, Bossou
Représentation du Mont Gban sur le bâtiment de l'IREB, Bossou

34 The main cause of Mr. B's consistent resistance may be due to personal poverty, as he states in public. However, he probably also expresses a warning regarding transformations in the village's relationships with chimpanzees due to the influence of outsiders. If the opposition between the two models is regarded as an opposition in designing the ideal environment, then Mr. B, by stepping forward with consistency and obstinacy— not fearing prison and not taking settlement money— is returning to the "beret like" landscape of the past.

4 Discussion: evaluation of the indigenous model for villager-chimpanzee coexistence

35 This opposition has an important meaning for the future of chimpanzee and forest conservation in Bossou. There are currently three serious conservation problems facing the chimpanzee population of Bossou. First is the aforementioned isolation of the habitat, and the associated insufficiency of genetic interaction with neighboring populations (Sugiyama, 1999; Matsuzawa and Kourouma, 2008, Shimada, 2011). Second is a dramatic decrease in population caused by mass death due to a contagious respiratory infection at the end of 2003 (Matsuzawa *et al.*, 2004; Humle, 2011). Third is the problem of injuries to people caused by chimpanzees, something which has occurred more frequently in recent years (Hockings *et al.*, 2010).

36 Regarding the last two problems in particular, the indigenous model seems the most efficient. Zoonotic diseases, primarily contagion from animals to humans, is currently a

serious international problem (Garber, 2008), but contagion from people to animals has also become a significant concern for reserve management, specifically in connection with tourism. In the case of Bossou in 2003, there are suspicions about contagion due to the presence of tourists, researchers and guides near the chimpanzees, and contagion via wastes near the village, particularly feces and urine. In the former case, we are faced with the fundamental problem of whether research and tourism regarding chimpanzee populations living near people, as in Bossou, are even appropriate in the first place. In the latter case, regarding human injuries caused by chimpanzees, the indigenous model clearly seems advantageous. A spatial model which secures a chimpanzee range at distance from the village using cultivated fields resembles the buffer zone model promoted by UNESCO, and is likely to reduce the probability of spreading contagious diseases between chimpanzees and humans, as well as the frequency of injuries caused by chimpanzees.

37 Of course, realizing the Bossou indigenous model is by no means simple. For example, the villagers presently depend on cash income, particularly on tourist income which they would like to increase. It is thus likely that the current landscape has a stronger aesthetic appeal to tourists than the "beret" landscape. The approach of Mr. B did not win support from the majority in this case, and it is conceivable that the villagers are striking a balance between political interests as a realistic response, while supporting the indigenous model as a "conservation" philosophy. Additionally, the indigenous model cannot handle all the region-specific problems. For example, for the first of the three problems—isolation of the habitat and securing genetic interaction with neighboring groups—there is, at present, no sense of crisis within the village, and the indigenous model is useless. However, if outsiders ignore the indigenous perspective, the inhabitants might be tempted by an anti-conservation response which maintains their independence but which at the same time rashly throws away a "resource" which is valuable to themselves (Matsuda, 2002).

38 In addition, it would be worth investigating to what extent this model may apply to other regions of human-chimpanzee coexistence in West Africa, where the great majority of chimpanzees are known to live in unprotected and cultivated spaces (e.g. Brugiere *et al.*, 2009 on the Guinea/Guinea-Bissau frontier ; Halloran *et al.*, 2013 in Sierra Leone). For instance, the meaning of "crop-raiding" as an offering may not have validity beyond Southeastern Guinea where chimpanzees often seem to be considered as ancestors, while in Western Guinea as in most Islamized regions these creatures are humans changed by God into repulsive beings and banned from village life after committing some kind of crime (Leblan and Bricka, 2013). However, other research has demonstrated that landscape transformation through human activities may imply habitat gain rather than loss for chimpanzees. For instance, processes of agricultural settlement formation a few kilometers away from "mother" villages in the Maninka region of Southwest Mali, which are occupied by the youngest farmers seeking to escape from the elders' direct tutelage, give way to the creation of fruit patches which become available to chimpanzees once these sites are abandoned after two decades of use at most. In this region, the forced displacement of these agricultural settlements by policymakers drives some farmers to settle secretly in less accessible areas which where actually favoured by chimpanzees (Duvall, 2008).

39 No matter what sort of conservation problems arise in the future, acts of resistance against environmental policies will definitely continue to function as the antithesis to

measures by outsiders who do not understand the local historical and spatial stakes, thus potentially leading to a situation which is not beneficial to the outsiders either. The outsider approach regarding the future of chimpanzee conservation in Bossou should be, to borrow the words of Kakeya (2001), to have faith in the "potential of indigenousness," i.e., in the villagers who maintained an intimate relationship with their chimpanzees through the storms of colonization, demystification policies and scientific conservation policies, and to continue the cross-fertilization of endogenous ideas with Western environmentalist views.

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NOTES

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ABSTRACTS

Environmental conservation policies in Africa have their origin in the forced establishment of nature reserves during the colonial era. Even after African countries became independent, top-

down operation of these reserves continued primarily due to international calls for nature conservation and to consumerist demand from western countries. For the people of Africa, this continued to be an externally-driven activity with little endogenous motivation and, quite often, real motives for opposition. Even in the context of today's participatory conservation approaches, there is vocal skepticism about the ability of Africans to act independently and about the existence of local "conservation" philosophies.

This paper offers a detailed description of field clearing demonstrations by the villagers of Bossou, Republic of Guinea, which flared up in 2002 following the establishment of a governmental research institute in the village. This place had been portrayed for several decades by natural scientists as a place of peaceful coexistence between people and chimpanzees. The stated goals of the swidden preparation campaign was to secure land for subsistence purposes, but it is thought that the main driving factor was maintaining the right to decide matters like the allocation of tourism income, which the government research institute was attempting to usurp. After the general 2002 uprising, a particular individual and his family continued their resistance consisting of swidden preparation and cultivation in the chimpanzee habitat. This was likely due to a conviction to recover the original vegetative landscape of the village, which had been transformed under the pressure of academic research, to its prior state. The agricultural environment is valued by a chimpanzee "conservation model" based on indigenous experience and knowledge, which is in conflict with models introduced by outsiders (scientists and public administrations).

The indigenous conservation model revealed by this case study may better help to prevent epidemics of zoonoses and injury and deaths due to chimpanzee attacks, compared with the outsiders' conservation approach based on general knowledge drawn from conservation ecology. Future conservation measures should be determined based on dialog between the two models. This article is modified after Yamakoshi (2006a).

La conservation de l'environnement en Afrique trouve ses origines dans les réserves naturelles imposées par les pouvoirs coloniaux. Même après les indépendances, la gestion "par le haut" de ces réserves a été maintenue notamment dans le cadre des politiques internationales de conservation et pour répondre aux attentes consuméristes des pays occidentaux. Dans les sociétés africaines, cette politique imposée a continué à générer très peu de motivation et, bien souvent, de véritables motifs d'opposition. Même dans le cadre des approches participatives actuelles, certains continuent à expriment leur scepticisme quant à la capacité des africains à agir de façon indépendante et quant à l'existence de conceptions locales de la "conservation".

Cet article propose une description détaillée d'une campagne de défrichement par les habitants de Bossou (République de Guinée) au sein d'une aire protégée, en 2002, dont le catalyseur a été l'installation d'un institut de recherche public au sein du village même. Depuis plusieurs décennies, ce village était considéré par les scientifiques comme un lieu de coexistence pacifique entre les habitants et les chimpanzés. L'objectif déclaré de la campagne de défrichement était de sécuriser des terres pour la production de la subsistance, mais il semble que la principale motivation des acteurs ait été de garder leur pouvoir de décision, face à l'institut public, sur des questions telles que la répartition des revenus générés par le tourisme local. Après le soulèvement général de 2002, un individu et sa famille ont poursuivi le défrichement et les cultures au sein de l'habitat des chimpanzés. Ceci exprime vraisemblablement un désir de retrouver l'environnement végétal tel qu'il était avant le début des recherches scientifiques. L'environnement agricole est localement valorisé pour la coexistence avec les chimpanzés, ce qui entre en conflit avec les modèles de gestion exogènes (scientifiques, administrations publiques).

Le modèle de "conservation" local révélé par cette étude de cas peut aider à prévenir les préjudices et les décès dus aux zoonoses et aux agressions commises par les chimpanzés, par comparaison avec le modèle exogène fondé sur les préceptes de l'écologie de la conservation.

Dans le futur, les mesures de conservation devraient être déterminées d'après un dialogue entre les deux approches. Cet article est modifié d'après Yamakoshi (2006a).

INDEX

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Eco-anthropologie et primatologie pour la conservation de la biodiversité : un projet collaboratif dans le Parc National de Moukalaba-Doudou, Gabon[1]

Ecological anthropology and primatology for biodiversity conservation: a collaborative project in Moukalaba-Doudou National Park in Gabon

Naoki Matsuura, Yuji Takenoshita et Juichi Yamagiwa

1 Introduction

1.1 Conservation de la biodiversité et populations locales

1 Bien que les politiques de conservation mettent aujourd'hui l'accent sur la participation des populations locales, les conflits entre conservation et intérêts locaux perdurent (Hackel, 1999). Nombre de projets associant conservation et développement ont été mis en œuvre, mais le succès escompté n'a guère été au rendez-vous. Certains chercheurs continuent même de soutenir qu'il est illusoire de vouloir concilier ces deux dimensions (Christensen, 2004).

2 Dans les forêts tropicales africaines, l'initiative des politiques de conservation revient avant tout aux gouvernements et aux ONG internationales, le pouvoir des populations locales étant limité (Barrow et Murphree, 2001; Debroux *et al.*, 2007). Les forêts ont été investies de nouvelles valeurs économiques par des instruments tels que le REDD (Réduction des Emissions dues au Déboisement et à la Dégradation des forêts), mais la propriété des forêts revient aux Etats et les bénéfices qu'en retirent les populations sont

négligeables. Les mesures de conservation sont décidées sans considération suffisante pour les conditions de vie locales et les droits coutumiers ne sont pas protégés de manière efficace (Lewis, 2005). Ces politiques véhiculent une représentation des populations locales, qui ont en fait longtemps coexisté avec la nature, en les simplifiant à l'extrême, sans tenir compte des divers aspects de leurs relations aux animaux sauvages (Wæhle, 1999; Köhler, 2000). Même lorsque leur harmonie avec la nature est reconnue, leurs pratiques sont encore fréquemment qualifiées de destructives et soupçonnées de nuire au maintien de la biodiversité, sous la pression de la modernité et de l'infiltration de l'économie de marché (Noss, 2001; Wilshusen *et al.*, 2002).

3 Entre les critiques des politiques de conservation qui défendent les populations locales et les promoteurs de la conservation, l'écart est difficile à surmonter. Les premiers soulignent que la création de parcs s'est souvent traduite par le déplacement des populations et condamnent sévèrement les violations des droits de l'homme qui s'ensuivent (Cernea, 2006; Cernea et Schmidt-Soltau, 2006; Schmidt-Soltau et Brockington, 2007; Schmidt-Soltau, 2009). Les seconds affirment, au contraire, que la considération des populations locales dans la mise en œuvre des politiques de conservation fait aujourd'hui largement consensus, et nient l'affirmation des premiers selon laquelle plusieurs centaines de milliers de personnes auraient été expulsées sans ménagement de leur lieu de résidence (Wilkie *et al.*, 2006; Curran *et al.*, 2009; 2010).

4 Il semble, d'une part, que les défenseurs de la prise en compte des populations véhiculent une critique émotive fondée sur un faible nombre de cas tandis que, d'autre part, les gestionnaires de parcs justifient leurs activités en négligeant ce qu'ils appellent « les petits faits ». Ni les partisans de l'appui aux populations, ni les promoteurs de la conservation, ne parviennent à rassembler l'ensemble des objectifs qui permettraient de viser simultanément la conservation de la biodiversité et le bien-être des populations locales. Il est donc plus important pour les chercheurs et les acteurs de la conservation de s'organiser afin de mieux comprendre la complexité des situations locales que de manifester leur adhésion à une discipline ou une autre.

1.2 Etat actuel et conservation des forêts tropicales en Afrique

5 Les forêts tropicales africaines diminuent rapidement en raison de l'expansion des terres cultivées et de l'exploitation commerciale du bois (Barnes, 1990; Laporte *et al.*, 2007; FAO 2010). Dans le bassin du Congo, 317000 hectares de forêts ont disparu entre 2000 et 2005, soit à un rythme deux fois plus rapide que dans la décennie 1990 (Ernst *et al.*, 2013). La progression de l'exploitation du bois induit l'émigration de travailleurs vers les forêt entraînant à son tour le développement de la chasse. Le commerce de viande de brousse en direction des villes se trouve facilité par les nouvelles infrastructures (Auzel et Wilkie, 2000; Laurance *et al.*, 2006b). La perte d'habitat provoquée par l'exploitation forestière et le développement de la chasse commerciale menacent de nombreuses espèces animales (Norris *et al.*, 2010; Laurance *et al.*, 2012). Le problème de la conservation des forêts tropicales et de la faune associée est une question internationale.

6 L'histoire de la conservation de la nature en Afrique remonte à l'époque coloniale. De nombreuses réserves forestières et de réserves de gibier, créées dans la deuxième moitié du XIXe siècle sous l'influence de l'environnementalisme américain, ont été mises au service du tourisme et de la chasse sportive des agents administratifs et des élites coloniales. Après la vague des indépendances au milieu du XXI^{e} siècle, les politiques de

conservation ont été prises en charge par les nouveaux Etats qui ont adopté l'approche dite de la « forteresse », fondée sur la clôture des espaces protégés avec une intensification des contrôles et des sanctions, notamment en infligeant des amendes aux contrevenants. Cependant, cette approche « top-down » s'est heurtée à une forte résistance de la part des populations qui dépendent profondément des ressources environnementales. Elle s'est donc traduite par des échecs. C'est ainsi qu'au cours des années 1980, le paradigme conservationniste s'est mué en « conservation communautaire », dans le but de distribuer équitablement le pouvoir et les profits issus à la gestion de ces ressources (Western *et al*, 1994; Hackel, 1999 Adams et Hulme, 2001; Hulme et Murphree, 2001; Berkes, 2007). Dans le même temps, ces projets intégrant conservation et développement (ICDPs) se sont multipliés sous l'influence du concept de « développement social et humain » avancé par les études sur le développement (Hughes et Flintan, 2001).

7 Ce mouvement s'est d'abord limité à l'Afrique orientale et australe, puis s'est étendu à d'autres régions à partir des années 1980, divers projets ayant été mis en œuvre par des organisations internationales, des ONG conservationnistes et des institutions Etatiques afin de répondre aux menaces sur la faune générées par la déforestation. C'est dans cette optique que la COMIFAC (Commission des Forêts d'Afrique Centrale) a été créée en 1999 par dix pays d'Afrique centrale, dont le Gabon, pour la coordination et l'harmonisation de leurs politiques environnementales. La COMIFAC a adopté en 2005 un Plan de Convergence pour une meilleure gestion et une meilleure conservation des forêts d'Afrique Centrale. En 2002, le PFBC (Partenariat pour les Forêts du Bassin du Congo) a été lancé afin de constituer une courroie de transmission entre les bailleurs de fonds et les organismes d'exécution. Cet organisme a établi onze régions clés, sélectionnées par plus de 160 experts régionaux et internationaux pour la richesse de leur biodiversité et la présence d'espèces de grands mammifères. Ce travail d'expertise a été accompagné par la mise en place d'un système de financement de la conservation faisant appel à des donateurs extérieurs. Enfin, en 2008, le FCPF (Fonds de Partenariat pour le Carbone Forestier) a vu le jour afin de promouvoir les activités du REDD.

1.3 Etat actuel et conservation des grands singes africains

8 Les grands singes comptent parmi les animaux les plus vulnérables des forêts tropicales africaines pour plusieurs raisons (Walsh *et al*., 2003; Caldecott et Miles, 2005). Tout d'abord, leur vie diurne et leur grande taille en font des animaux particulièrement exposés à la chasse au moyen d'armes à feu. Deuxièmement, leur faible taux de reproduction et la longueur de leur cycle de vie se traduit par une récupération lente des populations après toute diminution conséquente. En troisième lieu, leur propension à utiliser une large gamme de forêts les rend particulièrement sensibles à la déforestation. Enfin, étant génétiquement proches de l'Homme, ils encourent des risques élevés vis-à-vis des maladies d'origine humaine. Pour l'ensemble de ces raisons, le chimpanzé (*Pan troglodytes*), le bonobo (*Pan paniscus*), et le gorille de l'est (*Gorilla beringei*) reçoivent le statut d'espèces en danger (EN) dans la liste rouge de l'UICN (l'Union Internationale pour la Conservation de la Nature). Il se peut que les populations que composent ces taxons aient été réduites de plus de 50% en l'espace de trois générations (60 à 75 ans) depuis 1970 (IUCN, 2013). Quant au gorille de l'ouest (*Gorilla gorilla*), il est classé comme espèce en danger critique d'extinction (CR), signifiant que sa population s'est réduite de plus de 80% en l'espace de trois générations (66 ans) (IUCN, 2013).

9 Tous les pays couvrant l'aire de répartition des grands singes, à l'exception du Gabon, comptent parmi les moins avancés selon l'indice de développement humain (IDH) défini par le PNUD (Programme des Nations Unies pour le Développement). La République démocratique du Congo en occupe le dernier rang (avec le Niger) et la République Centrafricaine est classée au 180e rang parmi 187 pays (UNDP, 2013). Le Gabon, quant à lui, occupe le 106e rang de ce classement. Les populations locales qui souffrent d'extrême pauvreté sont concernées au premier chef par les activités d'exploitation forestière, minières, et le commerce de viande de brousse. De surcroît, des conflits armés surviennent fréquemment dans ces régions, conduisant à l'écroulement du système de gestion des réserves et à la dévastation des économies locales fondées sur le tourisme. L'importation d'armes constitue également un facteur de déforestation et de braconnage.

10 Le succès de la conservation des grands singes dépend du recouvrement de la stabilité politique ainsi que de la réalisation d'un développement socioéconomique durable dans ces pays (Miles *et al.*, 2005: 235) qui ont par ailleurs ratifié la Convention sur la Diversité Biologique (CDB) et la Convention sur le Commerce International des Espèces de Faune et de Flore Sauvages menacées d'Extinction (CITES). Leurs législations nationales interdisent strictement la capture et l'abattage des grands singes. Néanmoins, l'instabilité politique génère des situations de non-droit et empêche la mise en œuvre effective des mesures de conservation. En fait, le risque d'extinction des grands singes est étroitement lié aux tendances politiques et économiques mondiales. Ce n'est donc pas au niveau de la politique d'un Etat ou d'une organisation particulière qu'une solution peut être trouvée. C'est pour cette raison que le PNUE (Programme des Nations Unies pour l'Environnement) et l'UNESCO (Organisation des Nations Unies pour l'Education, la Science et la Culture) ont créé le GRASP (Projet pour la Survie des Grands singes) en 2001. Le GRASP exige de ces pays de qu'ils fassent respecter les lois relatives à la conservation, qu'ils essayent d'identifier précisément la situation actuelle des populations de grands singes et de leurs habitats, et qu'ils estiment l'impact écologique des projets de développement. Ce programme vise à renforcer l'efficacité des activités de conservation et à rendre plus efficace la communication entre les Etats, le monde académique, les ONG et le secteur privé (Varty *et al.*, 2005: 243–244). Parallèlement, chercheurs et acteurs de la conservation se mobilisent afin d'obtenir l'inscription des grands singes au patrimoine mondial (Nishida, 2005; Wrangham *et al.*, 2008).

1.4 Histoire des recherches en primatologie et en éco-anthropologie au Japon

11 C'est maintenant dans la pratique des chercheurs japonais, qui ont entrepris depuis longtemps des recherches de terrain sur les sociétés humaines et simiesques de différentes régions d'Afrique, que nous proposons de chercher des pistes de réflexion.

12 Les études africaines japonaises sont reconnues pour les recherches en primatologie et en éco-anthropologie à l'université de Kyoto. La primatologie japonaise a commencé en 1948 par des travaux, dirigés par Kinji Imanishi, sur des troupes de macaques japonais vivant à l'état sauvage. Des résultats nombreux et importants concernant l'écologie et la société de ces primates ont été produits dans la décennie suivante, constituant le point de départ des recherches sur les grands singes africains de Kinji Imanishi, Junichiro Itani et leurs collègues, à partir de 1958. Plutôt que de mettre l'emphase sur ce qui distingue les espèces les unes par rapport aux autres, ceux-ci ont reconnu une continuité entre l'Homme et les

autres animaux. S'étant donné pour objectif d'élucider les origines évolutives de la famille humaine, ils se sont logiquement tournés vers les grands singes africains, soit les animaux les plus proches de l'Homme.

13 Poursuivant sur cette thématique, d'autres travaux ont parallèlement pris en compte les sociétés de chasseurs-cueilleurs. *Homo* ayant vécu de la chasse et de la cueillette durant plus de 99% de son histoire, l'étude de ces sociétés, notamment sur le continent qui a vu l'apparition de notre genre, était pensée comme une source importante pour la connaissance des comportements et des relations sociales dont on sait qu'elles ne laissent aucune trace fossile. Imanishi et ses collègues ont cherché à restituer la société des ancêtres communs à l'Homme et aux grands singes afin de rendre compte tant de leurs caractères communs que de leurs différences. Ainsi, ces recherches sur les chasseurs-cueilleurs africains relatives à l'évolution humaine ont permis d'élucider certaines des caractéristiques de la subsistance et de la société des San du Kalahari (Tanaka, 1980) et des Pygmées Mbuti de la RDC (Ichikawa, 1978; 1981; Tanno, 1981).

14 Des résultats à l'interface de la primatologie et de l'anthropologie ont ainsi déjà été obtenus (Yamagiwa, 2011). En effet, les pionniers de l'éthologie des grands singes ne se sont pas contentés de publier uniquement des articles de primatologie. Ils ont également fourni des essais détaillés et des descriptions ethnographiques remarquables parce qu'ils se sont intéressés aux cultures locales (Itani *et al*., 1973; Kano et Kano, 1987; Mori, 1992; Kano, 1996). L'éco-anthropologie a permis aux primatologues japonais de remettre l'étude des structures sociales, des comportements sexuels et des comportements culturels des grands singes dans le contexte de l'évolution humaine et de discuter des origines de la famille et de l'humanité. Les éco-anthropologues, pour leur part, ont illustré certains aspects de l'économie de subsistance et de l'organisation sociale des chasseurs-cueilleurs tels que leurs interactions avec l'environnement naturel et ont débattu à propos de la spécificité de la communication humaine et de l'évolution de l'égalitarisme. Malgré un affaiblissement récent des connexions interdisciplinaires et de l'intérêt pour les problématiques évolutionnaires que l'on peut rapporter à la spécialisation et au morcellement croissant des domaines de recherche, des liaisons fortes existent toujours. On peut citer, notamment, un projet réunissant des primatologues et des anthropologues autour de la notion de « groupe » et de ses multiples manifestations chez l'Homme et les autres primates afin de discuter des fondements de l'évolution humaine (Kawai, 2013).

15 Cet héritage interdisciplinaire peut servir de point de départ afin de penser simultanément la conservation de la biodiversité et le bien-être des populations locales. Les primatologues japonais ont joué des rôles internationaux de premier plan dans la conservation des grands singes. Ils ont entre autres, par leurs recherches de longue haleine, participé à la création de réserves comme le Parc National du Mont Mahale en Tanzanie ou la Réserve Scientifique de Luo en RDC. Ils ont aussi contribué au développement du GRASP depuis sa création. D'autre part, ils ont promu la conservation des grands singes d'une façon nouvelle en collaborant avec des chercheurs locaux et tissant des relations intimes avec les habitants (Yamagiwa *et al*., 2011). En sus des deux réserves citées ci-dessus, ils ont créé des projets de développement local, d'éducation environnementale, de soutien à la scolarisation, etc., pendant plus de 20 ans à Bossou (Guinée) ; au Parc National de Kahuzi-Biega (RDC), et dans la Réserve Forestière de Kalinzu (Ouganda). A travers ces projets impliquant des collaborations durables, des chercheurs et des guides de terrain ont été formés. Bref, ils jouent un rôle de pivot dans la recherche et la conservation actuelles, tout comme sur le plan de la formation des jeunes

chercheurs japonais. Les résultats uniques et significatifs de la primatologie et de l'éco-anthropologie japonaises n'ont cependant pas été suffisamment diffusés à l'échelle internationale, y compris en direction des pays francophones. De plus, ces recherches ont eu, tout compte fait, un impact limité sur les politiques de conservation.

1.5 Mobiliser l'éco-anthropologie et la primatologie pour la conservation

16 Compte tenu de la situation décrite ci-dessus, nous conduisons actuellement un projet collaboratif pour la conservation de la biodiversité dans le Parc National de Moukalaba-Doudou au Gabon. En s'appuyant sur les recherches et les pratiques de la primatologie et de l'éco-anthropologie japonaises mises en place sur le terrain depuis plusieurs décennies, ce projet vise à établir un système de conservation fondé sur la coexistence entre la population et la faune.

17 L'intégration des deux disciplines et la production de résultats fructueux ne vont néanmoins pas sans difficulté. Un premier facteur tient à l'insuffisance des infrastructures sur le site de recherche. La Rivière Moukalaba, large de 30 mètres, marque la limite entre le Parc et le village. Les deux rives étaient auparavant reliées par un pont, emporté par une crue en 2002. Le passage d'un bord à l'autre ne peut plus s'effectuer qu'en pirogue à présent. Les biologistes et les assistants de terrain locaux sont installés dans un campement du côté du Parc afin suivre les gorilles et d'autres espèces animales. Les éco-anthropologues, quant à eux, séjournent au village et mènent leur recherche sur la population locale. La traversée de la rivière en pirogue et la marche en forêt rendent difficile l'accès au campement du Parc, situé à environ 4 kilomètres du village.

18 Mais il ne s'agit pas uniquement d'un problème de moyens de déplacement ni de distance. Les oppositions disciplinaires et méthodologiques s'invitent également dans la partie. Si les chercheurs étudiant la faune et la flore du Parc tendent à s'isoler au campement et à ignorer le village, c'est aussi parce que la vie sociale du village complique les recherches selon eux. Les éco-anthropologues ont pour leur part trop peu d'occasions de visiter le campement parce que les activités des villageois y sont en général défendues. Ainsi, les uns travaillent indépendamment des autres.

19 Cet article vise donc à surmonter ces oppositions et à rechercher une voie qui permette de concilier l'éco-anthropologie et la primatologie pour la conservation de la biodiversité, en explorant leurs thèmes communs. Ici, les primatologues évoquent concrètement leurs relations avec les habitants sans lesquels leurs recherches de terrain ne pourraient être menées à bien, tandis que l'anthropologue aborde les relations entre les habitants et la faune et leur incidence sur la perception locale des animaux. Enfin, nous tâchons de démontrer l'importance d'une collaboration entre les deux disciplines et discutons des modalités de son efficacité.

2 Site de Recherche

20 Le site de recherche est le Parc National de Moukalaba-Doudou (PNMD) situé au sud-ouest du Gabon. Des instituts de recherche japonais (Université de Kyoto et institutions partenaires) et gabonais (IRET : Institut de Recherches en Ecologie Tropicale) mènent un projet collaboratif pour la conservation de la biodiversité dans et autour du Parc.

2.1 Contexte écologique

21 La Réserve de la Moukalaba-Dougoua a été créée en 1962, puis le PNMD a été établi en 2002. Cet espace, couvrant une superficie de 5028 km² et caractérisé par une mosaïque de forêt-savane, a connu des activités humaines sous l'administration du Parc, mais n'est aujourd'hui plus habité et plus utilisé. La densité de population humaine autour du Parc est relativement faible : 0,8 personne/km² (Thibault et Blaney, 2003). La pluviosité annuelle moyenne est de 1777 mm (1583–2163 mm), pour 138 mm mensuels avec une différence marquée entre saison sèche (du juin à septembre) et saison des pluies (d'octobre à mai) (Takenoshita *et al.*, 2008).

Figure 1

Site de recherche
Location of research area

22 La riche biodiversité du Gabon est liée à la faible densité humaine et à l'importance des ressources pétrolières et minérales qui permettent de maintenir 80 % des forêts (Laurance *et al.*, 2006a). L'exploitation commerciale du bois a cependant pris une importance croissante en raison de la diminution des autres ressources naturelles depuis les années 1990. C'est ainsi que, dans une perspective de conservation environnementale pour le XXI^e^ siècle, l'Etat gabonais est passé d'une politique d'exploitation à une politique d'utilisation durable des ressources. Les treize parcs nationaux qui occupent 11% du territoire national ont été créés en 2002. La promotion de l'écotourisme est en cours, mais celui-ci est encore peu développé (Laurance *et al.*, 2006a ; Walker, 2010).

23 Le secteur du PNMD et sa périphérie a été l'emplacement d'un chantier de la compagnie forestière CEB (Compagnie Equatoriale des Bois) des années 1960 aux années 1980. Durant

cette période, plusieurs centaines de travailleurs en provenance de différentes régions du Gabon,y ont habité, ainsi que des étrangers (dont des Européens). Des infrastructures telles qu'une route, un terrain d'aviation, un dispensaire, un kiosque, et une école primaire ont été construites. La zone était alors dominée par l'économie monétaire. L'abattage des arbres et la consommation intensive de gibier ont certainement eu un impact négatif sur la faune et la flore. Après la clôture des opérations en 1989, les habitants, surtout les jeunes, ont quitté la zone afin de chercher des emplois. La population humaine a rapidement diminué et les infrastructures se sont détériorées. Cette région a ensuite attiré l'attention internationale pour la conservation à la fin des années 1990 en raison de la richesse de sa biodiversité. Les activités de recherche et de conservation ont alors été entreprises par des instituts de recherche et des ONG internationales.

24 Le chimpanzé et le gorille vivent en sympatrie au sein du PNMD. Nous avons commencé la recherche primatologique en 1999 afin de mieux comprendre les mécanismes de leur coexistence ainsi que les différences et les similitudes écologiques entre les deux espèces. Depuis, nous avons réussi à habituer un groupe de gorille et la recherche à long terme se poursuit (Ando *et al*., 2008). A partir de 2009, nous avons mis sur pied un grand projet, le PROCOBHA (Projet de Conservation de la Biodiversité en forêt tropicale à travers la coexistence durable entre l'Homme et l'Animal), financé par la JICA (Agence Japonaise de Coopération Internationale) et la JST (Agence Japonaise pour la Science et la Technologie). Il s'agit d'un projet de coopération scientifique pour la conservation de la biodiversité et le développement local par l'écotourisme, mené en partenariat par des chercheurs japonais et gabonais. Outre la primatologie, le projet inclut l'écologie, la génétique, la science vétérinaire, la microbiologie et l'éco-anthropologie. Parallèlement aux activités de recherche, l'ONG locale PROGRAM (Protectrice des Grand Singes de la Moukalaba) à vocation écotouristique a été créée en 2004 par des acteurs gabonais originaires de la région.

2.2 Contexte culturel

25 Les habitants autour du PNMD sont composés de trois groupes parlant des langues bantoues de l'ouest: les Punu (Bantu B43), qui constituent la majorité, les Vungu (B40.3), et les Varama (B40.2) (Guthrie, 1967–71 ; Perrois et Grand-Dufay, 2008). Venus du Congo il y a plusieurs siècles, ils habitent aujourd'hui le centre et le sud du Gabon ainsi que le sud de la République du Congo (Perrois et Grand-Dufay, 2008). Leur activité de subsistance principale est l'agriculture. Ils pratiquent aussi la chasse, la pêche, et la cueillette. Selon une étude remontant à 1999, les protéines proviennent à 44 % de la viande de brousse et à 23 % du poisson (Blaney et Tchibault, 2001). Mais aujourd'hui, selon notre étude, plus de la moitié de l'apport en protéines est constitué de poisson, notamment en raison du renforcement des contrôles de la circulation du gibier après la création du Parc en 2002.

26 La société locale est matrilinéaire et patrilocale et se caractérise également par une forte mobilité de la population et une hiérarchie peu prononcée (Vansina, 1990 ; Gray, 2002 ; Mayer, 2002). Les clans sont interethniques et manifestent une forte cohésion de groupe. Les catégories ethniques, en revanche, n'ont que peu d'importance et les mariages interethniques sont fréquents. Outre la fluidité de l'organisation sociale, il y a eu des flux de population à l'époque du chantier forestier qui s'est traduite par une structure de village singulière. Ainsi, peu de personnes habitent longtemps dans cette région en y

fondant un territoire. En plus de ces facteurs culturels et historiques, le développement des projets de recherche et de conservation a accentué les inégalités économiques entre les familles. Les histoires de vie et le caractère de chacun varient selon le sexe et l'âge. Pour l'ensemble de ces raisons, la solidarité entre les habitants est très faible.

3 Les primatologues, les grands singes et la population locale

27 La poursuite des recherches en primatologie dépend fortement de l'établissement de bons rapports avec la population locale. Les chercheurs ne peuvent, seuls, installer aménager et maintenir un campement dans la forêt. Les habitants sont donc employés pour animer le camp (cuisine, puisage de l'eau, etc.), en tant que travailleurs titulaires (10% d'entre eux) ou temporaires (plus de 50%). L'expérience locale des « pisteurs » est nécessaire pour orienter les chercheurs dans la forêt et les prévenir de possibles dangers. Les guides locaux jouent aussi un rôle important dans le suivi de certains groupes de grands singes, très difficiles à détecter en raison de leur faible densité et de la grande taille de leur domaine vital. Pour la recherche d'indices (vocalisation, nids, fèces, empreintes, restes de nourriture), les chercheurs s'en remettent à la perception fine des pisteurs.

28 Une fois le groupe localisé, les chercheurs ne sont pas au bout de leurs peines. Les grands singes se déplacent tant au sol qu'en hauteur, plus rapidement et plus librement que leurs observateurs. C'est dans ces conditions que les chercheurs doivent observer le comportement et prendre des notes sur les individus et leurs interactions sociales. Si le groupe n'est pas bien habitué, il y a également un risque d'être attaqué. En assistant les chercheurs dans ce cadre, les guides apprennent eux-mêmes à recueillir les données pertinentes (échantillonnage, positions GPS, enregistrements filmiques) et se professionnalisent. Les chercheurs et les pisteurs vivent également ensemble la nuit, au campement. Ils y parlent des recherches et y évoquent même leur vie personnelle. En fait, les primatologues passent plus de temps avec les pisteurs qu'avec les grands singes. Il est donc important de communiquer soigneusement et d'établir de bons rapports pour mener les recherches à leur terme, surtout durant la première phase, celle de l'habituation.

29 C'est à travers une coopération pluriannuelle chercheurs-pisteurs qu'un groupe de gorilles a pu être habitué au PNMD (Ando *et al.*, 2008). Chaque soir, après le dîner, se tient une petite réunion au campement que nous appelons « l'école ». On y discute des faits relatifs à l'écologie et aux mouvements des gorilles pendant la journée. Chacun donne son opinion sans se soucier de sa position hiérarchique, permettant de décider en commun le plan de travail du lendemain. C'est par « l'école » que s'élabore la connaissance sur les gorilles, en même temps que s'y cultive une relation de confiance mutuelle. Par conséquent, nos rapports dépassent la simple relation entre chercheurs et assistants.

30 Ces exemples de construction de bonnes relations avec la population locale, visant à développer un système de gestion communautaire, sont transférables à d'autres sites de recherche sur les grands singes où se déploient aussi des activités de recherche sur de longues périodes. Comme nous l'avons mentionné, la mise en œuvre d'un développement socioéconomique durable dans l'aire de répartition des grands singes est une condition indispensable à la leur conservation.

31 Néanmoins, la construction de cette relation de proximité n'est pas toujours chose aisée, en raison notamment de l'inéquité entre employeurs et employés. Ces derniers habitent le village attenant au Parc où les difficultés sociales locales ne manquent pas, telles que les maladies, les funérailles, l'accès aux soins et à la scolarité des enfants, les affaires relatives aux mariages, les initiations rituelles, etc. Le système social de la population du PNMD est originairement flexible comme nous l'avons indiqué. La dynamique migratoire datant de l'époque du chantier forestier a entraîné des mélanges de population, ce qui se traduit par la coexistence d'habitants présentant des caractéristiques sociales, des positions politiques et des situations économiques très variées selon leur origine. Les habitants sont, le plus souvent, peu liés à la terre et peu solidaires entre eux. Notre projet et la population d'immigrants se développent à un rythme qui ne permet pas à la communauté locale d'établir des relations sociales avec tous les nouveaux arrivants. Ainsi, les réseaux sociaux locaux ne peuvent que difficilement répondre aux problèmes politiques et économiques. L'application de règles de travail conformes au standard « moderne » est inévitable, mais celles-ci tendent à briser les relations de proximité que les chercheurs et la population locale ont établies au travers d'une longue collaboration. L'approche anthropologique des relations sociales peut alors se révéler d'un grand secours aux primatologues.

4 Les éco-anthropologues, la populations locale et les grands singes

32 L'éco-anthropologie, dont les premiers travaux remontent au milieu du XX^{e} siècle, s'intéresse aux relations entre les sociétés humaines et leur environnement. A la suite de courants néo-évolutionnistes empreints d'un certain positivisme scientifique, elle se charge d'analyser des données relatives aux activités de subsistance et à l'organisation sociale de peuples qui dépendent profondément de leur environnement naturel. Cette approche a démontré, entre autres, que le mode de vie des chasseurs-cueilleurs permet de produire une subsistance abondante, bien supérieure au minimum requis pour survivre (Sahlins, 1968), ou encore que le système flexible de formation des groupes sociaux de chasseurs-cueilleurs n'est pas indépendant de la distribution des ressources (Lee et DeVore, 1968). Cependant, l'éco-anthropologie ne se réduit pas à l'étude des aspects pratiques de l'acquisition et de la consommation des plantes et des animaux. Elle intègre aussi largement les systèmes de connaissance folkloriques, les rituels et les faits religieux, les conceptions de la maladie et du corps, les catégories du vivant et de la mort, etc. C'est à ce système global composé de connaissances, de croyances et de pratiques relatives à l'environnement naturel que se réfère la notion de TEK ou Traditional Ecological Knowledge (Inglis, 1993). L'étude de ces savoirs naturalistes traditionnels, objets de l'éco-anthropologie, implique nécessairement de comprendre le comportement et l'écologie des animaux sauvages.

33 Des travaux récents ont permis d'apprécier l'importance de ces savoirs naturalistes dans le contexte de la conservation de la biodiversité. Ceux-ci ne peuvent être qualifiés d'inférieurs au savoir scientifique (Berkes *et al.*, 1995). Dans le domaine de la gestion de l'environnement, l'imprévisibilité des processus naturels est reconnue. Depuis une quinzaine d'années se met en place un « management adaptatif » qui analyse les pratiques au sein des projets, le monitoring de l'ensemble du processus et le feed-back sur les résultats qui est lui-même réinvesti dans le projet. Une attention accrue est portée aux

aspects sociaux et aux discussions avec la population locale. Le TEK correspond à ce système de gestion et peut ainsi déboucher sur des applications pratiques et positives (Berkes *et al*., 2000; Folke, 2004).

34 L'article 8-j de la Convention sur la Diversité Biologique proclame la nécessité de respecter et de préserver les TEK qui contribuent à la conservation et à l'utilisation durable de la biodiversité. Récemment, leur importance pour la conservation des grands singes africains a été mise en avant. La préservation du gorille de la Rivière Cross au Cameroun résulte de son statut de totem auprès de la population locale (Etiendem *et al*., 2011). Etiendem et ses collègues (2011) soutiennent que la renaissance et l'encouragement des pratiques culturelles basées sur les relations entre les hommes et leurs gorilles, qui sont en train de disparaître parmi les jeunes, peuvent aider à développer des attitudes et des comportements favorables à la conservation et à la participation de la population locale à ce processus. Autre exemple : les facteurs écologiques ne peuvent à eux seuls expliquer la densité élevée de bonobos qui vivent à proximité d'une population humaine également dense et pratiquant des activités de subsistance intensives dans la forêt, autour du lac Tumba en RDC (Inogwabini *et al*, 2013). La population de bonobos est préservée parce que la population locale connaît bien l'écologie de ce grand singe et se montre, ici aussi, très favorable à sa conservation (Inogwabini *et al*., 2013).

35 La population autour du PNMD est également familière des grands singes qui vivent tout près d'eux. Leur haute densité peut être rapportée à leur statut particulier qui conduit à ne pas les tuer, comme c'est le cas dans d'autres régions. Il y a des clans dont le gorille et le chimpanzé sont les totems et qui racontent quelques contes folkloriques à leur sujet. Les grands singes sont également partie prenante des pratiques de sorcellerie. Dans nombre de sociétés des forêts tropicales africaines, on raconte que des humains renaissent sous la forme de grands singes ou que des sorciers se transforment en grands singes (Köhler, 2005). Une certaine continuité entre ces derniers et les humains est admise par les habitants voisins du PNMD. Par exemple, un pisteur attaqué par un chimpanzé en 2009 alors qu'il travaillait en forêt a expliqué qu'il s'agissait en fait d'un mauvais esprit envoyé par un homme du village jaloux de l'obtention de son poste auprès du projet. Ainsi, outre les conséquences écologiques des activités humaines et de la faible exploitation de la forêt, les facteurs culturels permettent également aux grands singes de survivre dans le PNMD et de vivre en symbiose avec les humains depuis longtemps.

36 Cependant, les relations hommes-grands singes étaient différentes à l'époque du chantier forestier. On estime que la population des grands singes avait diminué en raison de la déforestation et de l'intensification de la chasse par des immigrants pour lesquels il n'était pas tabou de les tuer. Mais 20 ans après la fin des opérations, la population humaine est plus faible et le village a décliné, conséquence positive pour les grands singes. Les arbres fournissant le bois précieux n'avaient heureusement pas été tous coupés et la forêt du PNMD était encore reliée à d'autres forêts situées au voisinage du littoral et dans la région intérieure. On suppose donc que la population des grands singes a augmenté graduellement. La montée de l'opinion internationale en faveur de la conservation des forêts tropicales a soutenu cette tendance. Le gouvernement gabonais a renforcé les politiques de conservation, et les ONG internationales et les instituts pour la conservation ont développé leurs activités. Toutefois, bien que le nombre de grands singes ait augmenté, les conflits avec les humains se sont développés eux aussi, se traduisant par un sentiment négatif accru à leur égard.

37 L'un de ces conflits résulte de la dévastation des plantations par les animaux sauvages. Pour les habitants, le gorille est un animal presque aussi nuisible que l'éléphant et le petit aulacode qui menacent les récoltes, notamment celle de la banane qui constitue l'aliment de base. Quant au chimpanzé, il commet également des déprédations, quoique de faible intensité, sur la canne à sucre. Cependant, leur grande taille et leur grégarité peuvent conduire à des dommages parfois considérables. Certains habitants ont subi des pertes sévères, alors même que la population locale n'a aucun moyen de riposte. Le gorille et le chimpanzé sont classés comme « Animaux Intégralement Protégés » selon le code forestier gabonais : leur chasse, leur capture, leur détention, leur transport, et leur commercialisation sont interdits (article 92). Après la création du parc en 2002, le Ministère des Eaux et Forêt et l'Agence Nationale des Parcs Nationaux ont renforcé le contrôle du braconnage. Mais parallèlement, la compensation pour les dommages causés aux plantations par la faune, qui appartient à l'Etat, est restée insuffisante. Par conséquent, les habitants n'ont d'autre choix que de protéger eux-mêmes leurs plantations. Il existe des mesures passives, telles que la construction de clôtures en tôle et l'installation d'épouvantails ou de sonnettes improvisées, mais elles ne sont en réalité guère efficaces pour prévenir les dommages. La mesure la plus effective consiste à rester au campement de la plantation afin d'effrayer les animaux par des cris, des bruits, ou de la lumière, mais cela demande un effort physique considérable (Walker, 2012). Le moindre relâchement, par exemple pour régler des affaires ou pour accomplir un travail salarié au village, peut anéantir tous les efforts fournis en un rien de temps.

38 Les habitants autour du PNMD ont coexisté avec les grands singes au travers d'une relation mêlant sympathie et hostilité, fondée sur l'idée de leur proximité et de leur similarité à ces animaux. Cependant, les contrôles anti-braconnage qu'ils subissent aujourd'hui accroissent graduellement les sentiments négatifs à leur égard. Certains ne se sentent donc pas concernés par les problèmes des grands singes. D'un autre côté, certains reconnaissent que les grands singes constituent une ressource importante qui attire les chercheurs, les acteurs de la conservation, et peut-être même des touristes à l'avenir. C'est donc à présent un sentiment ambivalent à l'égard des grands singes qui prédomine localement.

5 Eco-anthropologie et primatologie pour la conservation de la biodiversité

39 Les problèmes urgents posés par la conservation des forêts tropicales et des grands singes africains ne pourront être résolus sans la participation des populations locales. Dans le même temps, initier des processus de développement durable est indispensable. Cependant, les conflits entre politiques de conservation et modes de vie locaux sont loin d'être éteints. Afin de les surmonter, il est donc nécessaire d'accorder une attention équitable aux humains et aux animaux pour une approche large et intégrée des relations entre les sociétés locales et leur environnement. La primatologie et l'éco-anthropologie japonaises qui se sont développées simultanément ont accumulé suffisamment de résultats en ce sens. Les relations de proximité établies avec les populations locales à travers les activités de recherche et de soutien économique constituent un premier pas en direction d'une intégration de la conservation et du développement. En nous fondant sur les éléments d'analyse présentés dans cet article, nous allons à présent démontrer comment les primatologues et les éco-anthropologues jouent un rôle dans la conservation

de la biodiversité au PNMD (PROCOBHA). Nous suggèrerons aussi ce qui peut être fait afin de collaborer avec la population.

40 L'écotourisme peut contribuer à améliorer l'économie locale en exploitant les ressources naturelles de façon durable (Varty *et al.*, 2005: 261–263). Les grands singes sont des animaux charismatiques qui ont un fort potentiel en tant que ressource touristique. Le tourisme de vision des grands singes, déjà développé en Afrique de l'est, est une source de revenus importante pour la gestion des aires protégées et le développement local. Les modalités de participation et la distribution des revenus comptent parmi les défis majeurs de ce type de projet. Si les bénéfices ne reviennent pas en quantité suffisante auprès des habitants, le projet risque de s'attirer leur antipathie, sans compter les conflits entre bénéficiaires et non-bénéficiaires du projet. Par exemple, le gorille était fréquemment braconné dans le Parc National de Kahuzi-Biega en RDC suite à la dégradation des conditions de vie locales et au non-fonctionnement de la gestion du Parc en temps de guerre (Yamagiwa *et al.*, 2011). Le braconnage était pratiqué en réaction contre le Parc parce que les politiques de conservation ne leur avaient apporté aucun bénéfice. D'autre part, le risque de transmission de maladies et d'infections entre humains et grands singes augmente lorsque le tourisme se développe (Woodford *et al.*, 2002; Köndgen *et al.*, 2008). Pour ces raisons, tout projet écotouristique doit être développé avec beaucoup de précautions.

41 L'écotourisme, aujourd'hui promu par l'Etat gabonais, n'en est qu'à ses débuts dans le pays. Au PNMD, c'est l'ONG locale qui a lancé le projet, en aménageant une auberge ainsi que des pistes forestières. Il s'agit donc d'une étape importante au Gabon qui déterminera en partie l'avenir des projets de conservation à travers l'écotourisme au niveau national. Le PROCOBHA appuie l'initiative écotouristique locale en exploitant les connaissances scientifiques accumulées en plus de dix ans de recherches continues, notamment sur l'écologie des grands singes. Simultanément, il s'efforce d'établir une approche sécurisée des contacts entre humains et grands singes à travers le processus d'habituation et la recherche vétérinaire. En fait, les activités d'habituation et de recherche ont été effectuées en donnant de l'importance aux relations et aux collaborations locales, sans pour autant examiner de près leurs modalités. En d'autres termes, la recherche sur les grands singes fournit déjà des éléments d'application gestionnaire.

42 Les connaissances scientifiques et les relations locales développées par les primatologues vont s'unir aux efforts des éco-anthropologues pour mieux connaître mode de vie et de la culture locale. Ces derniers ont également mis en évidence la menace que représentent localement les grands singes et la solitude des habitants face à ce problème, ainsi que la longue histoire de coexistence entre humains et grands singes et leur valeur culturelle. La participation des anthropologues au projet va orienter le volet d'éducation environnementale vers une perspective de collaboration à l'initiative de la population locale, à l'opposé de l'approche « top-down » fondée sur la prévalence des connaissances scientifiques et des normes de conservation en usage. Ils peuvent aller jusqu'à suggérer une méthode pour organiser les projets de conservation et de développement à partir d'une connaissance approfondie du contexte historique et culturel.

43 Ce que nous proposons, à travers cette collaboration interdisciplinaire, est d'enrichir les pratiques de l'écotourisme au moyen de récits variés. En général, les touristes ne sont pas intéressés uniquement par l'observation des animaux, mais aussi par les informations relatives à leur sujet. Les récits exploitants savoirs naturalistes scientifiques et locaux peuvent apporter un « supplément d'âme » à l'activité touristique. Ce type de récit devra

être fondé tant sur les informations détaillées recueillies par les primatologues que sur l'histoire et la signification locale des grands singes mise en évidence par les éco-anthropologues.

44 Ce processus de mise en récits devrait également se révéler significatif pour l'implication des habitants dans les activités de conservation, l'inclusion de leur culture visant à favoriser la coexistence traditionnelle entre l'homme et la nature et devant permettre de cultiver de bonnes relations avec les chercheurs. Les pisteurs longuement formés à la recherche scientifique et les guides locaux ont un rôle décisif à jouer dans ces opérations de mise en récit et de « démonstration culturelle » envers les touristes. Les chercheurs et les « personnes-ressources » avec lesquels les chercheurs ont collaboré pourront se mettre à l'écoute des touristes et servir d'entremetteurs avec les guides locaux.

6 Conclusion

45 Pour la conservation de la biodiversité et notamment des grands singes des forêts tropicales africaines, il est important de promouvoir la participation des habitants et de mettre en œuvre des projets de développement local. La primatologie et l'éco-anthropologie japonaises, qui se sont développées simultanément dans diverses régions d'Afrique au cours des dernières décennies, permettent d'envisager des pistes de réflexion. Nous avons illustré comment les primatologues ont établi de bonnes relations avec la population locale à travers la recherche d'une coopération à long terme. D'autre part, nous avons également illustré comment les éco-anthropologues abordent les relations entre la population locale et la faune et comment celles-ci contribuent à façonner la perception locale des animaux. Ainsi, nous avons indiqué qu'il est important de mettre en relation les connaissances scientifiques des primatologues, leurs rapports avec la population locale et les efforts des éco-anthropologues pour appréhender de façon plus globale le mode de vie et la culture locale. Cette collaboration interdisciplinaire nous permet de proposer d'enrichir les pratiques de l'écotourisme au moyen de récits fondés sur ces différents aspects de la vie et de la recherche locales. Cette démarche peut aisément être mise en oeuvre pour la conservation et le développement local dans d'autres régions d'Afrique tropicale habitées par les hommes et les grands singes.

46 Dans cet article, nous avons également vu que le déplacement entre le campement de recherche et le village n'est pas aisé. Mais en réalité, cette observation est surtout le fait de chercheurs qui ergotent sur leurs divisions disciplinaires. Respecter l'interdiction de l'entrée du Parc n'empêche nullement les habitants de se déplacer quotidiennement et sans difficulté d'une rive à l'autre de la rivière Moukalaba, soit en pirogue, soit à pied en saison sèche, afin de rallier leurs plantations depuis le village. La Moukalaba elle-même est un lieu de pêche important. Ce sont sans doute les pratiques locales elles-mêmes qui fourniront les clefs permettant de synthétiser les différentes recherches et de conserver la biodiversité.

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RÉSUMÉS

La conservation de la biodiversité et notamment des grands singes, dans les forêts tropicales africaines, est un problème urgent, à la solution duquel la participation des populations locales est essentielle. Il est également important de mettre en œuvre des projets de développement afin d'atténuer les conflits entre politiques de conservation et modes de vie locaux. Il s'agit donc d'accorder une attention équitable aux humains et aux animaux pour une approche large et intégrée des relations entre les sociétés locales et leur environnement. L'éco-anthropologie et la primatologie japonaises, qui se sont depuis longtemps développées simultanément dans diverses régions d'Afrique, permettent d'envisager des pistes de réflexion. Cet article discute les possibilités de synthèse disciplinaire à partir d'un projet collaboratif dans et autour du Parc National de Moukalaba-Doudou au Gabon. Les primatologues évoquent concrètement leurs relations avec la population locale sans laquelle leurs recherches de terrain ne pourraient être menées à bien. D'un autre côté, l'éco-anthropologue aborde les relations entre la population locale et la faune et leur incidence sur la perception locale des animaux. La recherche d'une convergence entre connaissances scientifiques et relations des primatologues avec la population locale d'une part, avec la compréhension profonde de la culture locale des éco-anthropologues d'autre part, nous conduit à enrichir les pratiques écotouristiques par des récits variés fondés sur les savoirs locaux et la recherche scientifique.

African tropical rainforests are decreasing rapidly because of the expansion of agricultural lands and commercial logging. In addition to habitat loss resulting from deforestation, an increase in the bushmeat trade threatens some wildlife species with extinction. Among these, African great apes are especially vulnerable because of their long life cycle and low reproduction rates, large range size, and high risk of being infected by diseases of human origin. Thus, conservation of biodiversity in African tropical rainforest, especially of great apes, is an urgent problem. In order to find a solution, the participation of the local population is essential. It is also important to implement development projects in order to resolve conflicts between conservation policies and local lifestyles. It is therefore necessary to pay enough attention to both people and animals and to move towards an integrated approach geared at the relation between local societies and the environment.

Japanese ecological anthropology and primatology, which developed simultaneously through longterm field research in various regions of Africa, offer a suggestive idea to tackle the issue. Their interdisciplinary achievements may provide clues to establish a system of biodiversity conservation along with concerns for local welfare. As the outcome of cooperation between primatologists and an ecological anthropologist, this article discusses possibilities for synthesizing the two academic domains and realizing biodiversity conservation in African tropical forests based on a collaborative project in and around the Moukalaba-Doudou National Park in Gabon.

Primatologists describe in detail their relationships with local people which allow them to conduct effective field research. They have developed scientific knowledge on great ape ecology as well as intimate relationships with local trackers. On the other hand, the ecological anthropologist illustrates relationships between local people and wildlife and deals with the local perception of animals. Local people have coexisted with great apes regarding them as similar to humans and giving them cultural value. The negative aspect of great apes for local people, such as crop-raiding, is also pointed out.

Finally, the authors demonstrate how their interdisciplinary collaborative project integrates biodiversity conservation and local development, and then discuss the importance of ecotourism projects based on local initiatives. The synthesis of the scientific knowledge and close relationships that primatologists established with local people with the deep understanding of local culture acquired by ecological anthropologists, leads us to suggest implementing an ecotourism based on various narratives created through collaborative research activities.

INDEX

Thèmes : anthropologie
Mots-clés : Afrique tropicale., aires protégées, conservation des grands singes, développement local, éco-anthropologie, primatologie
Keywords : ecological anthropology, great apes conservation, local development, primatology, protected areas, tropical Africa.

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Historical hypotheses of chimpanzee tool use behaviour in relation to natural and human-induced changes in an East African rain forest[1]

Hypothèses historiques à propos du comportement d'utilisation d'outils par les chimpanzés en relation avec les changements naturels et anthropiques d'une forêt tropicale d'Afrique de l'Est

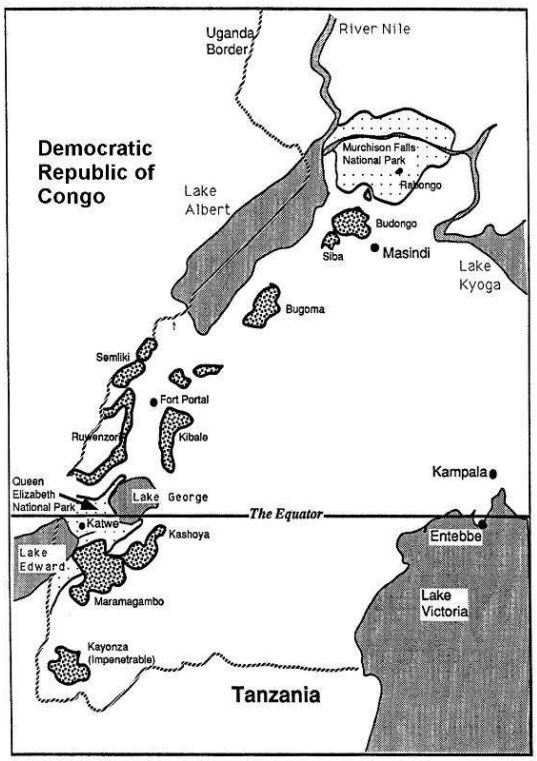
Thibaud Gruber

"The Budongo Forest has existed for millennia as an isolated block detached from the central African forest. Until this century, it has had minimal contact with human populations. It was neither inhabited nor used extensively as a resource, though it was undoubtedly kept from spreading by human-instigated fires. The precolonial restraints on the forest's expansion were thus fire, human-controlled animal herds, and elephants. These conditions prevailed until the extension of the British protectorate to include Bunyoro in 1901." (Paterson, 1991, p. 186).

1 Introduction

1 Despite being highly adaptable and found in a wide range of habitats (Pruetz, 2006), chimpanzees remain forest dwelling-animals (Kortlandt, 1983). The forests they inhabit experience constant changes in surface, coverage and composition among other ecological characteristics. These changes occur either naturally or are induced by human activities, and it is important to analyze the dynamics of the interactions between the forests and the species they host to understand how the latter evolve. Changes in the forest can lead to changes in the behaviour of the animals, for instance if the forest becomes swarmed with human activities (Zommers *et al.*, 2013); conversely, the behaviour of some inhabitants can also lead to the phenomenon known as "niche construction" (Odling-Smee *et al.*, 2003), whereby a particular species can shape its own environment by its actions, which in return may lead to the emergence of novel selective pressures for the species itself but also for other species (the most famous example being the beaver dam). In this article, I will focus on a particular forest, the Budongo Forest in Western Uganda (fig. 1) and on the potential influence of forest changes on the appearance, maintenance and disappearance of cultural behaviours in wild chimpanzees (*Pan troglodytes schweinfurthii*). To illustrate the connection between ecological and cultural variation, I will focus on stick use, for which both observational and experimental data suggest a clear impact of the former on the latter.

Figure 1



Map of Western Uganda showing the location of the Budongo and Kibale forests (courtesy of James Paterson, with modification by the author).
Carte de l'Ouganda occidental montrant l'emplacement des forêts de Budongo et Kibale (avec l'aimable autorisation de James Paterson, modifiée par l'auteur).

2 Forests change throughout the ages: the long-term picture

2 A defining feature of the ongoing Quaternary geological period, which started about 2.6 MA ago with the transition from the Pliocene to the Pleistocene epoch, is the presence of several major glacial events (Gradstein *et al.*, 2004). The current epoch, the Holocene, considered an interglacial epoch in the ongoing ice age, followed the last glaciation at the end of the Pleistocene, 11,700 years ago. Temperature variation had an impact on forest coverage, and led to periods of expansion and contraction, notably in Sub-Saharan Africa (Kendall, 1969; van Zinderen Bakker and Coetzee, 1972; Moeyersons and Roche, 1982), where the maximum expansion occurred about 12,500 years ago (Hamilton, 1976; Haffer, 1982; Mayr and O'Hara, 1986; Hamilton, 1988). The Budongo Forest was then part of a larger forest originating from northeastern Democratic Republic of Congo and encompassing several Ugandan forests such as Kibale (Hamilton, 1976; Grubb, 1982; Howard, 1991), which subsequently became fragmented (Philipson, 1977; Hamilton, 1984; Hamilton *et al.*, 1986; Howard, 1991). The Budongo Forest became separated from other forest patches about 8,000 to 10,000 years ago (Reynolds, 2005).

3 According to the Pleistocene refugia theory (Haffer, 1969), repeated oscillations between dry and moist climatic periods led to the isolation of forest-associated taxa, which provoked genetic diversification. Modern populations descending from these isolated populations have a higher genetic diversity than the ones descending from sub-populations that colonized areas regained during forest expansion. The theory has been partly supported by data in birds (Roy, 1997; Smith *et al.*, 2000; Bowie *et al.*, 2006) and in primates (Jensen-Seaman and Kidd, 2001; Telfer *et al.*, 2003; Anthony *et al.*, 2007). With respect to the Ugandan case, the model is supported for red colobus monkeys (*Colobus badius tephrosceles*) (Struhsaker, 1975), but less for Eastern chimpanzees (Goldberg, 1996). During the last ice age, the Eastern chimpanzee population, which remained small, may have occupied woodland habitats during the more arid and colder episodes rather than retracting in forest refugia, before populating the regenerating forests during the subsequent interglacial expansion (Goldberg, 1996; Goldberg and Ruvolo, 1997b; Goldberg, 1998).

4 Forest types composing the forest also change with time. For instance, the Budongo Forest, described as a "lowland rain forest" by Eggeling (1947), was composed of four forest types in 1944: *Cynometra* forest, *mixed* forest, *colonising woodland* and *swamp* forest. The first three types followed an ecological succession, with the colonising woodland turning into the mixed forest that could potentially become the climax forest type dominated by *Cynometra alexandrii* (Eggeling, 1947). In 1944, the mixed forest was the most represented forest type (60%) with over fifty species of large trees, including the economically valuable mahogany trees *Khaya anthotheca*, *Entandrophragma cylindricum*, *E. utile* and *E.angolense* (Plumptre and Reynolds, 1994). As of 1944, the *Cynometra* forest type accounted for up to 35% of Budongo Forest and the colonising woodland, found at the edge of the forest, for 6%. Finally, the swamp forest, found along the streams and growing on soils that are flooded for part of the year, represented about 2% of the forest surface. By the 1970s, the *Cynometra* forest was reduced to only 15 to 20% of the forest, when it may have represented as much as 50% of the total area prior to 1890 (Paterson, 1991). In a different study, Plumptre found that between 1951 and 1990, the *Cynometra* forest, the

Cynometra-mixed forest, the colonising-mixed forest, the colonising woodland and the swamp forest lost respectively 41%, 62.2%, 26.6%, 33.2% and 0.7% of their surface. In contrast, the mixed forest gained 175.8% (Plumptre, 1996). In the following section, I will explore the factors that led to such a change.

3 The impact of wildlife, fire and humans on forest and the consequences on primate behaviour and diet

5 Two main phenomena shaped precolonial Ugandan forests: elephant migrations and fire. The main action of the elephants was to trample over the vegetation and to damage the trees by way of debarking (Buechner and Dawkins, 1961). Although it was not necessarily lethal to the tree, this peeling exposed fire-sensitive layers that could not resist bushfires. One consequence of debarking was therefore the easier propagation of fire that could carry on deeper in the forest. The combined effect of elephants and fire would thus be the loss of numerous trees as well as the transformation of zones of thick forest into grassland.

6 Forest fires can have a natural origin, but also result from human action, most particularly since the domestication of fire and its use for agriculture (Goldammer and de Ronde, 2004). In the Bunyoro area, where the Budongo Forest is located, this became especially true with the settlement of Bahima herders, more than 600 years before colonial rules were implemented (Paterson, 1991). The major aim of grassland burning was to provide fresh forage for the herds. However, it also had the benefit to repel tsetse flies by burning the savannah bushes where they rest and lay their eggs, thus favouring human settlement in the area. The combined action of fires and elephants maintained the Budongo Forest within its boundaries and prevented it from expanding for centuries.

7 However, with the arrival of the British colonial power starting from the mid-nineteenth century, drastic measures were taken with respect to both fires and elephants and had numerous consequences on the forest (Paterson, 1991). The regulation of grassland burning in the 1920s led to the growth of bush savannah, the spread of the tsetse fly and the outburst of sleeping sickness (trypanosomiasis) in humans, cattle and wild species. The area became deserted and the forest started to expand over its previous boundaries. In the 1950s, to obliterate the tsetse fly, it was decided to shoot all its potential prey, notably big game such as buffalos and ungulates (including elephants). This led to the disappearance of these species south of the Nile. Elephants entirely disappeared in the 1960s, when the army shot them down during their annual migration (Reynolds, personal communication).

8 Other policies had a direct impact on the ecological composition of the forest as the Budongo Forest became of interest for forestry and logging activities. By 1926, a sawmill had been established at the heart of the forest, and by 1960, it was the largest timber producer in Uganda, with working plans established to support a sustainable extraction and favour the growth of usable trees (Plumptre, 1996). Because the *Cynometra* forest was not of economic value compared to the mixed forest, which contained valuable trees for production including the famous mahoganies, several poisoning campaigns in the 1950s and 60s aimed at reducing the amount of *Cynometra* trees in order to open the canopy and favour the development of the mixed forest tree species. These campaigns also aimed at removing “weed” species such as strangler figs (Plumptre, 1996). The areas treated with

arboricides saw an increase in mixed forest, but *Cynometra* remained an important part of the vegetation, albeit not dominant anymore. Interestingly, despite the initial goal of the poisoning, the campaigns unexpectedly favoured the growth of fig tree species (Plumptre *et al.*, 1997; Reynolds, 2005).

9 The increase in mixed forest in logged areas compared to non-logged areas led to the increase of the primate populations in the former for three species (*Colobus guereza*, *Cercopithecus mitis* and *Cercopithecus ascanius*, Plumptre and Reynolds, 1994) ; but not for chimpanzees or baboons (*Papio anubis*), possibly because of a greater sensitivity to human activities (Reynolds, 2005).

10 A more detailed analysis shows nonetheless some effects of logging. Chimpanzee faecal samples from the Sonso area (compartment N3, where the sawmill was located and thus a heavily logged area) had nearly eight times as many fig seeds as samples obtained from the unlogged Kaniyo Pabidi area (Plumptre *et al.*, 1997). Additionally, the Sonso chimpanzee started consuming the fruits and leaves of a species introduced at the sawmill for paper production, *Broussonetia papyrifera*, and absent in other parts of the forest. This species has an especially low concentrations of tannins, making it a chimpanzee favourite (Reynolds *et al.*, 1998). Human activities in the forest thus led to changes in the chimpanzee diet.

4 Digression: the impact of ecology on cultural behaviour and the unusual Budongo chimpanzees

11 While human activities have an impact on chimpanzee diet, they can also affect their behaviour. In the following paragraphs, I will only focus on the potential links between human activity and cultural behaviour in a long term perspective, but it must be noticed that chimpanzee behaviour may be affected more directly by human activities with sometimes a tense relationship between the two species (McLennan and Hill, 2010). Before developing hypotheses on chimpanzee cultural behaviour in Budongo Forest, I will first introduce some notions on chimpanzee culture.

12 Culture, as seen by zoologists, and most especially primatologists, consists of socially transmitted behaviours that vary between animal groups, for which the variation cannot be explained by obvious genetic or ecological factors (Whiten *et al.*, 1999). Following the chimpanzee findings, cultures (or traditions) have been inferred in other species such as orangutans, capuchins, whales and dolphins (Rendell and Whitehead, 2001; Perry and Manson, 2003; van Schaik *et al.*, 2003). However, some opposed this view, arguing that environment and genes cannot be excluded and always contribute to the shaping of behaviours (Laland and Janik, 2006). Since then, studies have aimed at quantifying what part of the behavioural variance could be attributed to the different factors (social, genetic and environmental). This approach still allows one to isolate a social component, for instance, in the case of ant-dipping, which justifies the use of the word ‘culture’ (Möbius *et al.*, 2008; Schöning *et al.*, 2008). Understanding what ecological factor drives the appearance, maintenance or disappearance of certain cultural behaviours, most notably tool use, has since been a hot topic in cultural primatology (Humle and Matsuzawa, 2002; Gruber *et al.*, 2012a; Koops *et al.*, 2013). Fox and colleagues (2004) proposed two major competing but non-mutually exclusive hypotheses to explain the influence of environment on orangutan tool use: the opportunity and the necessity hypotheses, a

distinction that has since be adapted to other species such as capuchins (Spagnoletti *et al.*, 2012) and chimpanzees (Koops *et al.*, 2013). Adapted to the chimpanzee species, the opportunity hypothesis states that "encounter rates with nuts, insects or tools explain tool use patterns" (patterns is here understood as the presence or absence of particular behaviours across Africa) while the necessity hypothesis states that "tool use is a response to scarcity of preferred foods (i.e. ripe fruit)" (Koops *et al.*, 2013, p. 175). Although the necessity hypothesis was favoured in the past (Yamakoshi, 1998; Lee, 2003), recent studies have argued in favour of the opportunity hypothesis, finding no support for the necessity hypothesis in current ecological settings (Spagnoletti *et al.*, 2012; Koops *et al.*, 2013).

13 Chimpanzees in Uganda are famous for having quite limited tool use behaviour (McGrew, 2010), notably when extracting food. In effect, the three most studied communities in Uganda, the Ngogo and Kanyawara communities (both found in Kibale Forest, see figure 1) and the Sonso community of Budongo Forest, display respectively 4, 2 and 1 food-related tool use behaviours (Gruber *et al.*, 2012a). The Sonso community has the smallest number of all, knowing only leaf-sponging (picking, folding and mashing leaves taken from the vegetation into a sponge to absorb water) but not using sticks in their daily life. The only observations of Sonso chimpanzees using sticks are when building a nest and when engaging in a tag-like game where one individual runs after another one carrying a stick. This is in contrast to other habituated Ugandan communities where the use of sticks as probes, levers and as tools to exploit food resources such as honey have been documented (Watts, 2008); and, more generally, to other long term study chimpanzee communities in Africa (Whiten *et al.*, 1999). This difference in tool use behaviour does not result from genetic factors, given low genetic variation among East African chimpanzee communities (Goldberg and Ruvolo, 1997a), nor from incomplete observations, the Sonso community having been under constant scientific scrutiny for more than twenty years (Reynolds, 2005). Additionally, recent experiments have confirmed the absence of the stick using behaviour in the community: the Sonso chimpanzees, when exposed to a hole filled with honey drilled in a natural log, manufactured leaf-sponges to extract the honey, in contrast to the Kanyawara chimpanzees who used sticks for the same task (Figure 2, Gruber *et al.*, 2009). The lack of knowledge of the Sonso community was later confirmed with more experimental work, showing that even when directly exposed to a stick plugged into the honey, the individuals who engaged with the task did not understand the affordances of the tool and did not develop stick use (Gruber *et al.*, 2011), suggesting that the development of a new tool behaviour may not be so straightforward in chimpanzees. How is it possible to explain such behaviour?

Figure 2

Kanyawara chimpanzee using a stick in the honey-trap experiment (courtesy of Andrew Bernard).
Chimpanzé Kanyawara utilisant un bâton dans l'expérience du piège à miel (avec l'aimable autorisation d'Andrew Bernard).

5 A potential scenario for changes in chimpanzee cultural behaviours in Budongo Forest

14 Analyzing the case of stick use in Budongo Forest through the opportunity and necessity hypotheses does not seem to yield convincing conclusions. Firstly, the opportunity hypothesis suggests that the encounter with bees' nests and sticks would favour the development of stick use. The experimental work conducted since 2009 argues against the fact that finding the food and the right tools nearby would lead necessarily to the development of the behaviour. Most compellingly, in one experimental setting, 20 chimpanzees (14 who had failed to reach the honey previously because they did not display any tool use and 6 who used leaf-sponges before to collect the honey) encountered a stick directly plugged into the honey but none of them, despite some of them engaging with the stick, started to use it as a tool (Gruber *et al.*, 2010; Gruber *et al.*, 2011). If taken in a larger perspective, the opportunity hypothesis may suggest that there is a difference in honey availability between Budongo and Kibale forests. It is hard to evaluate precisely how many bees' nests are present in the chimpanzee range. Bees' nests appear to be found and exploited opportunistically by chimpanzees although they remember where they extracted honey and come back even months afterwards to check whether honey is again available (Gruber, personal observations). However, the same genera of bees are present in the two forests (*Apis*, *Meliponula* and *Xylocopa*) and *Apis* or *Meliponula* bees appeared at all the testing sites to exploit the experimentally-provided honey, suggesting that their nest was in the vicinity. Similarly, the wide availability of

sticks anywhere in both forests makes unlikely that a difference in tool availability would cause a difference in stick use between the two communities.

15 Regarding the necessity hypothesis, the interpretation is at first sight also unlikely to yield significant results, given that even though no period of food scarcity has been documented in Sonso in the first twenty years of observations (Newton-Fisher, 1999; Reynolds, 2005), the Ngogo community (which has more tool use behaviours in their repertoire) appears to have the richest diet of the three studied communities (Gruber *et al.*, 2012a). However, the fact that the food supply was constant between 1990 and the early 2000s does not mean that it has always been the case in the past, and the diet of the Sonso or Ngogo chimpanzees may not have always been the same. One hypothesis proposed to explain the small genetic diversity in East African chimpanzees is that they survived in a mix of woodland and savannah-type areas rather than retreating into forest refugia during glacial events (Goldberg, 1998). The small size of the original gene pool suggests that the original population was kept low and survived in dry, marginal habitats where the food supply was probably reduced compared to the following interglacial period (Goldberg, 1996). This may have led to the development of stick use in East African chimpanzee populations as an adaptive behaviour, or at least, to the presence of a constant ecological pressure keeping the behaviour in the repertoire of the original population from which descended all modern East African communities (Gruber *et al.*, 2012a). This is supported by the fact that most studied East African chimpanzee communities have stick use in their current repertoire, a behaviour that is not so easy to develop and thus to re-invent in independent events (Gruber *et al.*, 2011). When the forest repopulated the areas where the chimpanzees were occupying woodland and savannahs, different ecotones came in place. For instance, in Budongo Forest, an important species is *Cynometra alexandrii*, which is also an important part of the community diet. This species is absent from the Kanyawara and Ngogo areas, probably because the Kibale Forest has a higher average elevation than the Budongo Forest (Chapman *et al.*, 1997; Gruber *et al.*, 2012a).

16 Could these subtle ecological differences in the re-established forests account for cultural differences between the communities? In a recent study, we showed that the Sonso area (and more generally, the Budongo Forest) appeared more diverse in terms of available edible tree species for chimpanzees, and that the Sonso chimpanzees consumed about twice as many items as the Kanyawara and Ngogo chimpanzees (Gruber *et al.*, 2012a). Our analyses led us to propose the diversity hypothesis with respect to food-related tool use behaviours, that is, the diversity of items consumed, by preventing periods of food scarcity (as opposed to food richness, which does not necessarily prevent food scarcity periods if ripe fruit availability is concentrated in given periods of the year), may influence tool use repertoire, notably by leading to the disappearance of food-related tool use behaviours. In other words, a mother chimpanzee having a constant range of food choices will not necessarily display tool-using behaviours, as opposed to a mother chimpanzee facing more limited food choices, and this may lead to the interruption of the transmission of one given behaviour within her matriline (and potentially to the extinction of the behaviour in the community if all chimpanzees cease to display the behaviour). As such, the Sonso community may have lost stick use because Sonso mothers stopped to display this behaviour in front of their infants. This event may have happened either in the past, at the time of forest recolonisation, or later on, or even during recent times following the effects of the logging activities in the forest (augmentation of fleshy

fruit tree availability in the area). Comparing the Sonso community with two other communities in the Budongo Forest (in Busingiro and Kaniyo Pabidi, respectively logged and unlogged areas of the forest), our preliminary results suggest that stick use may be absent in the entire Budongo Forest (Gruber *et al.*, 2012a). This may mean that logging was not directly responsible for the loss of the stick use behaviour, although it cannot be excluded that the Kaniyo Pabidi and Sonso communities experienced two independent losses. It could also be that neither community ever had stick use, in the hypothesis that the initial colonising population had already lost the behaviour. However, the finding of stick use for honey fishing in nearby Bulindi Forest (McLennan, 2011), as well as potentially in Kasokwa Forest (Wallis, personal communication), two satellite forests of the main Budongo block, makes this hypothesis unlikely. More data on other communities in Budongo Forest, as well as in other areas in Uganda will be necessary to understand the complete distribution of stick use in chimpanzee communities and decipher between the different hypotheses and potential scenarios.

6 Temporal dynamic characteristics as added values to ecological factors leading to cultural differences: A dynamic model of the influence of ecology on food-related tool use behaviour

17 The analysis of the situation, past and present, at Budongo Forest, despite needing more data points to evaluate the different hypotheses, allows me to underline that the opportunity and necessity hypotheses must include a temporal dimension in all cases:

18 The opportunity hypothesis is modulated by the diversity hypothesis in its cognitive dimension: while chimpanzees may encounter the suitable food and the right affordances to develop tool use at a given time, the development of tool use may not happen if the current diet already provides a buffer against food scarcity. Additionally, the development of new techniques may be prevented if the current tool use behaviour (e.g. leaf-sponging to extract honey) is efficient enough to extract the calories or nutrients necessary. Nevertheless, innovation may be still possible in the case of independent explorations, irrelevant of ecological conditions, for instance by young individuals while their mother is foraging). Why think of developing novel behaviours when there is a next-to-preferred available resource nearby? In other times, when the diet is not so optimal, development of tool use may happen.

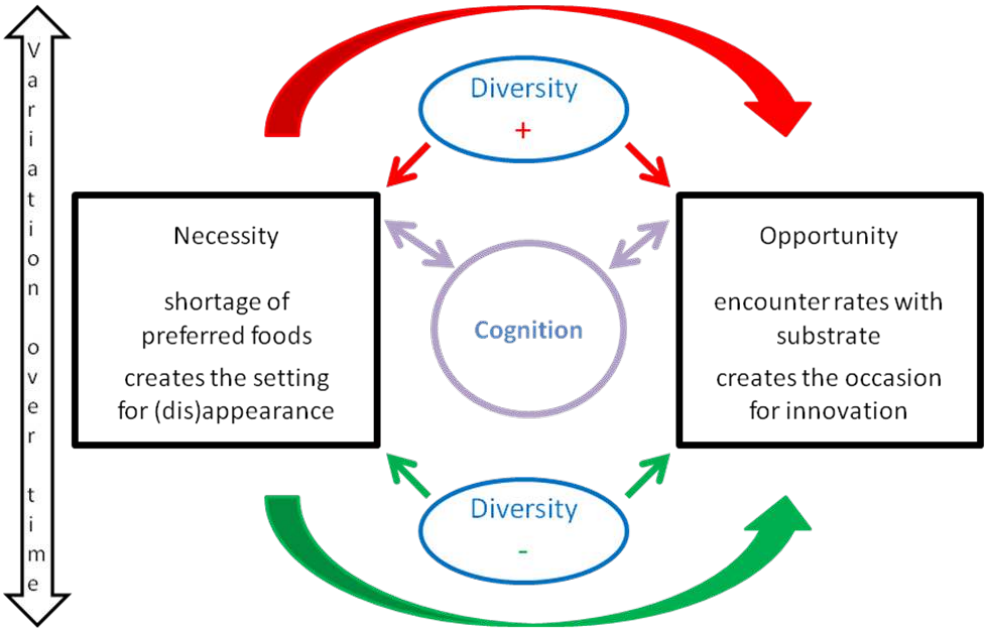
19 The necessity hypothesis is modulated by the diversity hypothesis in its ecological dimension: a community will adapt to its environment depending on whether the environmental pressure changes over time. A given behaviour may develop because of ecological constraints, but if the pressure disappears, the need to use this behaviour may also disappear, leading to the potential disappearance of the behaviour in the end.

20 In both cases, the factor to take into account is that ecological conditions change over time, and this has an impact on both the necessity and opportunity to develop a novel tool-using behaviour. For instance, the ecological pressures faced by the ancestors of Budongo Forest communities were different from the ones faced by modern Sonso chimpanzees. In the case of Ugandan forests, the environmental variation is best represented by the variation in diversity of food available rather than its quality, thus our decision to call it the ‘diversity hypothesis’ (Gruber *et al.*, 2012a). However this does not

preclude other environmental characteristics (e.g. quality of the diet) from influencing the opportunity and necessity factors in other sites or situations (i.e. in another community, it may not be the diversity of food available that will influence the development or the disappearance of a food-related tool use behaviour as in Sonso, but potentially a change in food quality or another relevant ecological factor in this period of time).

21 Taking time into consideration, an opportunity ignored at a given moment may become of crucial value for survival in a different setting. In fact, far from being opposed to each other, the necessity and opportunity hypotheses may go hand in hand: while the opportunity to create a novel behaviour (innovation) may either depend on the ecological pressure faced by the individuals at a given moment or not (giving the possibility to innovate both in periods of critical necessity or not), the spread of the behaviour within the community may also depend on whether there is an immediate necessity (for survival) for the group to adopt this behaviour. Thus, raising the necessity parameter will favour both the opportunity to develop a new behaviour (if there is no second choice, there is a bigger need to explore one's surroundings) and its spread in the community (if my neighbour is feeding and I am not, I should take some interest in how he got the food). Similarly, even if a behaviour exists in the community, it may be lost if the environment changes (for instance in proposing more easily accessible food, easing the necessity aspect that drove the appearance of the behaviour in the first place) and limits the opportunities for one generation to display the behaviour to the next generation (the youngsters are less exposed to the substrate and technique because the adults fail to exploit the resource). In effect, the necessity factor determines the general setting to develop a novel behaviour (if there is an ecological 'need' to develop or maintain a behaviour) while the opportunity factor will determine the occasions to develop such behaviours (if there is something new to notice and explore to answer to this need). This reasoning is summarised in Figure 3.

Figure 3



A dynamic model of the acquisition of food-related tool use in wild chimpanzees. Green: favours development of tool use; red: impedes development of tool use. Arrows: effect of factors on each other. The ovoid circles show the impact of environmental variation (food diversity in the case of Budongo Forest) on the opportunity and necessity to develop a particular tool using behaviour.
Un modèle dynamique de l'acquisition de l'utilisation des outils liés à l'alimentation chez les chimpanzés sauvages. Flèches:effets des facteurs les uns sur les autres. Flèche verte: favorise le développement de l'utilisation de l'outil; flèche rouge: contrecarie le développement de l'utilisation de l'outil. Les cercles ovoïdes montrent l'impact des variations de l'environnement (diversité alimentaire dans le cas de la forêt de Budongo) sur l'opportunité et la nécessité de développer un comportement d'utilisation d'un outil spécifique.

22 A second important point is that ecological factors alone will not necessarily lead to the appearance or disappearance of a given behaviour. The difficulty of the Sonso chimpanzees to develop stick use in the honey-trap experiments (Gruber *et al.*, 2011) illustrates that developing a novel behaviour, even as simple as stick use, may not be straightforward. Thus, both the opportunity and necessity hypotheses must be modulated by specific cognitive characteristics of the community considered (general intelligence, presence of innovators, opportunities for social learning, see van Schaik and Pradhan, 2003). This, in turn, may depend on genetic predisposition, for one thing, but most probably on the already present cultural niche in which the individual was born (Gruber *et al.*, 2012b). That Sonso chimpanzees adapted a leaf-based behaviour that is normally used to fetch water to solve the honey-trap experiment is not random and suggests that chimpanzees will explore new solutions in their environment close to their already existing state of knowledge. This may support the idea that chimpanzees have a zone of latent solutions (ZLS, Tennie *et al.*, 2009) that defines what solutions they can find. However rather than being defined at the species level as presented by Tennie *et al.*, the data presented here suggest that the ZLS is different for each chimpanzee, or at least, for each community, and is deeply influenced by their cultural knowledge. For instance, a chimpanzee who was born in a 'leaf-oriented' community such as Budongo will have a very different ZLS from a chimpanzee who was born in a 'stone-oriented' community such as Bossou. As such, cognition may also play a role in how chimpanzees may realize that there is an opportunity to develop a novel behaviour or not. If an object of their

environment has never been considered *as* a tool, which necessitates quite developed representational abilities (Gruber, submitted), it may be harder for chimpanzees to consider this object as a potential solution to their problem. But the other way is also possible: being exposed to the properties of a given object several times – and as such, being given the 'opportunity' to understand how it can be used – may be necessary to start using it. Similarly, the links between cognition and necessity have to be explored. Necessity may be the mother of invention (Lee, 2003) but a lack of necessity, by bringing all required and potentially even improved sources of nutrients, may also favour brain activity, innovation and the development of novel techniques (Wrangham, 2009). The links between cognition and the different sides of the model will have to be explored to understand fully how food-related tool use behaviours develop in wild chimpanzees.

7 Conclusion: chimpanzee cultural behaviour changes over time and humans are bound to play a role

23 In this article I attempted to put the study of chimpanzee culture into perspective, adopting an historical framework going back to the last ice age and the Pleistocene to underline how cultural evolution and ecological changes are linked, similar to what is claimed in humans (Richerson *et al.*, 2001). I also argued in favour of including a temporal dimension in the current debate on the influence of ecology on cultural behaviour. In the last paragraphs, I showed that many factors intervene and interplay in the development of chimpanzee cultures. Past human activities around and inside Budongo Forest have had a huge impact on the composition of the forest and had direct and indirect consequences on chimpanzee diet and behaviour. The proposed model is adapted to the case of the Budongo Forest and its chimpanzees, but I believe the general framework that mixes the opportunity and necessity factors leading to the development of novel tool use behaviour may be adapted to other chimpanzee communities or primate species, as far as the specific ecological pressures that they face in each case are considered.

24 Additionally, although I anchored the scenario in the forest's past, the interaction between ecological conditions and cultural knowledge is an ongoing process that is not static and that must be understood as a continuous dynamic system where human activity, with their constant uses of the forest, has an important role. This is not limited to chimpanzees, as a recent study showed that the famous stone tool-using Burmese long-tailed macaques (*Macaca fascicularis*) are now under threat of losing their cultural knowledge because of human activities (Gumert *et al.*, 2013). The presence of a research camp for the last twenty-three years has prevented illegal logging or hunting to spread into Sonso territory, turning this area into a haven for several species including monkeys or duikers, but the current trend in the forest is toward a decrease in food availability (Babweteera *et al.*, 2012). Whether this is directly linked to current human activity in the forest (most notably illegal logging and poaching) or to global climate change is to be determined. Nonetheless, the impact of these human-induced changes on chimpanzee behaviour and culture will have to be monitored in the future.

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NOTES

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ABSTRACTS

Chimpanzees and humans have co-existed in Africa for millennia. The forests inhabited by chimpanzees have experienced numerous changes in recent time, most notably during the last 12,000 years, as the current interglacial age started. In this article, I will study the case of

Western Ugandan forests to describe the different factors, natural and human-induced, which affect a tropical forest, and draw hypotheses on the influence of these changes on chimpanzee cultural behaviour. Before colonial times, the Budongo Forest was shaped by elephant migrations and fires lit by the pastoralists who settled in the area. Later on, the British colonial power organized the exploitation of the forest through work plans aimed at insuring sustainable extraction of valuable timber. The human activity resulted in unexpected consequences in the forest. Interestingly, the resident chimpanzees are nowadays remarkable in the small size of their tool use repertoire. Ecological analysis and tool use observations in Uganda only support partly the opportunity and necessity hypotheses that are currently proposed to explain the influence of ecological factors on tool-using behaviour. Rather, the data I present here suggest that the temporal dimension of ecological changes in the forest must be taken into account to explain tool use behaviour variation in Ugandan forests. I propose a dynamic model connecting the necessity and opportunity factors influenced by ecological changes over time, most salient in Ugandan forests through the variability in food diversity. Finally, I conclude on the ever-changing ecological situation in Budongo Forest.

Les chimpanzés et les humains ont coexisté en Afrique depuis des millénaires. Les forêts habitées par les chimpanzés ont changé de manière importante dans le passé récent, tout particulièrement depuis 12 000 ans et le début d'un âge interglaciaire. Dans cet article, j'étudierai le cas particulier des forêts de l'ouest de l'Ouganda pour décrire les différents facteurs, naturels et induits par l'homme, qui influent sur la forêt tropicale, et j'esquisserai des hypothèses à propos des effets des changements qui en résultent sur le comportement culturel des chimpanzés. Avant l'ère coloniale, la forêt de Budongo subissait les migrations des éléphants et les feux de brousse allumés par les populations pastorales des environs. Plus tard, les autorités coloniales britanniques ont organisé l'exploitation de la forêt en engageant des plans durables d'extraction du bois précieux. L'activité humaine eut des conséquences imprévues pour la forêt. De manière intéressante, les chimpanzés de Budongo ont un répertoire culturel limité comparé aux autres communautés. L'analyse écologique et les observations d'utilisation d'outils en Ouganda ne supportent que partiellement les hypothèses dites de 'nécessité' et d''opportunité' proposées pour expliquer le développement d'outils chez les primates non-humains. Au contraire, les données que je présente suggèrent que la dimension temporelle des changements écologiques de la forêt doit être prise en compte pour expliquer la variation des répertoires d'utilisation d'outils en Ouganda. Je propose un modèle dynamique qui connecte les facteurs de nécessité et d'opportunité via l'influence des variations écologiques au travers du temps, qui transparaît notamment en Ouganda à travers la variation en diversité de nourriture accessible à un moment donné. Je conclus sur l’évolution permanente de la forêt de Budongo.

INDEX

Keywords: chimpanzees, culture, Ecology, forest changes, human impact, Pan troglodytes
Mots-clés: changements de la forêt, chimpanzés, culture, écologie, impact humain, Pan troglodytes
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Revisiting Capuchin Monkeys (*Cebus capucinus*) and the Ancient Maya[1]

Les singes capucins (Cebus capucinus) *et les anciens Maya*

Mary Baker

1 Introduction

1 This paper begins at the time of creation. According to the **Popol Vuh**, the Quiché Maya creation myth, in the earliest time there was only still, silent sky and sea. Heart of Sky and Quetzal Serpent came together with other gods to form the earth, mountains, valleys and rivers. They gave birth to animals and gave them homes, places to rest. The animals were called on to speak the names of the gods, to revere and worship them, but the animals were only able to squawk, chatter and roar. Needing to be thus honored, the gods then decided to create people made of earth and mud, but these people soaked up water and dissolved; they couldn't walk and they couldn't speak (Christenson 2007; Recinos 1950; Tedlock 1985). Next, in consultation with the diviners Xpiyacoc and Xmucanc (grandfather and grandmother deities), they created wooden people, but these humans did not have souls or minds. So the gods had them beaten and disfigured before sending a deluge of heavy rain. The wooden people turned into spider monkeys (*k'oy*): their descendants are the monkeys which live in the forests today and accounts for the resemblance between monkeys and humans (Christenson 2007).

2 Before recounting the third and successful creation of humans from corn, the myth goes on to tell the story of the descendants of Xpiyacoc and Xmucanc. Of particular interest in this paper, it discusses the lives of two sets of twins who were also half-brothers. The first set of twins were named Hunbatz and Hunchouén; they grew to be very wise and they became great musicians, singers, flautists, painters, and carvers. The second set of twins were named Hunahpú and Xbalanqué, the Hero Twins. The myth gives focus to discord between the two sets of twins: The older brothers, Hunbatz and Hunchouén, were lazy and envious of their younger brothers and abused them. The younger brothers were

forced to grow and hunt food, but they were permitted to eat only after everyone had eaten their share (Christenson 2007; Recinos 1950; Tedlock 1985).

3 The younger brothers, Hunahpú and Xbalanqué, got tired of being abused, so they tricked their older brothers. They told them they had shot a bird which was stuck in a tree and they asked the older brothers to climb up and get it. As Hunbatz and Hunchouén climbed, the tree began to grow, bigger and bigger. Hunbatz and Hunchouén were afraid they would fall, so the younger brothers told them to loosen their loincloths and tie them to a tree branch. As they did, their loincloths became tails and Hunbatz and Hunchouén turned into spider monkeys (*k'oy*).

4 When the Hero Twins returned home, their grandmother was distraught over the loss of Hunbatz and Hunchouén. Hunahpú and Xbalanqué reassured her saying they would call the older brothers back, but only as a trial for their grandmother: she must not laugh when she saw them as monkeys. The Hero twins played the song of "*Hunahpú-k'oy*" (Hunahpú Spider Monkey) on their flutes, inviting the older brothers back. But when their grandmother saw their silly faces, she could only laugh. Hunahpú and Xbalanqué said they would give their grandmother three more chances not to laugh at the fallen older brothers, but each time Hunbatz and Hunchouén returned, their grandmother would burst out laughing. Thus was the fall of Hunbatz and Hunchouén who became animals. But not completely disgraced, they became the patron gods of the arts: musicians, singers, dancers, carvers, painters and craftsmen (Christenson 2007; Recinos 1950; Tedlock 1985).

5 Epigrapher and iconographer Michael Coe (1978, 1989) asserts that howler monkeys predominate in the representations of the monkey-man scribes portrayed on Late Classic (A.D. 550-900) funerary ceramics, which depict Hunbatz and Hunchouén. Coe also argues that all nonhuman personifications of the Maya day glyph, *kin*, are monkeys and particularly howler monkeys (see also Braakhuis 1987). However, as discussed in my previous paper (Baker 1992) there are many problems with his analysis. His conclusions were based on three lines of reasoning: an assumed but erroneous understanding of the distribution of Neotropical primates, limited linguistic data, and a limited understanding of the relevant morphological traits of monkeys living in the Maya region.

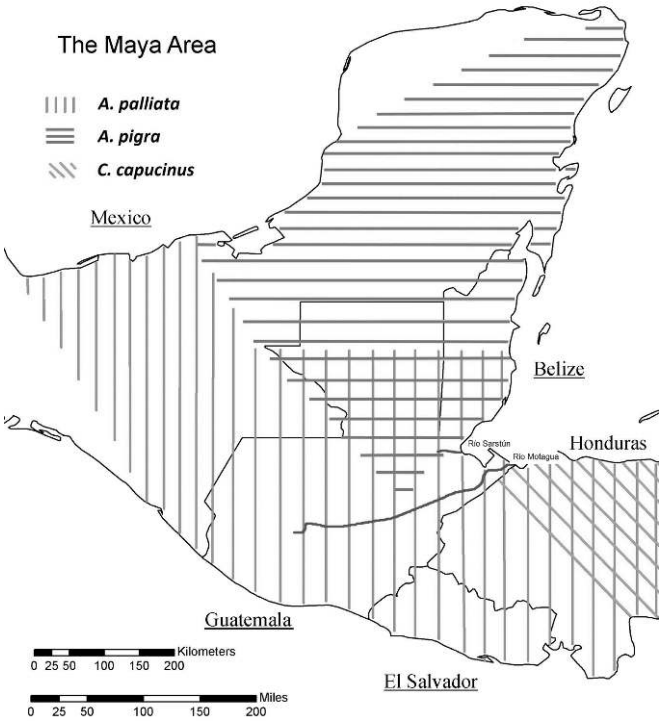
6 In this paper I revisit my original article (Baker 1992), again taking a four-field anthropological approach to re-interpret the iconography, considering how primatology can inform Maya archaeology. I will be comparing the content I collected in 1992 with more recent findings of Maya archaeologists, linguists, and iconographers. I also question the assumption that the name of Hunbatz, one of the fallen older brothers, should be the focal point of species identification. Instead, I think it is better to focus in on the term *k'oy* , which is what the fallen brothers and wooden people in the second creation were turned into, and thus spider monkeys may predominate in Maya ritual depictions of scribes and monkeys.

2 Modern distribution of monkeys in the Maya region

7 Coe (1978, 1989) stated that there are only three nonhuman primate species in the Maya region (Figure 1): Black howler monkeys (*Alouatta pigra)*, mantled howler monkeys (*Alouatta palliata*) and Geoffroyi's spider monkeys *(Ateles geoffroyi)*. It is well documented that *A. pigra* extends up into the Yucatan Peninsula through Belize and north-eastern

Guatemala and *A. palliata* exists from southern Mexico, through Central America and northern South America (Crockett & Eisenberg 1987; Emiliano and Cucina 2005; Estrada *et al.,* 2004; Fedigan *et al.,* 1998; Fedigan and Jack 2001; Munoz *et al.,* 2006; Rylands *et al.,* 2005). *A. geoffroyi* overlaps the combined distributions of *A. pigra* and *A. palliata* (Emiliano and Cucina 2005; Rylands *et al.,* 2005).

Figure1



Map of the Maya region locating *Alouatta pigra, Alouatta palliata* and *Cebus capucinus. Ateles geoffroyi* is located throughout the entire are represented.
Localisation sur une carte de la région Maya de Alouatta pigra, Alouatta palliata et Cebus capucinus. Les Ateles geoffroyi sont représentés sur l'ensemble du territoire.

8 There are verifiable records of white-faced capuchin monkeys, *Cebus capucinus*, in Honduras (Figure 1), well within the area encompassed by both modern and ancient Maya (McCarthy 1982, 1983; Hollister 1914, 1982). Archaeologist George Gordon (1898) described them in his account of excavations in the Ulúa Valley, Honduras, in which he described the very curious little white-faced monkey[s] in the nearby trees during his 1896-1902 excavations. Additionally, the Honduran parks around Tela and La Ceiba, including Laguna de los Micos, advertise white faced capuchins as frequently -sighted mammals and have been documented therein (see http://sites.wetlands.org/reports/ris/6HN002EN_FORMER_1993.pdf). John Stuart Buckley (1983) did his dissertation on capuchin monkeys at the Trujillo Farm site in Northern Honduras.

9 There are controversial reports of capuchins in Belize as well, primarily based on Hollister's 1914 account of pelts recovered in Belize in 1887 which are now housed at the Smithsonian Institution. It is unknown whether the skins came from indigenous monkeys or if they had been brought there from another location. Sightings of capuchins in Belize have been reported by Hubrecht (1986), Dahl (1984, 1987) and McCarthy (1982, 1993) but these have never been confirmed or replicated. The Temash and Sarstoon Delta Wildlife

Sanctuary (www.southernbelize.com/temash.html), a protected area in the southernmost region of Belize, advertises the presence of capuchin monkeys, but this has never been verified. Currently, there are no confirmed populations of capuchins living in Belize.

10 This is surprising to many primatologists studying capuchin monkeys (see Fragaszy *et al.,* 2004). There is general agreement that the forests of the Peten, in Guatemala, the Lacandon in Mexico and the Maya Mountains in Belize should support capuchins: the vegetation, elevations, temperatures and rainfall patterns are consistent with those seen where capuchins are known to thrive. Why are howlers and spiders seen in these areas, but not capuchins?

11 It may be that capuchins moved from South America more recently than spider and howler monkeys and thus encountered barriers not present during earlier migrations. Forest gaps between eastern and western Honduras, within El Salvador or between north and south Guatemala may have prevented capuchins from moving into these areas. Alternatively, the Montagua River in Guatemala and the Sarstun River in Belize may have been geographic barriers, preventing capuchins from traveling further north (Fragaszy *et al.,* 2004).

3 The archaeological record for monkeys in the Maya region

12 It is also possible that capuchins lived in these areas in the past and have become extirpated from Guatemala, Belize and southern Mexico. The archaeological record has the potential to inform us about the paleodistributions of nonhuman primates in the Maya region, but it proves to be problematic. Preservation conditions for faunal remains are poor, so the available record is, at best, limited (Chase *et al.,* 2004). This problem has been exacerbated by the focus on structures and elite artifacts such as polychrome ceramics and jade (Chase *et al.,* 2004; Pohl 1985); most Maya archaeologists are not interested in collecting, sorting and analyzing faunal remains. Kitty Emery (2004) notes that there are few zooarchaeologists who are appropriately trained to work in the Maya region, and there is a lack of appropriate comparative collections (Wake 2002) and limited sampling strategies available to those who are well trained (Chase *et al.,* 2004).

13 Reviewing the record in search of remains of identified monkeys is disappointing. The vast majority of identified remains of large mammals are those of deer, armadillos, dogs and possums (Emery 2004, 2003; Carr and Fradkin 2008; Freiwald 2010; Götz 2008; Hamblin 1984; Masson and Peraza Lope 2008). Coupled with the problem that remains are not always completely or expertly identified (Healy 1983; Pohl 1983), modern distributions of animals are often assumed. Maya archaeologists are often unaware that capuchins are currently present, at least in the southern Maya region (Baker 1992).

14 In my original article, there were three howler, one spider and four possible howler monkeys reported in the archaeological record. Combining these with those discovered in my recent literature review there are, among the vast amounts of zooarchaeological remains recovered and identified, eleven monkeys. There is one verified howler monkey (*Alouatta* sp.) and there are four additional possible howler monkey skeletons that have been identified at the Selín Farm site in northern Honduras (Henderson and Joyce 2004; Healy 1983); two howler monkeys were found at the site of Seibal, Guatemala (Pohl 1985, 1990), and a single howler monkey skeleton was recorded in a Belize Valley settlement

survey (Willey *et al.,* 1965). One set of spider monkey (*Ateles sp.)* remains have been identified by Moholy-Nagy (2004) at Tikal, Guatemala, and one spider monkey individual was identified at Seibal, Guatemala (Pohl 1985, 1990).

15 A written personal communication from archaeologist Joseph Ball in 1991 (see Baker 1992) described a mandible of a capuchin monkey (*Cebus)* found at the Buenavista del Cayo site in the upper Belize Valley. The mandible was found in a pipe drain extending from elite residential quarters. Obsidian hydration dating placed the deposit in the Late Classic period within an estimated range of A.D. 850-950. The information pertaining to this mandible, however, remains informally analyzed and unpublished (Ball, personal communication 2013).

4 Maya trade networks

16 It has been demonstrated that by A.D. 250 - 550 and possibly earlier, trade routes connected lower Central America and Mesoamerica. By the Late Classic (A.D. 550 - 900) and Early Postclassic (A.D. 900 - 1100) trade networks were establish linking Quirigua, the Lower Montagua Valley, and the Ulúa Valley with southern Honduras, Nicaragua, and Costa Rica, exchanging goods such as minerals, cacao, salt and spondylus shells (Hamblin 1984; Hirth 1988; Joyce 1988; Sharer 1988; Schaffer 1992; Thorton 2011).

17 It is thus conceivable that, if not indigenous to the northern Maya region, capuchin monkeys may have been traded in from further south as was done with other mammals and birds (Masson 1999) which were used in ceremonies, in feasting and for personal adornment (Emery 2003). The (illegal) pet trade network today unfortunately includes capuchin monkeys and there is considerable demand for them as captive-reared pets. The Cuna people of Panama are known to have included baby white-faced capuchins and spider monkeys as a source of money in the pet-trade business and both species are hunted as well for food (Bennett 1962). It is worth noting that, although they are present, the Cuna do not eat or collect howler monkeys for pets (Bennett 1962).

18 As monkeys are regarded as cute, engaging animals that might be kept as pets today, it is reasonable to imagine them to be so regarded in the past, and there is evidence which supports such supposition: Spider monkeys were traded from Mesoamerica and South America to the Caribbean Islands (Bruner and Cucina 2005) and at the archaeological site Bonaire, Netherlands Antilles, Newsom and Wing (2004) reported the major part of a skeleton of a young capuchin monkey, which was probably traded from the Venezuelan mainland. They unearthed 10 unmodified bones and asserted the monkey was very likely a pet from Prehispanic time.

5 Linguistic data

19 Linguistic data are an additional line of inquiry that may inform us about the presence of capuchin monkeys in the Maya region; if the Maya were aware of capuchin monkeys, they should have had a referent for them. Coe (1978, 1989) indicates that the name “Hunbatz” is most properly translated as “One Howler Monkey” and “Hunchouén” translates as “One Artisan” or “One Spider Monkey”. This should be easy to assess by simply reviewing Mayan dictionaries, searching for Mayan terms for monkeys and their English and Spanish equivalents (but see below). As seen in Tables I and II, according to the Mayan

dictionaries I surveyed, *ba'atz* and its cognates are generally translated as either generic monkey or specifically as a howler monkey (see also Stross 2008). The term is also defined as rascal, *saraguate*, *aulluador* (crier), black monkey, bearded monkey and monkey from El Monte Gueguecho in Guatemala. According to Edmonson (1965), *ba'atz* is also a term used for spider monkeys.

Table I

Term	Translation	Language	Sources
baac	monkey	Yucatec	Tozzer and Allen 1910
baaq	mona, mono(a)	Cakchiquel	Coto 1983
bac	howler monkey	Chol	Attinasi 1973
	howler monkey	Tzeltal	Laughlin 1975
baats	howler monkey	Yucatec	Luna Kan 1945
baats'	Aullador [howler , crier]	Yucatec	Barrera Vasquez 1980
baatz	Zaraguate [zaragate: rascal?]	Mopan	Ulrich and Ulrich 1976
	spider monkey	Quiche	Edmonson 1965
badz	mono negro	Yucatec	Solis Alcalá 1949
	saraguato	Yucatec	Swadesh et al 1949
bats'	mono negro	Chol	Aulie and Aulie 1978
	saraguato	Tzeltal	Slocum and Gerdel 1980
bats	saraguato	Tzeltal	Hurley and Ruiz 1986
	mono negro grande barbado, saraguate	Yucatec	Barrera Vasquez 1980
batz	mono barbado	Cholti	Moran 1935
	mono de gueguecho [from El Gueguecho]	Cholti	Moran 1935
	mono	Kekchi	Sedat 1955
	mono, mico	Tzeltal	Ruz 1986
batz'	howler monkey	Tzeltal	Laughlin 1988
xbatz	mona	Quiche	Teletor 1959
maac	monkey	Chorti	Wisdom 1950
maas	monkey	Yucatec	Tozzer & Allen 1910
ma'as	monkey	Chorti	Wisdom 1950
maash	monkey	Yucatec	Luna Kan 1945
maax	monkey	Yucatec	Heath 1980
	mona	Yucatec	Perez 1898
	mono	Yucatec	Solis Alcalá 1949
	mono	Yucatec	Swadesh et al 1949
		Yucatec	Tozzer & Allen 1910
Ma'ax	mico araña	Mopan	Ulrich & Ulrich 1976
	mono	Yucatec	Barrera Vasquez 1980
mas	spider monkey	Chol	Attinasi 1973
	gorgojo [weevil dwarf]	Kekchi	Sedat 1955
	spider monkey	Tzeltal	Laughlin 1988
	howler monkey character of Chamula Carnival		

Linguistic compilation for the Mayan terms referring to monkeys.
Compilation linguistique des termes Maya se rapportant aux primates.

Table I (cont.)

Term	Translation	Language	Sources
max	mico mico mono long-tailed monkey simia gato mono (chango?) monkey	Chol Cholti Tzeltal Tzeltal Tzeltal Tzeltal Yucatec	Aulie & Aulie 1978 Moran 1935 Hurley & Ruiz 1986 Laughlin 1988 Ruz 1986 Slocum & Gerdel 1980 Luna Kan 1945
xmaax	mona	Yucatec	Solis Alcalá 1949
ljc'al max	mono araña	Chol	Aulie and Aulie 1978
C'ʌnc'ʌn max	Mico de noche	Chol	Aulie and Aulie 1978
u maac a ak'ap	night monkey	Chorti	Wisdom 1950
P'urem maac	small black monkey occasionally seen as a pet	Chorti	Wisdom 1950
ah maas	mona	Yucatec	Perez 1898 p 232
ah maax	monkey	Yucatec	Barrera Vasquez 1980
ix maax	mona	Yucatec	Perez 1898
ajma'ax	spider money capuchin monkey	Itzaj	Hofling & Tesucún 2000 Robertson et al 2007
K'oy	monkey, spider monkey	Kaqchikel	McKenna Brown et al 2010
coy	mico	Quiche	Teletor 1959
c'oy	mono	Quiche	Pontious 1980
joy	mico	Quiche	Teletor 1959
qoy	mono(a)	Cakchiquel	Coto 1983
q'oy	spider monkey	Quiche	Edmonson 1965
mico	gorgojo [weevil, dwarf]	Kekchi	Sedat 1955
xtuch	mono hembra, mona	Yucatec	Solis Alcalá 1949
Ch'oven	monkey	Quiche	Edmonson 1965
ixmai	mono, mico	Mam	Reynoso 1915
u k'ab che	mono	Quiche	Pontious 1980

Linguistic compilation for the Mayan terms referring to monkeys (continued and end).
Compilation linguistique des termes Maya se rapportant aux primates (suite et fin).

20 *Ma'ax* and its cognates are most often used to refer to generic monkeys, but can be used to refer to spider monkeys (Tables I and II). The term also refers to *gorgojo*, long tailed monkeys, funny monkey, cat, and the howler monkey characters of Chamula Carnival who wear hats made of howler monkey skins. *Ma'ax* is also modified in a number of ways (Tables I and II) and can refer to generic monkeys, spider monkeys, and night monkeys. Most interesting is the *Iztaj* Mayan term *ajma'ax* which translates as both spider monkey and capuchin monkey (Hofling and Tesucún 2000; Robertson *et al.,* 2007). The term *p'urem maac* is translated as "a small black monkey occasionally kept as a pet" (Wisdom 1950). It is likely that this term refers to capuchin monkeys, who are both small and black and often kept as pets, rather than howler or spider monkeys.

Table II

	Batz	Maax	Modified Maax	K'oy	xtuch	Ch'oven	ixmai	u k'ab che
Generic monkey	6	17	3	4	1	1	1	1
Howler monkey	5							
Bearded monkey [howler]	2							
Black monkey [howler]	1							
Spider monkey	1	3	2					
Mono grande (howler or spider)	1							
Long-tailed monkey [howler or spider]		1						
Capuchin			1					
Small black monkey kept as a pet (capuchin?)			1					
Mono gueguecho [geographic ref.]	1							
Zaraguate, Saraguate [rascal?]	5							
Gorgojo [funny]		1						
Gato		1						
Howler monkey character of Chamula Carnival		1						
Night monkey			5					

Linguistic data summary.
Résumé des données linguistiques.

21 The term *K'oy* is translated as both generic monkey and spider monkey (Tables I and II), and additional terms that are used to refer to monkeys include *xtuch*, *ch'oven*, *ixmai*, *mico* and *u k'ab che* (Tables I and II).

22 Surveying the dictionaries is problematic for several reasons. There are between 21 and 35 distinct Mayan languages, each with its own distinct vocabulary and meaning. It is unclear how precise the terms and translations are. While reviewing the dictionaries I found myself wondering about the specificity of the Mayan and Spanish. When asked, "what do you call that?", did the Maya offer specific or general definitions? And, when receiving information, did the lexicographer have general or more specific knowledge of the local flora and fauna? Either would impact the results and it may explain the predominance of referents for generic monkey, and there is no way for the reader to know which case applies.

23 Further complicating the issue is language shift. Dictionaries compiled during the 1900's may not be reflective of earlier Mayan language use and the linguistic context of meaning has likely shifted. Personal knowledge of monkey species and how people think about them is likely quite different today than 400-500 years ago, and thus more recent dictionaries may be less useful when trying to understand how the ancient Maya thought about their world. For example, at the site of Palenque (Chiapás, Mexico) today I have heard Mayan speakers refer to howler monkeys as *mono arañas* (spider monkeys) and they call spider monkeys *alluadores* (criers or howlers); the terms for the two monkeys have been reversed.

24 Finally, I think it worth considering that we have been focusing on the wrong term. The name Hunbatz can be translated to mean One Monkey or One Howler Monkey, thus Coe (1978, 1989) uses the name of this fallen brother to conclude that it is howler monkeys being depicted on Maya Vases and as the personified *k'in* glyph. However, it does not follow that the name of the brother refers to the type of monkey he became or to the depictions of monkeys on Maya ceramics. One of the younger brothers is named Xbalanqué, but no one imagines him to be half jaguar and half deer and he is not portrayed as such.

25 The **Popol Vuh** is consistent in referring to monkeys as *k'oy* (Christenson 2007, see also Braakhuis 1987). The wooden people created in the second creation became *k'oy* as did the fallen older brothers (Table III). I would suggest that perhaps this should be the focus of our attention: The wooden people and fallen older brothers became spider monkeys. If this were the case, one would expect spider monkeys, rather than howler monkeys, to predominate in monkey-scribe depictions on Late Classic funerary ceramics and as personifications of the day-glyph *K'in*.

Table III

Wooden people turned into monkeys

English	Quiche	Line
Said therefore these their descendent, The spider monkeys That are in forest today, These were their descendent	Xcha' k'ut are' retal, Ri**k'oy** K'o pa k'eche'lajwakamik, Are' xk'oje' wiretal	824

Hun Baa'tz and Hunchouén as monkeys

English	Quiche	Line
Then they pulled out therefore its end, their loincloths Merely also straightaway their tails now they became, Merely spider monkeys they appeared like now ..... They howled now, They chattered noisily now in its branches trees	Ta xkijurub'a' k'ut u tza'mkito'q. Xa pu ju su ki je' chi xuxik, Xa**k'oy**xkiwachib'ejchik ..... Kewojonchik, Kisilojchikchuq'ab' taq che'.	2853 2860

Grandmother's trial

English	Quiche	Line
Truly funny their faces The spider monkeys. Paunchy below their bellies, Naked below also at its edges their chests ..... They climbed up therefore hither, They would scamper wall. Very red their mouths, Foolish their faces, Puckered their mouths, Bushy their mouths. Their faces silly, They snort at them.	Qitzijtze'b'alkiwach Ri**k'oy**. Chixiririkxe' kipam, Chich'ilitaxe' pu chuchi' kik'u'x. ..... Xe'aq'ank'uuloq, Chukatanajtz'aq. Kaqruxruj u chi', Tak kiwach. Mutzuma'qki chi', Chik'imalki chi'. Ki wachmak'ama, Chikijoq'ijchike.	2946 2962

Sections of the **POPOL VUH** which describe the monkeys the wooden people and the fallen older brothers were turned into. The term k'oy is used consistently throughout. From Christenson, 2007
*Les entités du **POPOL VUH** qui décrivent les singes individus des bois et leurs frères plus agés. Le terme k'oy est utilisé systématiquement pour décrire les singes araignée. D'après Christenson, 2007.*

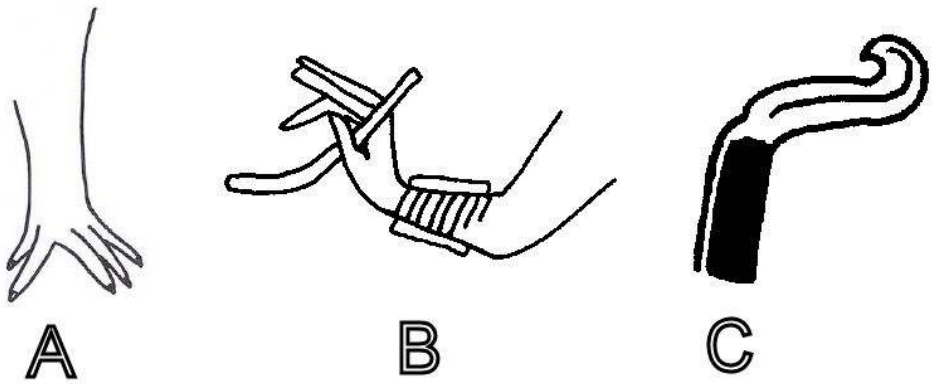
6 Morphology and behavior

26 Perhaps some of the most compelling data to consider are morphological and behavioral traits of the primate species in question. I am not a Maya archaeologist or iconographer; I am a primatologist and this is where I am most effective in the discussion. When teasing

apart which monkeys are being depicted on vases and as glyphs I think it is very important to know what traits distinguish the individual species.

27 Howler monkeys are the loudest and largest of New World primates. Both howler species show marked sexual dimorphism; males are larger, have larger teeth, and a pronounced beard. Howler monkeys also have the unusual hand adaptation of schizodactyly: the first two digits are opposed to the remaining three (Figure 2). They are also examples of sperm competition, wherein females are typically promiscuous breeders and males compete by producing large quantities of sperm. The males, therefore, have extremely large and distinctive testicles.

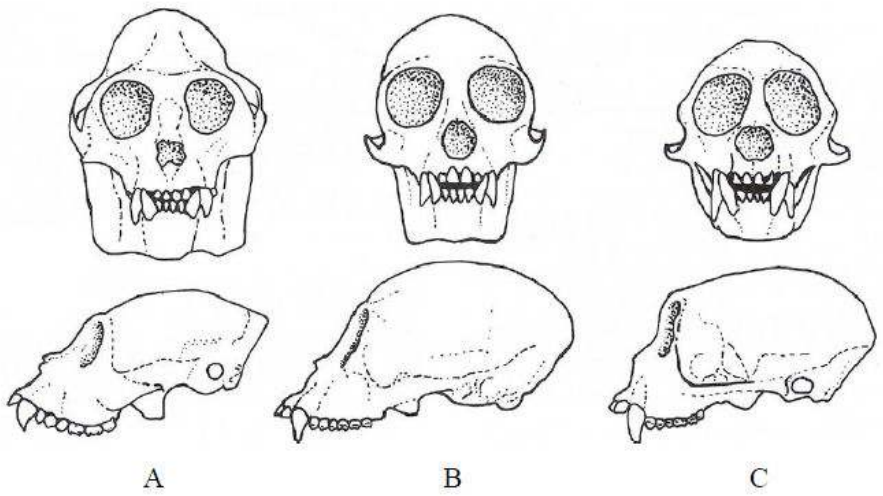
Figure 2



Comparative hands. A: The schizodactylous opposition seen in howler monkeys (From Baker 1992, Figure 2); B. Dextrous hand of a scribe (after Kerr 717); C: Hand of a spider monkey, note the lack of a thumb (after Kerr #7602).
Comparaison des mains. A: Opposition de type schizodactyle présente chez les singes hurleurs (Baker 1992, Figure 2.); B. main droite d'un scribe (après Kerr 717); C: La main d'un singe-araignée, noter l'absence de pouce (D'après Kerr # 7602).

28 *Alouatta pigra,* the black howler monkey, is completely black (both skin and fur), though some individuals have traces of brown. *A. pigra* is quite large: their body length is 52.1-63.9 cm and has a tail length of 59.0-69.0 cm. Females weigh 6.43 kg and males weigh 11.35 kg; female canine length is 6.2 mm and that of males is 7.6 mm. *Alouatta palliata*, the mantled howler monkeys, are somewhat smaller than *A. pigra*. Their body size ranges from 52.0- 56.1 cm and their tails are 58.3 - 60.9 cm. They weigh 5.5 -7.8 kg. The canines of females project 2.6 mm beyond the tooth row and those of males project 5.1 mm (Figure 3). Their skin and fur are mostly black, with a side mantle of yellow-red fringe. The diet of both howler monkey species is predominantly leaves supplemented with fruit and flowers. For this reason, howler monkeys are typically lethargic; rest accounts for about 66-74% of their activity budget followed by feeding and traveling.

Figure 3



Comparative skull morphology: (a) howler monkey, (b) spider monkey and (c) capuchin monkey. From Baker 1992, Figure 1.
Morphologie comparée du crane: (a) singe hurleur, (b) singe araignée et (c) singe capucin. D'après Baker 1992, Figure 1.

29 Distinctive characteristics to be looking for in Maya imagery of howler monkeys include schizodacylous hand opposition, beards, lethargy, howling or screaming, large dangling testicles and possibly a mantle of side fur (Table IV).

Table IV

Species	Body cm	Tail cm	Weight kg	canine projection	Color	Unique Characteristics
Alouatta pigra	52.1 - 63.9	59.0 -69.0	6.43 - 11.35	---	All black, some have traces of brown.	Schizodactylous opposition Beard in males Lethargic Loud howling Large testicles A. palliata has side mantle of yellow-red fringe
Alouatta palliata	52.0 - 56.1	58.3 -60.9	5.5 - 7.8	2.6 - 5.1	Black with side mantle of yellow-red fringe	
Ateles geoffroyi	38.0 - 63.0	63.5 - 84	7.7-8.26	2.6 - 5.4	Black, brown, or reddish upper fur and dorsal fur, often with unpigmented skin at eyes and muzzle. Dark arms and feet, paler ventrum.	Vestigial thumb Very long limbs and tail Bulging stomach. Unpigmented skin at eyes and muzzle Brachiation Elongated clitoral hood
Cebus capucinus	33.5 - 45.3	35.0 -55.1	2.4-3.86	2.4 - 7.7	Black body, buffy colored head, chest and forearms. Face is pale. Black Acap@ of fur on head	Small Face is pale Manipulative and dexterous hands Tool users Completely furred, prehensile tail.

Comparative morphology and behavior of nonhuman primate species located within the Maya region. *Morphologie et comportement comparés des primates non humains localisés dans la région géogaphique Maya.*

30 *Ateles geoffroyi* bodies range from 38 - 63 cm, with tails extending 63.5-84 cm; they weigh 7.7-8.26 kg. Canine tooth projection for females and males is 2.6 and 5.4 respectively (Figure 3). *A. geoffroyi* has black, brown, or reddish upper and dorsal fur, often with unpigmented skin at eyes and muzzle. They have darker arms and feet, and a paler ventrum. The fur on their heads sweeps forward, giving them an appearance of a balding man's comb-forward. They have very long limbs and tail, and a distinctively large and bulging stomach. They are primarily brachiators and possess long thin fingers and a vestigial thumb. Females have an elongated clitoral hood that is frequently mistaken for a male's penis. Their diet is focused on fruit, and, as such they are more active than howlers: they spend only 54% of their time at rest, followed by feeding, traveling, and interacting.

31 Distinctive characteristics to be looking for in Maya imagery of spider monkeys include the absence of a thumb, very long, skinny limbs and tails, a large bulging stomach, unpigmented skin around the eyes and muzzle, brachiation and possibly an elongated clitoral hood (Table IV).

32 White-faced capuchin monkeys *Cebus capucinus* are the smallest of the monkeys found in the Maya region. Their bodies are 33.5-45.3 cm long and their tails are 35.0-50.1 cm long. They weigh 2.66 - 3.86 kg. They have black bodies with a buff-colored head, chest and forearms. The face is pale pink and they have a black "cap" of fur on their head. Although all three species have prehensile tails, the capuchin tail is shorter and completely furred.

They have more robust canines than *Alouatta* and *Ateles* (Anapol and Lee 1994); the canine projection of males and females is 2.4 - 7.7 mm (Figure 3).

33 Flexibility and adaptability typify capuchin monkeys (Fragaszy *et al.,* 2004; Robinson and Janson 1987). The bulk of their diet is focused on insects and ripe fruit (65%). However, they also consume flowers, nectar, some leaves, nuts, and a wide variety of animal prey including small reptiles and amphibians, shell fish including clams, mussels, crabs and oysters; snails, birds (both fledglings and adults) and small mammals including mice, rats, squirrels, bats, and coati pups (Baker 1998; Buckley 1983; Fragaszy *et al.,* 2004). They are extremely active, resting only 12 - 25% of their day. All capuchins are known for their manipulative or destructive foraging behavior (Fragaszy *et al.,* 2004; Izawa and Mizuno 1977;Terborgh 1983). When searching for insects, they dig out accumulated debris, open leaves, and peel off bark, and break open sticks and other vegetation (Baker 1998; Chevalier-Skolnikoff 1989; Fedigan 1990; Visalberghi 1990; Visalberghi and Trinca 1989; Westergaard and Fragaszy 1987). They are also known to make and use tools to access food items they would otherwise not be able to consume (Anderson 1990; Chevalier-Skolnikoff 1989; Liu *et al.,* 2006).

34 Distinctive characteristics to be looking for in Maya imagery of capuchin monkeys include a smaller body, a cap on the head, a pale face, a shorter furred tail and excellent prehension with tool use.

7 The monkeys and scribes in art

35 I looked at depictions of monkeys on Maya ceramics, restricting my analysis to vases included in the Maya Vase Data Base (http://www.mayavase.com/). Utilizing the search function, I identified vases with monkeys and monkey scribes and looked for distinctive physical and behavioral characteristics as listed above. I divided the images into types: howler monkeys and possible howler monkeys, spider monkeys and possible spider monkeys, capuchin monkeys and possible capuchins, generic monkeys, highly stylized or anthropomorphic monkeys, and things that are called monkeys in the literature but which I do not recognize as monkeys. If there was more than one monkey on a vase, I list each individual representation. For example, Kerr Vase #8357 is listed four times because there are four individual monkeys on this vase (Table V).

Table V

Spider	Spider?	Howler	Howler?	Capuchin	Capuchin?	Generic	Stylized or Anthropomorphic	?????
K1789	K1181		K505		K626	K774	K501	K771
K1789	K1203		K1211		**K954**	K774	**K760**	K4634
K1789	K1491		K4992		K1558	K1208	**K760**	K4634
K3637	K1809		K4992		K5185	K2592	K774	K4634
K3637	K1811		K8740		K6547	K2592	**K1180**	K4634
K4691	K2010				K8829	K3235	**K1225**	K5509
K4691	K2249					K3838	**K1225**	K5652
K5185	K2249					K3838	**K1491**	K7007
K5185	K3038					K4096	K1558	K8642
K5622	K3060					K4599	K1558	K8642
K5622	K3154					K4920	**K2220**	K8642
K5622	K3433					K4947	**K2220**	
K6214	K3433					K5744	**K3413**	
K9013	K5010					K6063	**K3413**	
K9013	K5070					K6063	K4963	
	K7602					K6063	K6223	
	K7993					K6063	K6738	
	K8234					K6312	K9180	
	K8234					K6765		
	K8234					K6765		
	K8733					K7007		
	K8855					K7152		
	K8855					K7454		
						K7456		
						K7525		
						K8017		
						K8357		
						K8357		
						K8357		
						K8357		
						K8575		
						K8575		
						K8575		
						K8640		
						K9064		
N = 13	N = 25	N = 0	N = 5	N = 0	N = 6	N = 35	N = 18	N = 11
Spider = 38 0.361%		Howler = 5 0.047%		Capuchin = 6 0.057%		N = 27 0.257%	N = 18 0.171%	N = 11 0.104%
N = 105 100%								

Monkeys depicted on Maya Vases. Survey of monkeys represented on vases in the Kerr database. Each number represents a single monkey; numbers listed more than once refer to more than one monkey on a given vase. Vase numbers in bold are monkey scribes.
Singes représentés sur les Vases Maya. Vue d'ensemble des singes représentés sur les vases dans la base de données Kerr. Chaque numéro représente un singe; les numéros indiqués plus d'une fois se réfèrent à plus d'un singe sur un vase donné. Les numéros des Vases, en gras, indiquent des "singes" scribes.

36 Some traits were more useful than others. Hand morphology, especially for identifying spider monkeys and possibly capuchin monkeys was effective (Figure 2). Many of the vases depict beautifully rendered spider monkey hands which lack thumbs (Figure 2; see also Kerr Vase #1789; Kerr Vase #9103). Some of the hands were also highly dexterous in appearance, bringing to mind capuchins stripping the bark off small sticks to eat the cambium or using them as probes (Figure 2; see also Kerr Vase #626; Kerr Vase #1491; Kerr Vase #1558; Kerr Vase #3413).

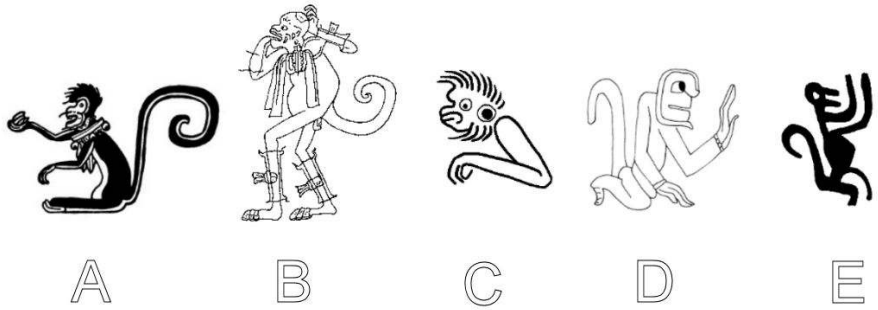
37 The overall appearance of spider monkey bodies, the long skinny limbs, long tail and bulging belly, were also quite accurate in depictions of monkeys (Figure 4A; see also Kerr Vase #1181; Kerr Vase #1789; Kerr 6214; Kerr Vase #9103).

38 Other traits were somewhat ambiguous. Some of the monkeys had comb-forwards which greatly resemble the fur on spider monkeys heads (Kerr Vase #4691 Kerr Vase #6547), but which might also be the black cap of the capuchin monkeys, while others were less clear, suggesting a capuchin or spider monkey (Kerr Vase #6312; Kerr Vase #8017).

39 There were very few monkeys with beards (Kerr Vase #8740) and two with testicles resembling those of howler monkeys (Figure 4B; see also Kerr Vase #5070). Skin and pelage color was not generally useful, there were no monkeys with a mantle of fur as seen on *A. palliata*, however there was one vase with two completely black monkeys (Kerr Vase #4992). None of the monkeys were ever depicted howling or crying (a highly distinctive

trait of howler monkeys) and most of the monkeys depicted were active rather than resting or lethargic.

Figure 4



A. Beautifully rendered spider monkey represented on Kerr 1789 (From Baker 1992); B. Possible howler monkey (after Kerr Vase #1211); C. Example of a generic monkey depicted on a Maya Vase (after Kerr Vase #6547); D. Highly stylized and anthropomorphized monkey (after Kerr Vase # 8642); E. Example of an image which is identified in the literature as a monkey, but which does not resemble a monkey (after Kerr Vase # 4634).
A. Un singe araignée magnifiquement rendu et représenté dans Kerr, 1789 (D'après Baker 1992); B. Probablement un singe hurleur (D'après Kerr, Vase # 1211); C. Exemple d'un singe générique représenté sur un vase Maya (Kerr, Vase # 6547); D. Un singe anthropomorphe hautement stylisé (Kerr, Vase # 8642); E. Exemple d'une image qui est identifié dans la littérature comme un singe, mais qui ne ressemble pas à un singe (Kerr, Vase # 4634).

40 As seen in Table V, spider monkeys are very well represented on Maya ceramics, 36.1% of the monkeys were spider and possible spider monkeys (Figure 4A). Assuming the wooden people and fallen brothers of the **Popol Vuh** were turned into spider monkeys, this is not surprising. Generic monkeys were also well represented on the ceramics, comprising 25.7% of the images (Figure 4C). Howler monkeys are poorly represented: I could not find images that were unequivocally howler monkeys, and I was only able to identify five possible howler monkeys (Figure 4B; see also Kerr Vase #505; Kerr Vase #4992; Kerr Vase #8740), only 4.7% of the depicted monkeys. I did find six monkeys that may be capuchins (Figure 5; see also Vase #1558; Kerr Vase #6547; Kerr Vase #8829), 5.7% of the depictions. There were also many stylized or anthropomorphized monkeys (Figure 4D, see also Kerr Vase#2220; Kerr Vase #6738) totaling 17.1% of the representations and finally several odd looking monkey-like things (Kerr Vase #771; Kerr Vase #5652), and some things I couldn't identify comprising 10.4% of the images (Figure 4E, see also Kerr Vase #4634).

Figure 5

Possible capuchin monkeys (after Kerr Vase #626; Kerr Vase #954 and Kerr Vase #1558).
Vraisemblablement des singes capuchins (D'après Kerr Vase #626; Vase #954 and Vase #1558).

41 The depictions of scribes are also highly variable. Some look like monkeys (Kerr Vase #626) and others are very highly stylized and/or anthropomorphic (Kerr Vase #1225; Kerr Vase #3413). When looking for beards on monkey-scribes, I found that only 4 of 25 monkey-man scribes have beards (see also Robicsek and Hale 1981, vessels 63, 64, 66, 67, 68 and Figures 29A-C and 33A). This is surprising and seems an important but missing attribute if it is truly howler monkeys that represent scribes. One the other hand, most scribes are shown with writing quills, which readily brings to mind the dexterous hands and use of sticks by capuchins.

8 Summary and conclusion

42 There are three genera of nonhuman primates currently residing in the Maya area, *Alouatta*, *Ateles* and *Cebus*. Howler and spider monkeys are located throughout the region and, today, capuchin monkeys are restricted to the southern-most Maya region of Honduras. Capuchins may have had a wider geographic distribution in the past or they may have been traded into the northern Maya area. This remains an issue for zooarchaeologists who recognize that there are insufficient numbers of well-trained practitioners, and that better sampling methods and more robust comparative collections for analysis are needed (Chase *et al.,* 2004; Emery 2004; Pohl 1983; Wake 2002).

43 The linguistic data are problematic because of the potential of lack of specificity by the information gatherer and/or provider, as well as language drift. I think the most significant linguistic issue may be that we have been focusing on the wrong terms. *K'o*y, is the term used in the **Popol Vuh** for the kind of monkey the fallen brothers became, Hunbatz is simply an individual's name. *K'oy* thus seems the more appropriate term for understanding the monkey depictions. This assertion is supported by the preference for spider over howler monkeys (Baker 1992; Bruner and Cucina 2005) and the predominance of spider monkeys represented on Maya ceremonial vases.

44 That the majority of depictions of monkeys on Maya vases are either spider monkeys or generic monkeys is not a surprise when considering how the Maya may regard each primate species. Howler monkeys are generally lethargic and loud and they are rarely kept as pets. Spider monkeys are more active, graceful, and curious, and they are more frequently kept as pets (see also Bruner and Cucina 2005). It seems likely that painters of

the Maya polychrome vases, who would have been among the elite, would have direct experience with monkeys in and around the royal courts rather than monkeys in the forests, and that the monkeys kept around the living structures would have been spider monkeys or possibly capuchin monkeys.

45 Morphological and behavioral data can be used for identifying some animals depicted in Maya iconography and art. In this particular case primatologists can play an important role in informing Maya archaeologists, epigraphers and iconographers: we may not be as familiar with the Maya and their (pre)history, but we do know about monkeys in the Maya region. I look forward to more integrative, ethnoprimatological research in this area, drawing on the human-nonhuman primate interface (Fuentes and Hockings 2010). In this respect there is a paucity of ethnographic data focusing on how the modern Maya think about the monkeys in their forests.

46 It is curious that there are so few monkey bones in the archaeological record, especially because monkeys are and have been culturally important: they are a recurring theme in the Quiche Maya creation myth which recognizes monkeys as their ancestors, there are folktales and ceremonial dances in which monkeys are the central players, they are the patron gods of scribes, artisans, artists and seers, and they are likely regarded as animal spirits of the Maya (Bruner and Cucina 2005; Santos-Fita *et al.,* 2012). It seems quite likely that the ancient Maya would have eaten monkeys, as is done today and indicating a preference to spider monkey meat over that of howler monkeys (Bruner and Cucina 2005; Santos-Fita *et al.,* 2012), certainly they were present in the forested areas and possibly kept as pets in the elite courts. The Maya keep the bones of important animals in caves for ritual uses but, to date, there are no monkeys in these records (Brown 2005; Emery 2004; Emery and Brown 2012; Pohl 1983).

47 Taking an ethnoprimatological and holistic approach is necessary to resolve this puzzle. While the archaeological record is weak and unable to resolve whether or not capuchin monkeys resided further north in the Maya region, the evidence for their trade is compelling: since the Maya traded for other animals, and since capuchins were traded as pets further south, it seems plausible that capuchins may have been traded to the northern Maya region as well. The linguistic data are powerful in that they demonstrate awareness of capuchin monkeys in the naming of them. The morphological and behavioral data are perhaps the most significant data. Hunbatz and Hunchouén became the patron gods of musicians, singers, dancers, carvers, painters and craftsmen. There are images which very much resemble capuchin monkeys represented as scribes on Maya vases. The older brothers and monkey scribes are depicted holding styluses and actively engaged in writing. Such images are very reminiscent of the manual dexterity and foraging techniques of capuchin monkeys.

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NOTES

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would not know as much as I do about capuchin monkeys. I declare I have no competing interests in this article.

ABSTRACTS

Two genera of nonhuman primates, howler monkeys (*Alouatta palliata* and *A. pigra*) and spider monkeys (*Ateles geoffroyi*) currently reside throughout the area inhabited by the modern Maya. Michael Coe (1978, 1989) suggested that the Classic Maya (A.D. 300-900) associated these monkeys, especially howlers, with the arts exemplified in the Quiche Maya creation myth, the Popol Vuh, and in depictions of monkey-men scribes on Late Classic (A.D. 550-900) ceramics. Originally refuted by Baker (1992), this paper reevaluates the evidence from both papers, taking an ethnoprimatological, four-field approach and integrating content from cultural, biological, linguistic and archaeological anthropology to discuss evidence that capuchin monkeys *(Cebus capucinus*) were also found within the Maya region in ancient times. It is proposed, based on interspecific comparison of morphological and behavioral characteristics and linguistic data, that capuchin monkeys are also represented in depictions of monkey scribes. Although much of the previous literature has focused on the name Hunbatz to determine which monkeys are being represented, it is suggested herein that the term *k'oy* should be used instead.

Deux genres de primates non humains , les singes hurleurs (*Alouatta palliata* et *A. pigra*) et les singes araignées (*Ateles geoffroyi*) résident actuellement dans toute la zone habitée par les Mayas modernes. Michael Coe (1978 , 1989) a suggéré que la civilisation Maya classique (300-900 av. J.-C) associait ces primates, les singes hurleurs en particulier, aux représentations artistiques telles qu'illustrées dans le mythe de la création Quiche Maya , le Popol Vuh, et dans les représentations des hommes-singes scribes, représentées sur les céramiques classiques tardives (550-900 av. J.-C). Cet article réévalue les éléments de preuve, déjà contestés par Baker (1992), des deux documents de M Coe. Notre article adopte une approche de terrain éthnoprimatologique à quatre niveaux. Elle intègre les contenus de l'anthropologie culturelle , biologique , linguistique et archéologique afin de discuter les preuves que les singes capucins (*Cebus capucinus*) étaient bien présents dans la région Maya aux temps anciens. Nous proposons, à partir de comparaisons interspécifiques de caractéristiques morphologiques et comportementales et de données linguistiques, que les singes capucins sont bien dans les représentations des "singes" scribes. Bien que la plupart de la littérature précédente se soit focalisée sur le terme Hunbatz pour déterminer lesquels des singes étaient représentés, nous suggérons ici que le terme *k'oy* devrait être utilisé en remplacement.

INDEX

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A place holder: the social sciences of monkeys and apes

Un lieu en friche : les sciences sociales des primates non humains

Véronique Servais

1 Introduction

1 Because of the extreme polarization of the nature/culture duality which has widened the gap between natural and social sciences (cf. Kaufmann and Cordonnier, 2011; Whitehouse, 2001; De Fornel and Lemieux, 2007; Ingold, 1990; 2003; Guillo, 2012) it has been convenient to assign the study of all the characteristics of non-human animals to natural sciences. They are considered to have neither an authentic society (absence of norms, taboos, intersubjectivity etc.), nor a real culture, and even though primatologists today use the term "culture", it must be recognized that the notion itself is often explained in terms of behavior or biology. Animal behavior, therefore, is considered as entirely the product of biology. In the absence of an alternative, the theory of evolution is the unique explanation of social behavior, which easily leads to the conclusion that social behavior is the product of selection and is genetically determined. This situation leads to a systematic overestimation of the role of biology, and selection and genes in particular, in the determination of social behavior in primates. This in turn has repercussions for mankind, when an evolutionary approach to behavior is concerned, suggesting that the biological component of behavior is overestimated as well. It must not be forgotten that social behavior involves another level of determination: that of social systems themselves. Of course these systems are partially determined by the ecological environment, but individuals who, by the impact of their actions, construct social relationships also produce them. Social relationships are not - or are not only – abstract structures reconstructed by researchers. They also constitute the emotional environment in which individuals grow and develop as well as the context which gives meaning to their signals. Although somewhat intangible, social relationships are constructed by

individuals endowed with emotions and specific cognitive and communicative skills. These relationships produce configurations that become autonomous and within which a part of individual cognition is contained. Taking account of this strictly social aspect of the explanation requires the serious application of social sciences to primatology. Evidently, a way to do this needs to be found, but doing so should make it possible to specify and better identify what, in terms of social communication and behavior, comes under the area of biological determination (and therefore genetic determination) and which stems from individual learning, from the network of relationships that pre-dates individuals and possible local affective cultures. Restoring an explicative autonomy to the structures that connect individuals should both limit evolutionary inflation in the assessment of social behavior and make it possible to empirically research the connection points between the biological and the social.

2 A place without a name

2 Despite repeated attempts, neither biology nor cognitive ethology has satisfactorily been able to offer an explanation for a certain number of observations linked to social behavior, notably among apes. The reason for this failure is partly due to the fact that their social skills are not present as such inside individuals, but partially in situations. The example below serves to clarify this. Zoos are often confronted by the problem of female gorillas, chimpanzees or orangutangs that are incapable of caring for their offspring correctly. The negligence or incompetence is so pronounced that it can cause the death of the infant without external help. To remedy the problem, vitamins are given to the mother, an attempt is made to lower her stress levels (caused for the most part by the infant herself and the fact that the mother doesn't know how to deal with her), or an attempt is made to teach the mother how to care for the infant. For example, she is shown how to give the child a bottle, with only limited success. All these "solutions" presuppose that the origin of the problem is to be found somewhere "within" the mother, in her biology or cognition. However, we can alternatively consider that the skills neccessary for taking care of the infant are not to be entirely found "within" the mother, either biologically or even cognitively, but are precisely distributed among a functioning social group (Hutchins, 1991). Once the integrity of the group and the links that maintain and update knowledge from generation to generation are broken, these skills are difficult to restore. What is particularly interesting in this example is the fact that this knowledge and skill, which are crucial for the *survival* of the species, are thus "placed" in an order of reality that must be called social as it is neither strictly biological nor strictly psychological. This order of reality has a kind of autonomy in relation to individual biological and psychological determinations and partly constitutes the evolutionary environment of the species. Although it does so somewhat crudely, this example shows where biology fails and suggests that there is a limit to what biology is capable of explaining given its own conceptual tools. The areas for study that exist beyond these limits are left in the wilderness so to speak, and are abandoned to social science. Should social sciences refuse to take an interest in these areas simply because doing so would involve a radical overhaul of their methods and identity, and continue to limit themselves strictly to the study of human beings? I do not believe that they should. The sociology of primates will certainly be different to human sociology. Perhaps the sociology of primates may not even be "real" sociology but it is certain that the phenomenon alluded to in the

example cited above belongs neither to the realm of biology nor psychology, and it appears logical that social sciences should take an interest in this unnamed area. Social sciences would certainly be transformed during this process. But it wouldn't necessarily be prejudicial to them. I believe that, on the contrary, by cultivating an interest in this new field, social sciences would be really challenged to reconsider their objects, renew their points of view and increase their understanding of human societies.

3 Social skills in situation

3 The second point of my discussion takes an in-depth view of the problem of the decontextualization of social cognition in primatology. Decontextualizing means isolating skills from the interactive context in which they become current and thus transforming social skills which are linked to a situation into independent cognitive skills *located in the minds* of individuals (cf. Wieder, 1980, in particular). What a certain number of studies on social cognition show, if we agree to read them from this point of view, is that social competence is not totally transferable and that a part of social cognition is recorded in the structures that link individuals to each other. Indeed, the experiments which I will briefly give an account of here show that when the interactive fabric that allows chimpanzees to give meaning to the social situation and to act while being part of a situation is broken, for example by an experimental method which aims to identify "pure" cognition free from all contingencies, chimpanzees "lose" certain cognitive skills which they actually exhibit in real life. I will concentrate on two types of work here: studies which have attempted to show the existence of a calculated reciprocity ("win-win") in chimpanzees and orangutans (de Waal, 1997; Chapais, 2006; Schino, 2007; Melis *et al*., 2006b; Melis *et al*., 2008; Melis *et al*., 2010), and studies which have focused on cooperation and the way this is linked to food tolerance in *Panidae* (Melis *et al*., 2006; Melis *et al*, 2009; Hare *et al*., 2007; Jaeggi *et al*., 2010).

4 A well-known difficulty with the theory of evolution is that it has difficulty explaining altruism when this is not directed toward relatives. And yet, monkeys and apes show a lot of altruistic and cooperative behavior (Packer, 1977; Chalmeau and Gallo, 1995; Clutton-Brock, 2009). In order for this altruism to be explained by Triver's theory of reciprocal altruism, it would be neccessary for individuals to be capable of keeping an account of favors given and received, and of detecting "cheats". A number of studies have been completed in order to establish whether chimpanzees, orangutangs, capuchins and several species of macaques are capable of "calculated reciprocity" (Seyfarth and Cheyney, 1984; de Waal, 1997; 2000; Brosnan *et al*, 2006; Brosnan *et al*, 2009, Hauser *et al*, 2003; Pelé *et al*., 2010; Dufour *et al*.., 2009; Koyama *et al*., 2006). With regard to chimpanzees, the results are contradictory (Schino, 2007) and actually depend on the study method: experimental versus observation in a socially valid environment. When placed in experimental situations, chimpanzees do not show a preference for helping a fellow-creature who previously helped them (Melis *et al*., 2008), and yet, if we observe who shares food with whom within a group, we see that chimpanzees show a preference for sharing with another chimp who had groomed them during the preceding few hours (de Waal, 1997). Different theories have been offered to explain this phenomenon but primatologists do not seem to go far enough to reach the obvious conclusion: the limitations observed in experimental situations are not of a cognitive nature but are social or emotional. It is not that chimpanzees are not capable, cognitively of resolving a

calculated reciprocal task ("I give or I come to the assistance of someone who has helped me in the past"), because they do this every day. It is rather the case that experimental situations prevent them from doing so by matching them with randomly chosen fellow-creatures. In this way the social and relational variables are neutralized and chimpanzees are placed in situations where *only decontextualized calculation* (cognitive calculation) allows them to make choices. The inability of chimpanzees to resolve this task is more a reflection of the inability to build a relationship based on "pure" exchange, in the absence of political or emotional issues which would give meaning to the situation. It seems therefore that only part of reciprocity is based on the cognitive competence of an individual, the other part depending on information distributed in the building of relationships. In other words, it is a mistake to place the entire strategy of "calculated reciprocity" in the head of individuals, and then draw evolution-based conclusions about the way such a "strategy" was able to be selected. A large part of the definition of the situation is supported *by the social situation itself,* and is not represented as such in the minds of chimpanzees. As individuals of flesh and blood, dominated by emotions and located at a particular point in the social network, they can only have a partial view and a limited awareness of this group. To believe that chimpanzees have the same thing in their minds as the researcher needs to have in his in order to understand their behavior is to commit what the sociologist Pierre Bourdieu called the "intellectualist bias" (Bourdieu and Wacquant, 1992): this involves putting into the heads of the participants what we need in order to explain their behavior (strategies, intentions, etc.). But it is evident that the participants, whether animal or human, as actors *involved in a situation*, clearly have a very different vision to that of the researcher who is observing from a position of detachment. In order to have a clearer vision of what, as part of a strategy for example, was able to be selected by evolution and that which results from the situation, it is important to recontextualise behavior and resituate it in the embodied logic of the participants. This approach does not exclude all biological determinations of behavior but raises the question as to the place where the determining factors act by virtue of their nature and the way they are included in systems of social logic which go beyond them and which they still contribute to organizing.

5 It is ironic that it is the primates themselves who, by their failures, remind the researchers that cooperation or reciprocity are not "simple" cognitive skills but skills that take place in individuals who are emotionally involved in situations. It is probable that this applies to other social or perceptual skills and that many of these are partly determined by the situation. That is to say that their identification must be accompanied by a detailed description of the social situation to avoid the risk of overestimating the importance of biological determinism in social behavior.

6 Experiments on cooperation and its links to food tolerance offer a good example of the connection between a given biological fact, individual learning and what could be called local emotional cultures within a determined group. Melis *et al.* (2006a) tested cooperation in chimpanzees during a task in which two animals had to pull on a device in order to obtain food. They showed that their performance was closely related to the relationship between the cooperators. More precisely, the constraints weighing on the ability to cooperate were not cognitive but emotional: the chimpanzees cooperated very well when they had to work with a fellow-creature with whom they were capable of sharing food. It was therefore a question of tolerance for food-sharing rather than cognitive ability. To be capable of cooperating with a fellow-creature, chimpanzees

needed to have developed a relationship in which they felt sufficiently at ease to accept to feed beside each other and share a resource. Cooperation could arise in a relational context of food-sharing but not in the absence thereof. The more pairs of chimpanzees were tolerant with regard to cooperation the higher their food-sharing scores were. Another study (Hare *et al.*, 2007) compared the performance of chimpanzees and bonobos in the same cooperative task. As anticipated the bonobos were seen to be more tolerant with regard to food-sharing and performed better with regard to cooperative tasks. The authors concluded that there was a specific difference here, which was understood to be linked to the skills specific to the species: the bonobos were more tolerant with regard to food-sharing and were therefore more cooperative. But a more detailed examination (Hare and Tan, 2013) revealed that the difference between chimpanzees and bonobos mostly concerned males, and only developed progressively as individuals joined their social group and acquired the relational models of their group, a model which in this case was that of "their species ": competitive for the chimpanzees and cooperative for the bonobos. The young chimpanzees were as tolerant with regard to food-sharing (and therefore as cooperative as the young bonobos). Finally, another study (Jaeggi *et al.*, 2010) showed contradictory results: in two captive groups studied, the chimpanzees were more tolerant than the bonobos with regard to food-sharing.

7 This led to the unmistakable conclusion:

1- That food tolerance is not (or not entirely) an innate or typical trait of the species;
2- That competitive or cooperative relationships, and therefore the fact that individuals become more or less competitive or cooperative, are partially acquired: chimpanzees are not born chimpanzees but become chimpanzees;
3- That food tolerance and therefore cooperation are the result of interactive modalities that individuals have the means and the possibility to construct given their communication skills, their biological systems and the type of relationship that pre-existed them and which they need to join. This can vary according to local conditions. On the other hand, it is possible that once certain relationship models are acquired it is very difficult to change them (Bateson, 1977). Here is where the notion of *affective culture* assumes its full meaning: it concerns interactive modalities and emotional learning which is handed down from generation to generation but which is only partly related to individual biology or psychology.

8 With these examples we went from biological hypothesis that ascribed social skills to individuals (and which the theory of evolution should logically have taken account of) to much more modest hypothesis which give way to a certain indetermination of the social by the biological.

9 The scope for variation left by this indetermination is one of the unexplored areas mentioned above, which neither biologists nor psychologists can really study due to a lack of adequate methodologies and conceptual tools and which the social sciences could take on board. The area is vast and unexplored but it seems to me that there are important issues here for social sciences. It requires taking possession of an area that belongs to social sciences in their own right and upon which evolutionary biology and psychology purport to have a legitimate claim despite the fact that, as we have earlier established, these disciplines are poorly equipped to take up this challenge. It is also a question of limiting the influence of evolutionary theories on the social sciences by means of empirical studies.

4 The inflation of adaptation theories in the social sciences.

10 Adaptationist theories have enjoyed increasing success with regard to the social sciences, provoking debates which are often more ideological than empirical (cf. Kaufmann and Cordonnier, 2011; Whitehouse, 2001; De Fornel and Lemieux, 2007; Ingold, 1990; 2003; Guillo, 2012). And yet, the overestimation of biology in the social behavior of primates has an impact on the way the social sciences incorporate natural sciences. This is because when ethological data are imported into the social sciences, it leads to a truncated vision which consequently leads to concepts in the social sciences that are needlessly finalistic. The importation of finalistic concepts tends to reinforce the nature/culture duality by placing skills on either side of the wall. In addition, this obscures empirical research of what is (or could be) innate or biological in humans. Drawing from the examples of primitive social forms of Kauffman & Cordonier (2011) and pointing in dogs and primates, I would like to demonstrate that finalistic reasoning could easily lead to a poor identification of the entities that are supposed to have been selected and that it would be better to put forward the theory that we are dealing more with evolutionary concoctions (Gould and Lewontin, 1979) and composites of nature/culture than selected skills for the purpose of a precise function.

11 Neutralist theories of evolution (Langaney, 1999), which put the importance of selection into the perspective of the mechanisms of the evolution of species, are relatively neglected by behavioral biologists and totally neglected by evolutionary psychologists (Ehrlich and Feldman, 2007). The latter seem to think that selection and adaptation to an environment are the main forces behind evolution. From this, they draw the conclusion that if a specific aptitude exists it is because it has been selected and that, if it has been selected, it conferred an adaptational advantage on the individual that was endowed with this skill. Yet we know that many errors of reasoning which have been denounced many times (eg. Gould and Lewontin, 1979; Panksepp & Panksepp, 2000; Ingold, 2007; Ehrlich & Feldman, 2007) form the structure for this form of thinking: adaptationism, ad hoc theories, disconnection from phylogenesis, confusion of evolutionary strategies and individual strategy: the problems are numerous and sufficiently serious to lead to the conclusion that behavior cannot, in its own right, have been the object of selection in our own species at least: "[...] most population geneticists – remembering linkage, pleiotropy, epistasis, and developmental complexity – reject evolutionary psychology as a theoretical paradigm: its predictions ignore how difficult gene-gene and gene-environment interactions make it *for selection to operate on just one phenotypic attribute*. If we had trillions of largely independent genes, then it might be possible for selection (if it were strong enough and time available long enough) to program us to rape, be honest, detect cheaters, excel at calculus, or vote Republican. But the number of *independent* genes is much smaller than twenty-five thousand" (Ehrlich and Feldman, 2007, p. 11, our emphasis). It is never a pointless exercise to recall:because a competence exists and is adapted to a function does not mean that it has specifically been the object of selection.

12 This is why evolutionary psychology, despite the strange hold it has on the minds of researchers, is probably nothing other than a sort of speculative bubble which, having undergone a sudden inflation will burst when the place of selection in evolution, and notably the evolution of cognition and behavior, is correctly reassessed.

13 Having said this, human beings are indeed the result of evolution and their evolutionary environment has, for thousands of years, been as much made up of the natural environment as the social environment which their actions and reciprocal actions define. The study of the differences between humans and their nearest relations the *Panidae* (chimpanzees and bonobos) is interesting because it makes it possible to identify gaps that could have played an important role in making us what we are. Certainly the reconstitution of the major stages that marked hominization and which makes mankind such a particular species (tools, language, intersubjectivity, bipedalism, cooperation etc.) remains speculative but we still know a little more today than yesterday about two or three things that distinguish us with regard to the cognition and social cognition of chimpanzees and bonobos.

14 In a text that is both inspiring but understandably controversial, Laurence Kaufmann and Laurent Cordonier (2011) put forward the theory that there is an innate cognitive apparatus in all human beings made up of specialized systems for processing information and that among these some concern the social world. This is the way, according to them that "the brain that equips the members of our species was 'calibrated' by evolution in such a way as to manage the sense of belonging, exchange and coalition that is indispensable to the survival of the individual." Within the same perspective, they write that "social facts, far from being reduced to causally inert epiphenomena, are endowed with a causal power in the long run, one which gives structure to our cognitive apparatus" (2011, p. 16, our translation). This perspective seems to me to be uselessly finalistic. Adaptations do not appear "in order to" resolve a problem (it is not in order to be able to communicate that language appeared but because languages appeared new possibilities opened up). Therefore, it was not "in order to" adapt to a type of society that did not yet exist that our brains evolved in this direction, but rather because our brains became capable of managing these connections that certain types of arrangements and social complexity became possible. We should also remember that, in order for an adaptation to be passed on from generation to generation with the result of endowing all the members of a species, the adaptation must confer a net advantage in terms of reproduction and survival to those who are the carriers of this adaptation. It is often difficult to demonstrate how a cognitive improvement actually allows those who are endowed with it to reproduce and survive better than those who are not endowed in this way – and who have survived very well up to that point.

15 This does not, however, invalidate the theory that our brains are endowed with specific cognitive abilities which take the form of a "naive sociology", that is to say "a system of identification of typical forms of social relationships and a system of inference, anticipation and prediction concerning what should normally occur within these relationships [...] " (Kaufman and Cordonnier, 2011, our translation). For the moment, we have no idea what such a system might materially look like. We do not know *what*, within this system might be innate or how it could have evolved or even if it exists. This is open to empirical research but we must not suppose, if we base our suppositions on what we know about other social skills such as cooperation or pointing, that this system, if it exists, is a single skill; it is rather a set of skills.

16 What the phylogenesis of cognitive skills such as pointing or cooperation suggests, is that what appears to us in its "completed and adapted" human form, such as a single cognitive aptitude, is, in reality, made up of the combination of different elements that can exist in different and incomplete states in different species, which combine to give rise to a

complex skill. In the case of pointing for example, the difference between dogs (who understand it, Soproni *et al.*, 2002) and wolfs (who don't) could be explained not by a cognitive "leap", but by a modification, during the domestication process, of the intensity of emotional responses (fear and aggression) in the presence of humans (Hare *et al.*,2002, 2005, 2007; Trut,1999). This is how the domestication of foxes, by successive breeding of less fearful and aggressive individuals, leads to a line of foxes that not only carry traits that are typical of domesticated species (Trut, 1999) but are also capable of understanding pointing...(Hare *et al.*, 2005). In this case, it is changes in the agonistic response system (the "emotional reactivity hypothesis", Hare *et al.*, 2007) which allows the manifestation of a cognitive skill. It is not a world where pointing was useful that created this skill; it is a world where it was useful to have animals that were less fearful and less aggressive. Chimpanzees, for their part, understand pointing in competitive situations, but not as a form of cooperative communication for similar reasons possibly (Hare and Tomasello, 2004). Pointing which has long been considered as a symbolic skill that is typically human, therefore exists in incomplete and/or contingent forms in other animals, where its appearance depends on the inhibition of emotional responses. We are therefore not dealing with a purely cognitive skill that developed due to its adaptive character, but rather due to a mosaic of cognitive and emotional elements which combine to create skills which, in each species, assume different forms. In the human species, pointing is combined with intersubjectivity which leads to a total reconfiguration of the relationship with others that it involves. We should therefore not neccessarily suppose that innate social skills, if they exist, have been selected as such – even though this could well be the case – nor that they constitute indivisible and innate units. They could constitute aggregates whose elements need to be empirically identified.

17 In summary, it appears that empirical research can be carried out on naive sociology and on social skills for example (Hirschfeld, 2001) without postulating that these are genetically determined (we need to be prudent given the current state of our knowledge of this subject) or that they have been perfected by evolution because they conferred an adaptive character on those who carried them. On the other hand, it is much more heuristic to ask what elements these social skills could be made up of, which ones are likely to be innate and how they function in particular situations. Based on comparisons with other species of primates, evolutionary theories could be formulated. This is therefore another possible contribution by sociology to natural sciences: the supply of precise descriptions of actual social interactions – to form a basis for comparison with non-human primates – and not the fantasy-driven interactions that evolutionary psychology is only too often content with.

18 However, it must be pointed out that there is a difficulty linked to naïve sociology as long as it is seen as a cognitive system of processing social information. This is because competition, cooperation, affiliation, submission or dominance are first and foremost, among primates, children or adult humans, relationship models which mobilize affects. Yet to neglect the emotional dimension of communication (human or animal), and reduce communication to a question of exchange and information processing, has the consequence of transforming animals into calculators which make choices, develop strategies and "refrain from replying" etc. (cf. on this point Servais, 2007). It matters little here that we are speaking of animals who "really" calculate or that possess an analysis mechanism that has been "perfected by evolution". What counts is that the animals are taken from the relational fabric which allows them to exist and to react, and that the

social nature of communication is transformed into reasoning : another example of decontextualization. For example, does the fact that a monkey uses a different cry to call for help when his attacker is a member of his family or another line (Hauser, 1996) mean that he conceptually "recognizes" the relationship, even minimally? The cry is therefore a kind of etiquette describing the nature of its relationship with the aggressor. An alternative approach is to consider that the animal finds itself in the grip of a very different situation according to whether his attacker is a family member or not. The cry would therefore be more inclined to be part of an act than the description of a relationship. This type of "*pars pro toto*" encoding is common in animal and non-verbal human communication (Bateson, 1977b). This argument is all the more valid when we switch our interest from primates to animals such as chickens or other birds, among whom evidence of audience effects have been demonstrated. Marler *et al.* (1991) showed that a cock, for example, who is presented with seeds will create food-call sounds the quantity and variety of which will vary according to whether he is alone or in the presence of hens he knows, the presence of hens he doesn't know, or in the presence of a rival. The interpretations of ethologists neglect the pragmatic dimension to this communication and analyse it purely on a cognitive level. Therefore they speak about the cock who "restrains" his calls for food in the presence of a rival or who "chose not to inform" a rival...in inverted commas of course. This is how cocks "deliberate" and "make choices"... (Marler *et al.*,1991). And yet the cock, in the presence of a rival or a strange hen is, necessarily, in very different dispositions. These dispositions depend on the nature of the relationship in which he finds himself, and a cock that shows a different orientation in the real situation is one who makes food calls or not. Reducing all this to a "choice" and placing the mechanism of choice in the mind of the cock is to transform an elementary social situation, or a relational one, into a purely cognitive processing of information. The intellectualization of animals is another consequence of the decontextualization of social cognition which isolates rather than taking an interest in the individual *in situ*, connected by specific motivation modalities towards their fellow-creatures. The same line of arguments is developed by Costall and Leudar (2009) about the Theory of Mind, and by Menzel (1988) in the case of Machiavellian intelligence.

5 Conclusions

19 The examination of studies on cooperation in *Panidae* suggests that biology is not sufficient to explain the social strategies of individuals. By neglecting the fact that a part of social skills is distributed in the situation, and supposing that the entire strategy is to be found "within" individuals, biology and evolutionary psychology overestimate the importance of individual cognition in social determination; in the same way, they then overestimate the importance of selection in the evolution of this cognition. Once it is admitted that the entire explanation is not to be found in selection, we can formulate questions relating to the manner in which relationship models emerge, change or are transmitted in groups of non-human primates. This is why primatology could benefit from serious ethnographies which are likely to help distinguish what stems from individual skills and what stems from situations. These ethnographies could also recontextualise behavior and understand it within the context of relationships and interactions which count for the actors. If social sciences want to gain a grasp of these questions, this would have the effect not only of limiting evolutionary inflation in social

sciences, but also of reassessing, on an empirical basis, what is potentially innate or inherited and what depends on situations. It means to take an interest in social skills as nature/culture composites. The social sciences have the means to respond to annexationist programs of evolutionary psychology on condition of accepting to become involved in new fields and with new objects. On the other hand, some attempts are being done in biological sciences to stress the crucial significance of the socio-cultural and to include the environment it the theory, i.e. in developmental systems theory (Oyama *et al*, 2001)

20 In order to invest in these unexplored fields, sociologists or anthropologists will be given the challenge of inventing appropriate methodologies and redefining their objectives. It will be necessary to accept opening up modern categories of nature and the social and take on the task of recomposing constituent elements. I plead in favor of opening up this unexplored and abandoned area, that is to say, the connection between the biological and the social to empirical research within the context of social sciences. The new objects that this will neccessarily cause to appear will mark a step towards the reconstruction of scientific disciplines surrounding problems defined outside the realm of the nature/culture dualism. While it is indispensable that social sciences open up to natural sciences it seems to me that it is also neccessary to envisage the opposite, that is to say an opening up of natural sciences, in particular primatology, to social sciences and their methods. It will mean big changes in the social sciences – but it is worth doing.

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ABSTRACTS

With the rise of cognitive sciences, the nature/culture debate has been reignited, and this debate often takes the form of a discussion about the opportunities and dangers of the naturalization of the social. Faced with what they perceive as a threat and an invasion of their discipline by the natural sciences, social science researchers often react by denying that natural sciences have any relevance for their own discipline, as though the biological and cultural aspects of human beings were separate entities, each one being a subject for individual study. This only serves to widen the gulf between two sister-disciplines, increases the polarization of the nature/culture duality and makes it even more difficult to connect the two. The point of view put forward in this paper shifts the emphasis of these discussions slightly. It does not take account of the contributions, whether desirable or not, made by natural sciences to sociology or anthropology, but rather argues in favor of a sociology of primates. By using examples drawn from cooperation studies, this paper aims to point to some problems that demonstrate the limitations of biological explanations for social behavior in primates. If we look beyond these limitations, there lies an unnamed world ripe for exploration by social science. This involves the invention of new methods and the definition of new objects (such as "affective cultures" for example) that appear to be composites of nature and culture. An empirical study of these composites would perhaps pave the way for a future understanding of the way in which biological and social determinants are woven into the reality of individual and collective histories. This would, in turn, make it possible to better identify the innate elements of the social skills of primates and to limit the importation of adaptationist theories into social sciences. In other words, the issue here is to replace an ideological debate with empirical questions. This paper is a revised version a paper previously published in SociologieS under the title : "Faut-il faire la sociologie des singes?"

Avec l'arrivée des sciences de la cognition, le débat nature/culture a repris vigueur, souvent sous la forme de discussion quant aux opportunités et dangers de la naturalisation du social. Face à ce qu'ils ressentent comme une menace et un envahissement de leur discipline par les sciences naturelles, les chercheurs en sciences sociales réagissent parfois en niant toute pertinence aux sciences de la nature pour leur propre discipline, comme si les parts biologiques et culturelles de l'humain étaient séparées, chacune faisant l'objet d'études autonomes. Ceci agrandit le fossé entre disciplines voisines, aggrave la polarisation de la dualité nature/culture et rend plus difficile encore leur articulation. Le point de vue qui sera développé ici déplace légèrement l'axe de ces discussions. Il ne s'intéresse pas aux apports, désirables ou non, des sciences de la nature pour la sociologie ou l'anthropologie, mais à l'inverse il plaide pour une véritable sociologie des singes. Il se propose de pointer, notamment à partir d'exemples empruntés aux études sur la coopération, quelques questions problématiques qui suggèrent l'existence d'une limite aux explications biologiques du comportement social chez les primates, et d'argumenter qu'au-delà de cette limite s'étend une contrée sans nom, restée en friche, qu'il reviendrait aux sciences sociales d'investir. Cela implique l'invention de nouvelles méthodes et la définition de nouveaux objets (comme les « cultures affectives » par exemple) se présentant comme des composites de nature et de culture. Etudier empiriquement ces composites permettrait probablement de comprendre sous un autre jour la manière dont déterminations biologiques et sociales s'imbriquent dans la réalité des histoires individuelles et collectives des primates humains et non humains. Ceci à son tour permettrait de mieux identifier quels sont les éléments innés dans les compétences sociales des primates, et de limiter l'importation des hypothèses adaptationnistes en sciences sociales. En d'autres mots, l'enjeu est de remplacer un débat idéologique par des

questions empiriques. Cet article est une version révisée de l'article « Faut-il faire la sociologie des singes? » publié précédemment dans SociologieS.

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Mutual coordination of behaviors in human–chimpanzee interactions: A case study in a laboratory setting[1]

Coordination mutuelle des comportements dans les interactions humains-chimpanzés: étude de cas en contexte de laboratoire

Akira Takada

1 Introduction: Studies of Communication among Chimpanzees

1 A number of animal behavior studies have been conducted to help clarify various aspects of human sociality. Most of these have compared animal and human behaviors. Some research in the comparative cognitive sciences has focused on great apes, which are genetically similar to humans, and has explored the theme of hominization to reconstruct the evolutionary trajectory across species of great apes, including humans. Humans, chimpanzees, and gorillas are all hominoids that originated in Africa (Matsuzawa, 2006). Chimpanzees are an especially close evolutionary neighbor of humans and are genetically the most similar to them.

2 Western scholars have focused on chimpanzees for a long time. According to Barnard (2011), London physician Edward Tyson recognized unexpected similarities between chimpanzees and humans at the end of the 17th century, particularly with regard to the brain, and he concluded that chimpanzees are located somewhere between Man and Common Ape (a category similar to Monkeys today). In the 18th century, Scottish judge Lord Monboddo believed that Orang Outang (a widely employed term used to mean today's great apes) habitually built huts, used tools, built fires, and even had a sense of honor. Jean Jacques Rousseau and Carolus Linnaeus also believed Orang Outang to be a ‘man,’ or, in Linnaean terms, to at least belong to the genus *Homo*. According to Cole

(1996), Carolus Linnaeus, the father of systematic botany, also conducted a typological study of animal species. He divided the genus *Homo* into *Homo sapience,* which included Europeans,and *Homo monstrous*, which included Chinese, Hottentots, who are now known as Bushmen or the indigenous people of Southern Africa, and so on. These classifications illustrate the difference between how humans were once perceived, compared with present-day perceptions.

3 In the 20th century, researchers began to conduct primatological and psychological studies using living chimpanzees. Of these, studies involving gestures and tool use are highly relevant to the main theme of this study: Analyzing the sequential organization of interactions between chimpanzees and humans.

4 Chimpanzees can perform and learn gestures to a certain extent. A number of studies have identified similarities and differences between chimpanzees and human children in gestural communication. These findings are thought to be important when considering the origin of human language (Tomasello and Camaioni, 1997; Cartmill *et al*., 2014). Chimpanzees begin to touch objects by pointing a finger at the age of eight months, but unlike human children, do not point to objects located far away (Matsuzawa, 2005). Captive chimpanzees understand the meaning of human pointing and demonstrate 'hand pointing' in which they indicate an object by stretching out their arm toward it (Itakura, 1996; Itakura and Tanaka, 1998). According to Tomasello and Camaioni (1997), however, they do not make gestures to attract attention to other conspecifics or to humans or to indicate an object to them. In contrast, humans begin to use these gestures during the course of development. Cartmill and Byrne (2010) also concluded that whereas humans (even infants) use gestures to draw attention to an object or to comment on an aspect of the world, use of gestures among apes is primarily limited to requests that others interact or leave.

5 In addition to the use of gestures, the use of tools is considered highly relevant to discussions of the origin of human communication. Chimpanzee infants in the wild are motivated by intellectual curiosity and begin to associate two objects from the age of approximately 1.5 years. When they reach the age of 3.5–5 years, they begin to associate a third object with the two objects. Their operation of tools becomes increasingly elaborate until the age of approximately 10 years (Matsuzawa, 1994; Nishida and Hosaka, 2001; Matsuzawa, 2005; Hayashi *et al*., 2006). Captive chimpanzees may demonstrate effective tool use at younger ages (Hirata, 2006). Moreover, a number of researchers have reported between-group differences along with within-group homogeneity with regard to tool use in the wild, even in the absence of genetic and environmental differences between groups (e.g., Whiten *et al*., 1999; Gruber *et al*., 2009). These observations suggest that chimpanzees learn certain behavioral patterns by observation. However, it should be noted that observational learning among chimpanzees requires trial-and-error experiences over a much longer time period than required by humans. Tomasello and colleagues claimed that after an individual invents a type of behavior, others in the group must re-invent it, primarily by copying the product or engaging in 'emulation learning' (Tomasello, 1999). Chimpanzees are considered to have a very limited ability to imitate (i.e., immediately reproduce another's intended behaviors). In contrast, there is little doubt that human children begin to imitate very actively, beginning around the age of nine months, and then develop various kinds of cooperative behavior (Tomasello and Camaioni, 1997; Tennie *et al*., 2009; Tomasello *et al*., 2012).

6 Some scholars have argued that chimpanzees have a ‘culture,’ based on their tool use. Tetsuro Matsuzawa, one of the leading primatologists in Japan, defines ‘culture’ as the whole of knowledge or skills shared by members of a certain community, and this is transmitted across generations, such as from parents to children, through non-genetic channels. He argues that cultural transmission of knowledge or skills occurs among chimpanzees: Female chimpanzees reveal their knowledge or skills when they move into other groups, and their children inherit this cultural tradition. Consequently, neighboring chimpanzee communities often share cultural features even though they encounter varied constraints in their surrounding environment (Matsuzawa, 2006). Recent experimental studies of chimpanzees have explicated how such cultural transmission of skills occurs both within and across groups (see the review on chimpanzee cultural transmission in Whiten *et al.*, 2009). Moreover, Whiten and colleagues (2009) analyzed the definition of and recent findings regarding imitation and argued that if copying the *form* of an action (the copied action may include the use of objects that are not directly observed) is considered imitation, then chimpanzees rely more on imitation and have more cultural capacity than previously acknowledged.

7 Some researchers have tried to document the relationship between gestures, tool use, and the development of proto-languages (e.g., Bickerton, 2002; Falk, 2004; Cartmill *et al.*, 2014). Many have proposed that the human linguistic structure first emerged in gestures and later spread to vocalizations (Cartmill *et al.*, 2014). After reviewing the literature on caregiver–child interactions among chimpanzees, bonobos, and humans, Falk (2004) argued that during hominization, the development of bipedalism and loss of infant clinging made hominin mothers more likely to use prosodic markings in accordance with gestural markings to encourage juveniles to behave in certain ways. Consequently, the meaning of some utterances became conventionalized and eventually developed into proto-languages. Recent studies of grammaticalization suggest that early proto-languages of hominins probably did not include suffixes or functional words but did include nouns and verbs (Heine, 1997; Heine and Kuteva, 2002). Such proto-languages might have been used in contexts similar to those in which chimpanzees now use various kinds of gestures. According to Falk (2004), chimpanzees’ infant-directed gestural communication is much richer than their infant-directed vocal communication. Many of the emotional states of chimpanzees are similar to those of humans and are expressed using a variety of easily recognizable facial expressions that, in turn, are frequently linked with particular vocalizations. Based on these findings, Falk (2004) proposed the above hypothesis regarding the development of a proto-language in hominins.

8 Interestingly, captive chimpanzees who interact with humans often display high levels of performance that are rarely observed among wild chimpanzees. For example, they may understand the meaning of human pointing and use ‘hand pointing’ (Itakura, 1996). They may also achieve certain levels of performance at a younger age compared with their wild counterparts, such as mastering tool use (Hirata, 2006) and using gestures (Bard *et al.*, 2014). When they are taught human-designed communication systems (e.g., modified American Sign Language or computer-based symbols), their communication style resembles that of two-year-old human children in some respects (see the review in Cartmill *et al.*, 2014). These phenomena are well known among experimental primatologists and psychologists: The standard interpretation is that chimpanzees have a universal ability that emerges in certain situations (Matsuzawa, 2000). However, few studies have focused specifically on in *which context* and *how* such performances are

elicited (for a notable exception, see Rossano, 2013). Instead, most researchers who engage in experimental work with chimpanzees have tended to focus on the level of performance they can elicit from a chimpanzee under various conditions.

9 Interaction analysis is one of the most promising and effective ways to investigate this under-studied research topic. Interaction analysis is an empirical method for determining why an action is selected at a specific place and time by deconstructing the micro-sequential context (i.e., clarifying the relevance of the adjacent actions; Nishizaka, 1997; Schegloff, 2007). This approach makes it possible to analyze the sequential organization of interactions, incorporating not only the results of actions under certain situations but also the procedural context within which the actions take place. It can help clarify the great differences in performance between captive and wild chimpanzees and shed new light on the findings of previous studies involving captive and wild chimpanzees. This kind of analysis also deepens our understanding of the sociality that can be established between chimpanzees and humans, beyond species-related limitations, and of human sociality in general.

10 Therefore, the present study involved using video recordings of interactions between captive chimpanzees and human trainers and researchers to analyze how their actions were spatiotemporally organized. The process of mutual adjustment of actions between chimpanzees and humans was investigated by focusing on the use of body movements and vocal sounds.

- (1) Body movements: body movements constitute one of the central semiotic resources (Goodwin, 2000) for interactions between captive chimpanzees and human trainers and researchers, who often try to understand what chimpanzees will do next based on their body movements. Moreover, chimpanzees can learn gestures from humans and communicate with them using these gestures. Human trainers and researchers may try to convey their messages using various gestures, including those they have not taught to chimpanzees. They also give various objects, including food, to chimpanzees, which facilitates embodied interactions between them.
- (2) Vocal sounds: chimpanzees in the wild can distinguish between and use various types of vocal sounds depending on the situation (Goodall, 1986). Some of the vocal sounds inform group members about important information of which they may be unaware (e.g., the presence of food or a snake) and strengthen affiliative relationships with social partners (Slocombe *et al.*, 2010b; Crockford *et al.*, 2012). When chimpanzees listen to vocal interactions among other individuals, they can extract social information about the callers (e.g., higher or lower ranking, victim or aggressor) from their vocal sounds and thereby interpret what is happening within the wider social context (Slocombe *et al.*, 2010a). Human trainers often talk to captive chimpanzees using various verbal and non-verbal sounds, including those they have not taught the chimpanzees. These vocal sounds play important roles in organizing their interactions.

2 Methods

11 We obtained approval from the ethics committee of the Great Ape Research Institute (GARI) at Hayashibara Bio-chemical Research Institute. I have periodically visited GARI to study interactions between captive chimpanzees and humans since 2008. GARI was founded in Tamano, a city in Okayama Prefecture, Japan, to promote research about the evolutionary foundations of human intelligence, behavior, livelihood, society, and culture

by comparing great apes and humans. The GARI building is located at the tip of a small peninsula near a quiet seashore. Eight chimpanzees were being raised at GARI while I conducted my research (2008–2013). Regrettably, GARI was closed in 2013 due to financial problems: All chimpanzees (but none of the trainers) were transferred to the Kyoto University Kumamoto sanctuary, where they remain.

12 I collected a large amount of video (approx. 400 hours in total) and other materials with the generous cooperation of the trainers and researchers at GARI. I conducted a preliminary analysis of the video materials and selected two short video clips that recorded a physical measurement event (specifically, 'morph-physiological measurement'), in which chimpanzees actively interacted with human trainers in a narrow room. The clips reveal several of the fundamental patterns characterizing human–chimpanzee interactions at GARI, although we will need to further examine the rest of the dataset to draw generalizations about these patterns. The following analyses are based on systematic transcriptions of interactions in the video clips. First, I made detailed transcriptions of the verbal and non-verbal behaviors of each interactant along with the timeline for the two video clips. Here, because of space constraints, I have translated the utterances and omitted the original utterances made in Japanese.

13 Utterances were transcribed according to a modified version of the conventions developed for conversation analysis research (for details, see Sacks *et al.*, 1974; Schegloff, 2007). Information important to the utterance is indicated in double parentheses: (( )). Equal signs (=) indicate run-on utterances or an utterance that is interrupted by someone else. Pause length is marked in parentheses, in tenths of a second (e.g., (0.6)). Overlapping utterances are marked by square brackets: [ ]. Two degree signs (° °) enclose remarks that were markedly softer in tone compared with the discussion surrounding them. An up arrow (↑) indicates an increase in the pitch of the voice. Talk between 'more-than' and 'less-than' symbols has been compressed (> <) or slowed (< >). Audible laughter is indicated by the letter 'h,' and multiple uses of 'h' indicate more laughter. Stressed words have been underlined, and single parentheses indicate that an utterance was unintelligible or made by an unidentifiable source.

14 I also loaded the video clips into Windows Live Movie Maker to capture still images from these interactions. By combining these materials, I was able to analyze how the interactions were spatiotemporally organized during these events.

3 Results and Discussion

3.1 Mutual coordination of behaviors between chimpanzees and humans

15 During this kind of physical measurement session, the trainers would usually invite one or two chimpanzees, in turn, into the room from the outside field. Excerpt 1 was extracted from a video of the physical measurement of two female chimpanzees: TB (aged 12 years at the time) and NT (aged 3 years and 2 months). The following humans were involved in the data collection: F (a male trainer responsible for measuring the body parts of the chimpanzees), K (a female trainer responsible for helping F measure these body parts), H (a male researcher responsible for recording the video), and S (a male trainer responsible for recording the results of the measurement). S was excluded from

transcription because he rarely interacted with other participants in the excerpt. Along with female chimpanzees TB and NT, a female infant chimpanzee HT (aged 1 year and 2 months) appeared in the video excerpt. HT and NT are half-siblings as they have the same father. Unlike NT, who was nursed by her mother TB, HT had been abandoned by her birth mother, MS, who appears in excerpt 2. Thus, HT had been raised by human trainers and researchers at GARI. Child abandonment is common among captive chimpanzees: As many as half of infants may be abandoned. In contrast, wild chimpanzee mothers form intimate relationships with their infants (Tomonaga *et al.*, 2003; Matsuzawa, 2005). The close mother–child bond is shaped by mutual coordination between the mother and the baby: Mothers hold babies while babies cling to mothers (Matsuzawa, 2006). According to Matsuzawa (2005), it is particularly important for female chimpanzees to have sufficient physical contact with other chimpanzees, at least during their first year of life, to ensure they will successfully nurse a child later. This finding suggests that chimpanzees must learn to rear infants and that learning plays an important role in the life of a chimpanzee.

16 On the day of the video recording, F entered the room while carrying HT under his arm. Before long, F carried out the physical measurements for NT and then TB. They engaged in physical measurements for approximately 11 minutes and then the activity shifted to a semi-free session. K measured TB's heart rate using a stethoscope and then cut TB's nails. K then measured NT's heart rate. The video clip began at this point.

Table I (Excerpt 1)

Excerpt 1 Physical measurement session for NT (born 2005.7.8) and TB (born 1996.2.17: Mo of NT)

		NT (female chimp: aged 3 years and 2 months)		TB (female chimp: aged 12 years)		F (male human)		K (female human)		H (male human)	
counter (min: sec)	line	verbal	nonverbal	verbal	nonverbal	verbal	nonverbal	verbal	nonverbal	verbal	nonverbal
	1		climbing on the wall and looks outside.		hanging below the ceiling and looks outside.						
	2				coming back to the inside and squats.						
00:16	3				streching out her left arm.			oh, really			
00:19	4				TB moves her left fingers.				bringing a paper cup under TB's genitals.	((TB is going to)) urinate	
00:20	5				TB urinates while streching out her left arm to F.			okay, good girl TB.			
00:21	6					[wait]		[wait]			
	7							just wait ((it)) comes from various points.			
	8							↑oh, wait, don't move.			
	9				TB moves her left fingers.						
00:28	10				TB leans toward F.	[oh wait, wait wait wait		wait TB, ahh ha			
00:32	11				TB sits up straight.			okay			
00:33	12					[yes.]		[yes.]			
00:35	13				TB turns around and sits on the board.						
	14							hey TB, let me show your bud <↑show your buds>			
	15		NT touches the board and grabs TB's back		TB gets up on all fours.						
00:42	16							NT no, NT no, no, don't do			
00:43	17					hey, come on			K wipes TB's genitals.		
	18					come on					
00:45	19							yes good			
00:45	20					TB					
00:46	21							TB, °((show your)) bud°			
	22				TB slowly moves to F.						
	23				TB touches the face by her left hand						
00:49	24					hey, come on					
00:50	25				TB moves to F.					((TB)) was called by	
00:52	26				TB sits on the ground	sit	F nods his head.				
	27					[°hey°	F stretches out his right hand to TB.	[one one four seven ( )			
00:53	28				TB hesitates to take the piece of food	take it					
	29				TB looks slightly left while touches her left leg by her left hand.						
00:55	30				TB touch her mouth with her left hand and grabs a stair with her right hand.	will ((you)) go back?					
00:56	31							well			
00:57	32				TB turns around and then looks back F while scratching her body by her left hand.	((do you)) wanna go back?					
00:58	33							ouch, sorry			
01:00	34					come here	F points to the ground while looking				
	35					TB, here, here					
01:04	36				TB turns around and sits in front of F.	right on	F points to the ground while looking				
01:06	37					[once more]	F points to the ground while looking				
	38				TB looks away from F while scratching her body.		F picks up a piece of food from his pocket.	(° °)			
	39						F stretches his right				
01:12	40					((will you)) go back?					
01:13	41					((you are)) unusually on tenterhooks					
01:15	42					why are you ((like that))?					
01:17	43				TB turns around and climb up the stair.	°[illegible]°					
01:19	44							°((will you)) go back?°			
01:20	45				TB sits on the board	((will you)) go back?					
01:21	46					you're strange.					

Physical measurement session for NT (born 2005.7.8) and TB (born 1996.2.17: Mo of NT).
Session de prise de mesures physiques sur NT (née le 8/7/2005) et sur TB (née le 17/2/1996 : mère de NT).

17 At first, NT and TB climb on bars facing the next room and look outside. Then, TB comes back to the center of the room and squats on the stair set in front of the exit. TB looks at F, who is sitting in front of the tray with food inside, while stretching out her left arm

toward him (line 3). This action is used to request food. Moreover, TB moves her left fingers repeatedly, as if she is reiterating the request (line 4). Immediately after TB squats on the stair, K utters a 'change-of-state' token "oh, really" (line 3) and then places a paper cup under TB's genitals. H makes a comment "((TB is going to)) urinate" (line 4). TB starts urinating and looks at the exit. K makes an utterance to TB "okay, good girl TB" while receiving urine in the cup (line 5). Then TB's urine seems to splash a bit. K and F say "wait" simultaneously (line 6). Following this, K makes a command to TB, saying "just wait ((it)) comes from various points." and then " ↑ oh, wait, don't move." in lines 7 and 8. After moving her left fingers again, TB leans toward F (line 10). Responding to this behavior F says "[oh wait, wait wait wait" in line 10. The utterances work as commands. Overlapping with F's utterance, K also talks to TB saying "wait [TB, ahh hh" (line 10). TB then sits up straight. TB finishes urinating, and the urine seems to be caught in the cup. K says "okay" (line 11), and then K and F simultaneously say "yes" (line 12).

18 TB turns around and sits on the board (line 13). K then makes a request to TB, saying "hey TB, let me show your bud > ↑ show your bud:: <" (line 14) to wipe the genitals. Then TB gets up on all fours (line 15). Simultaneously, NT touches the board and grabs TB's back (line 15). Seeing this, K says "NT no, NT no, no, don't do that" (line 16). F also calls NT (lines 17 and 18) to get her away from TB, while K wipes TB's genitals. K then makes an utterance "yes good" which gives a positive assessment to TB (line 19).

19 F then calls TB in line 20. TB then slowly moves to F. F further utters a command "hey, come on" to TB (line 24). TB then moves toward F while H makes an utterance "((TB)) was called by F" (line 25) for recording it in the video. F tells TB "sit" (line 26), and she immediately sits on the ground. F then says "[°hey°" (line 27), while stretching out his right hand, which contains some food, to TB. F then says "take it" to TB (line 28). However, TB hesitates to take the food piece. TB touches her mouth with her left hand and grabs a stair with her right hand (line 30). F gives TB a candidate understanding of this gesture, namely the interpretation that TB wants to go back to the yard (lines 30 and 32). TB then turns around and faces the stairs while holding the stairs with both hands. She then looks back at F again while scratching her body with her left hand (line 32). F then reiterates the command saying "come here", "TB, here, here" (lines 34 and 35). Simultaneously, F points to the ground while looking at TB. TB turns around and looks at F. When F makes a command "right on" in a stressed voice (line 36), she sits straight in front of F. F picks up a piece of food from his pocket (line 38). However, TB fidgets and looks away from F again while scratching her body (line 38). Looking at this F stretches his right hand toward TB and then gives an interpretation of TB's behavior "((will you)) go back?" (line 40), which already appeared in lines 30 and 32. F then makes a comment about TB today, saying "((you are)) unusually on tenterhooks" (line 41) and asks her a question "why are you ((like that))?" (line 42). Without answering this question, TB then turns around and climbs up the stair (line 43). Seeing this, F gives an interjection "yoisho" in a spirited voice (line 43). Looking at this K murmurs "°((will you)) go back?°" (line 44). The utterance not only gives her a candidate understanding of TB's behavior but also shows agreement with F's understanding, manifested in line 40. F reiterates his candidate understanding "((will you)) go back?" again (line 45) and then makes a comment "you're strange" to TB who in sitting on the board (line 46).

Use of body movements

20 We identified several distinctive features of the body movements of the captive chimpanzees at GARI based on the above interactions. First, TB used a hand gesture to request food. Great apes are known to make several types of requests (Cartmill and Byrne, 2010; Rossano, 2013; Bard *et al*., 2014). The chimpanzees at GARI were prohibited from taking food from the tray directly. Instead, they were taught to make a hand gesture to request food or a pointing gesture to indicate which food they wanted. All chimpanzees at GARI learned these gestures. Accordingly, TB made a request to F for some food on the tray using a hand gesture (stretching out the left arm toward F and moving the fingers repeatedly) in lines 3 and 4 (Figure 1). However, F announced a hold on the request in line 6, as TB was going to urinate at that time. In response, TB moved her left fingers again (line 9), which reiterated the request. This is consistent with the observation the same gesture was sometimes repeated when it initially did not generate a response (Liebal *et al* ., 2004; Cartmill and Byrne, 2010). However, F did not give her any food. Then, TB leaned toward F (line 10) to get closer to F in front of the food.

Figure 1

TB stretches out the left arm toward F (sitting outside of the frame).
TB déploie son bras gauche en direction de F (en dehors de l'image).

21 As exemplified by the above interplay, food often works as an object encouraging interactions between chimpanzees and humans. Note that food is not only transferred from human to chimpanzee to be eaten: It is also used as a resource for eliciting an utterance or behavior from the recipient in the form of turn-taking during human–chimpanzee interactions (see the next section). The base sequence here is the adjacency pair of request and acceptance/rejection (Schegloff, 2007).

Figure 2

TB grabs a stair by the hand.
TB saisit un barreau de la main.

22 The hand gesture functioned as an index of a wider sequence of actions. There is no doubt that chimpanzees can use indices (a type of sign in the classification developed by Peirce's Sign Theory) in their interactions (Tanaka and Matsuzawa, 2000). We also recognized other forms of index in the above excerpt. For example, TB gestured by grabbing a stair by one hand (line 30; Figure 2), which indexes the movements to go back to the outside yard. F interpreted this as such and gave TB a candidate understanding (lines 30 and 32). TB then turned around and faced the stairs while holding the stairs, this time with both hands (line 32; Figure 3). It should be noted that TB used not only her hands but also her whole posture and gaze direction to index the movements to go back to the outside yard.

Figure 3

Figure 3 TB holds the stair by her both hands.
TB tient le barreau de ses deux mains.

23 As another type of gesture, TB scratched her body several times to demonstrate frustration. For example, even though TB made gestures that indexed the movements to go back to the outside yard, F did not allow her to do that. Then, she scratched her body with her left hand while looking at F (line 32; Figure 4). Similar behavior is seen again later: after F made a command to sit straight and then picked up a piece of food from his pocket, TB scratched her body while looking away from F (line 38). The action of scratching is thought to be not a personal behavior to relieve itching, but rather a social behavior to show frustration in response to the unwelcome command made by F.

Figure 4

Figure 4 TB scratches her body by the left hand while looking at F.
TB gratte son corps de la main gauche tout en regardant F.

Use of vocal sounds

24 A number of semiotic resources can be used to frame turn-taking. Among others, verbal utterances by humans have various meanings in chimpanzee–human interactions. The offer made by F in lines 27 and 28 is one example: it worked as the first pair part of an offering sequence, a type of adjacency pair. The question asked by F in line 42 also works as the first pair part of a question–answer sequence, another type of adjacency pair (Schegloff, 2007). Moreover, the trainers frequently issued directives to chimpanzees, which also work as the first pair part of an adjacency pair. Directives are broadly defined as utterances designed to get (an) addressee(s) to perform a goal-oriented action or an "utterance intended to get the listener to do something" (Goodwin, 2006). Takada (2013) has proposed several sub-classes of directives in Japanese that depend on the intensity of action, ranging from (1) commands, to (2) requests, (3) suggestions, (4) prompts, and (5) invitations. In lines 7 and 8, K issued commands to TB by her utterance "just wait ((it)) comes from various points. ↑oh, wait, don't move", while setting a paper cup under TB's genitals. Accordingly, TB kept sitting on the stair. In lines 26, F issued a command to TB by his utterance "sit" and a gesture (nodding his head), and TB then sat down on the ground. F further issued commands by his utterances "[°hey°, take it" and gesture (stretching out his right hand to TB) in lines 27 and 28, but TB did not accept it this time. When the trainers at GARI issue directives to chimpanzees, they mostly use commands,

specifically utterances in which the verb takes the form of the imperative, together with certain non-verbal behaviors that also indicate directives.

25 The chimpanzee's responses to directives were often followed by third turn assessments (Pomerantz, 1984) by the human trainers. In the above excerpt, K issued several commands to make TB urinate without moving away (lines 6, 7, 8, and 10). Accordingly, TB finished urinating successfully. K then issued the positive assessments "okay, yes", which complimented TB's behavior (lines 11 and 12). Similar interplay between F and TB was identified on lines 10 to 12 as well. It should be noted that a third turn assessment can function to indicate that a certain behavioral sequence is completed. In the above example, immediately after the simultaneous assessment turns by F and K (line 12), TB started to shift her action, by turning around and sitting on the board (line 13). This shift in movement indicates that TB understood that the previous sequence of actions was completed and thus she was allowed to move on.

26 Human trainers are able to issue a second pair part of an adjacency pair, for example F's utterance "wait", which held TB's request in line 6. However, compared with the number of cases that were issued by the first pair part of adjacency pairs, human trainers appear to issue the second pair part relatively less frequently. This trend probably reflects the fact that chimpanzees issue the first pair parts of adjacency pairs less frequently than human trainers.

27 Another type of verbal utterance made by the human trainers is giving a candidate understanding of certain chimpanzee behaviors. For example, seeing that TB hesitated to take the food piece (line 28), F said "will ((you)) go back?" (line 30). The utterance provided a candidate understanding of what the previous behavior by TB meant. Then, TB turned around and faced the stairs while holding the stairs with both hands (line 32; Figure 3). F gave TB a candidate understanding of this by saying "((do you)) wanna go back?" (line 32). The main feature of this type of verbal utterance (i.e., giving a candidate understanding of the prior behavior) is that the speaker takes the viewpoint of observer and can respond to whatever movement is initiated by and whatever state is experienced by the recipient. After the utterance, the recipient is not obliged to respond. Similar features are also recognized when human trainers make comments on the behaviors of chimpanzees, as exemplified by the utterances "((you are)) unusually on tenterhooks" in line 41 and "you're strange" in line 46, as well as chanting together with the onset of chimpanzee behaviors, as exemplified by the utterance "yoisho", made when TB climbed up the stairs (line 43). These types of verbal utterances are particularly useful for speakers to smooth the flow of interactions and when the speaker cannot expect a clear response from the recipients.

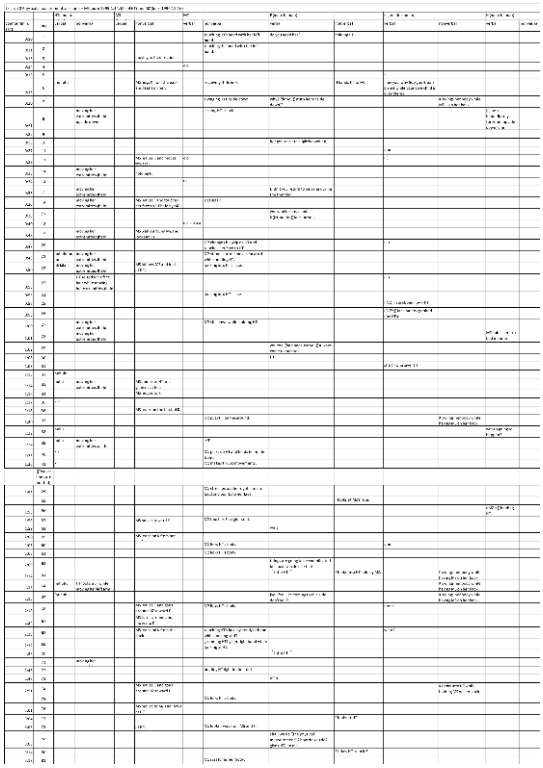
3.2 Caregiver–child interactions among chimpanzees and humans

28 This section focuses on more complicated human–chimpanzee interactions, specifically interactions in which more than two chimpanzees are actively engaged. The analysis will illustrate some differences between human–chimpanzee and chimpanzee–chimpanzee interactions.

29 Excerpt 2 was extracted from a video of the physical measurement of female chimpanzees MS (aged 9 years) and MZ (aged 11 years). These measurements were performed slightly before Excerpt 1, on the same day. This excerpt took place in the same small room with the same human trainers and researcher who appeared in Excerpt 1, along with the

female infant chimpanzee HT. The humans (F, K, H, and S) had the same responsibilities as in Excerpt 1. S was again excluded from the transcription because he rarely interacted with other participants in the excerpt. As mentioned above, HT was raised by human trainers and researchers because her mother (MS) had stopped nursing her soon after birth. F entered the room carrying HT under his arm. At the time of recording, the group was enjoying a semi-free session before the onset of physical measurements.

Table II (Excerpt 2)



Physical measurement session for MS (born 1999.1.14: Mo of HT) and MZ (born 1996.12.16).
Session de prise de mesures physiques sur MS (née le 14/1/1999 : mère de HT) et sur MZ (née le 16/12/1996).

30 MZ curiously looks at HT, who is clinging to F, and touches HT's head with her left hand. Seeing this, F gives a candidate understanding of MZ's behavior by saying "do you need her?" (line 1). F then hands HT to MZ. MZ makes short grunts "o o" and receives HT (line 4), while HT whimpers "[huhuhu" (line 6). MS scratches her head and then moves behind MZ and HT toward the direction of K (line 3). Then, MS hugs K from the back and leans on her while K says "[hey you, why ((do you)) lean on me while your own child is over there?" (line 6). Although this utterance by K contains an accusatory nuance, K does not resist MS leaning on her back. K then starts swinging her body while MS is on her back and looks at the interplay between MZ and HT (line 7).

31 After receiving HT with both hands, MZ swings her upside down and kisses HT's back around the genitals (lines 7 and 8). HT struggles by moving her extremities. Seeing this, F makes an accusatory utterance "why [((do you)) (turn her upside down)?" in line 7. Overlapping with this utterance, H makes the comment "[((she)) immediately turns her upside down, umn" to the video (line 8). F then makes a comment "her genitals are slightly swollen" (line 10). K acknowledges this by saying "umn" in line 11.

32 HT keeps moving her extremities. Meanwhile, MS leaves K and then moves behind MZ and HT toward the direction of F (line 12). MS then hugs F from his left side (line 13). Grabbing MS's left elbow with his left hand, F asks a question "Didn't you return to be sane during the thunder" to MS (line 15). Thunder here indicates the recent heavy rain. By asking this tag question in a joking manner, F indicates that MS is insane, because she has not taken care of her child HT. MS leaves F and then touches her face to HT, held by MZ (line 16). HT is moving her extremities. F adds the comment "you won't change unless it ((=thunder)) falls on you" (line 17). MS walks around MZ and looks at HT again (line 19). MZ changes his grip on HT and touches her face to HT (line 20). MZ then stands up and moves forward while holding HT (line 21). During the course of these actions, HT whimpers "huhuhuhuhu" (line 21) and then gives a short scream "hh kiki" (line 22) while opening her mouth wide and moving her extremities. MZ looks into HT's face. MS follows MZ and looks at HT from MZ's right side (line 22). HT keeps moving her extremities. Then, K says "((MZ)) is grabbed ((by HT))" (line 25) and "((MZ's)) face hair is grabbed ((by HT))" (line 26). MZ then sits down while holding HT (line 27). H comments on this by saying "MZ holds her in a bad manner" in line 28. F then says to HT, "you too ((bad, because you)) always come to humans" in line 29. HT looks at F while moving her extremities. Then, F exchanges a few words, which are difficult to hear in the video, with K (lines 30 and 31). Then, MS comes to HT, who is whimpering by opening her mouth wide, and glances at her (line 33). However, MS immediately goes back to K and leans on the back of K (lines 34 and 36). K swings her body while having MS on the back (line 37).

33 MZ then puts HT on the ground (line 37). Looking at this H says "what's going to happen?" (line 38). HT whimpers "huhuhuhu" (lines 38 and 39). When MZ picks up HT and holds her in front, HT utters a short scream, "kiki, ki" (lines 40 and 41). HT then becomes quiet while MZ is holding her while MZ makes thrusting movements (line 41). Due to page restrictions, 12 lines are omitted here.

34 In line 54, MZ stretches out her right hand to food and points to her face. This is a gesture requesting that F give her the food piece. F looks at MZ's face. H makes a comment, saying "((MZ is)) holding HT." (line 56). MZ then touches F's right hand as if to repeat the request (line 57). F replies to this action by saying "wait" in line 58. MZ then starts licking HT's body (line 60). When she licks HT's genitals, F says to MZ, "things are going to be complicated because you do like that" (line 62).

35 F then looks to HT, held by MZ, and calls HT by saying "°little HT°" in line 63. HT looks at F and whimpers "huhuhu" while pursing her lips and moving her left arm (line 64). Looking at this, F gives a candidate understanding of HT's reactions, saying "[you feel like coming to this side, don't you?" (line 65). MZ licks HT's body again (line 66). MS leaves K and goes around MZ toward F (line 66). Then, MS immediately turns around and moves to K from her back (line 67). Although K says "what?" to MS, K allows MS to lean on her (line 68).

36 MZ touches HT's face and grooms her with her right hand while looking at HT (lines 68 and 69). Then, F addresses HT by name by saying "°little HT°" again (line 70). HT moves her extremities as she tries to move toward F (line 71). MZ then holds HT tight in front of her (line 72). This action appears to hide HT from F and, at the same time, prevents her moving away. F says "umn" to MZ (line 73). Then K comes closer to MZ and looks at HT while holding MS on her back (line 74). MS then leaves K and goes around MZ toward F (line 74). However, MS immediately turns around and moves to MZ and curiously looks at HT (line 76). MS almost touches her face to HT. F looks at HT (line 77). MZ then looks away

from them (line 78). MS follows HT and looks at HT again (line 78). F then says to MZ, “shall we do ((the physical measurement))? how do you do? give ((HT)) to me.” (line 79) and then takes HT from MZ (line 80). MZ scratches her body (line 81).

Uses of body movements

37 In this video excerpt, one of the female chimpanzees, MZ, showed great interest in the infant chimpanzee HT. However, the mutual coordination of body movements between MZ and HT did not go well. For example, MZ touched HT (line 1) and then held her (line 6). When MZ held HT upside down and kissed around her genitals, HT started struggling by moving her extremities (lines 7 and 8; Figure 5). Moreover, HT uttered a short scream when MZ stood up and started moving forward while holding HT awkwardly. MZ then quizzically looked into HT’s face (line 22) while HT grabbed MZ’s face hair as if resisting her (lines 23). Soon, MZ put HT on the ground (line 37). HT whimpered, which indicates she was afraid (lines 38 and 39). When MZ picked up HT abruptly and held her tightly in front of her, HT again uttered a short scream (lines 40 and 41; see the next section regarding the vocal sounds that they made during these interplay).

Figure 5

MZ holds HT upside down, and HT struggles by moving her extremities.
MZ tient HT à l’envers, et HT se débat en remuant ses extrémités.

38 Because HT had mainly been raised by humans, she was not used to the behavioral patterns of chimpanzees. For example, MZ often licked her body, while human trainers rarely did so. HT was more accustomed to the behavioral patterns of human caregiving. When F looked at HT and called her a name (lines 63), HT immediately responded by looking at him and whimpering while moving her left arm and pursing her lips (line 64). F quickly interpreted these actions to mean that HT wanted to move to his side (line 65) (for a discussion, see the next section as well).

39 The other female chimpanzee, MS, also showed some interest in HT, who is her biological daughter. Nevertheless, MS could not interact with HT smoothly. In this video excerpt, MS touched HT’s face while HT was held upside down by MZ in line 16 (Figure 6). Then, she went back and forth around HT while HT was being held by MZ and looked at HT many times (lines 19, 22, 33, 76, and 78). However, she was not involved in any additional

physical interaction with HT. Instead, MS hugged or leaned on F and K several times (lines 6, 13, 36, 59, and 68). K swung MS from side to side while she was on her back (lines 7 and 37). The human trainers had cared for MS since her childhood and had helped shape her behavioral patterns. When MS felt frustrated, these behavioral patterns appeared to ease her.

Figure 6

MS touches her face on HT held upside down by MZ.
MS touche HT de son visage tandis que celle-ci est tenue à l'envers par MZ.

40 Adult chimpanzees other than mothers are known to enjoy holding infants. However, they are not permitted to do this unless the mother trusts them. Therefore, these adults often groom the mothers to gain their trust (Nishida and Hosaka, 2001; Matsuzawa, 2005). Interestingly, in this excerpt, although MS is HT's birth mother, she probably had to gain the trust of MZ, who had primary access to HT, to get closer to HT.

41 When MS looked at HT, she tended to persistently gaze at her. For example, when MS looked at HT (line 19), MZ soon stood up and then moved forward while holding HT (line 21). However, MS followed MZ and looked at HT from MZ's right side (line 22; Figure 7). Similarly, MS curiously looked at HT and almost touched her own face to HT's (line 76). MZ then looked away from her as if to avoid the gaze. Nevertheless, MS followed HT and kept looking at HT (line 78). This kind of persistent gaze is a distinctive pattern of interaction among chimpanzees. Researchers have suggested that the pattern is highly relevant to their learning style; that is, taking a long time to observe and reiterating using trial-and-error countless times. Young chimpanzees are reportedly able to acquire a certain pattern of behavior by repeatedly observing the relevant behaviors as they are performed by nearby individuals. When they observe such behaviors, they often come very close to these individuals (Ueno, 2006; Fujimoto, 2008). Mothers are usually tolerant of their children looking at them, despite the fact that adult chimpanzees frequently fight with one another (Matsuzawa, 2005).

Figure 7

MS looks into HT from MZ's right side.
MS regarde HT depuis le côté droit de MZ.

Uses of vocal sounds

42 Goodall (1986) classified 34 discrete chimpanzee calls along with the emotions with which they are associated. However, vocalizations that lack signs of emotional arousal are rarely observed among chimpanzees (Tomasello and Camaioni, 1997; Goodall, 1986).

43 Excerpt 2 illustrates several of the distinctive vocalization patterns of chimpanzees. When F handed HT to MZ, MZ made short grunts "o o" (line 4). This vocalization showed that MZ acknowledged that she received HT. HT's whimpers of "[huhuhu" (line 6) and "huhuhuhuhu" (line 21) indicate that HT was afraid of being held awkwardly. Nevertheless, MZ stood up and moved forward while holding HT (line 21). The following short scream, "hh kiki", and her facial expression (opening her mouth wide)(line 22) shows that HT was frightened of being carried in an uncomfortable position by MZ. The whimpers, screams, and facial expressions made by HT in lines 32–35 and 38–41 demonstrate a similar pattern of awkward interplay between MZ and HT.

44 In contrast, HT was accustomed to interacting with human trainers using vocal sounds. When F looked at HT and called her name softly by saying "°little HT°" (line 63), HT immediately responded by whimpering "huhuhu" with her lips pursed. Moreover, she started moving her left arm widely while looking at him (line 64). F interpreted these reactions by HT to mean that she wanted to move to his side (line 65). A similar pattern of interactions was also observed between F and HT in lines 70 and 71. These call-and-response interplays exemplified one of the common types of adjacency pairs. As shown in these examples, the human trainers at GARI tended to treat HT as they would treat a human infant. HT coordinated her actions to respond to this treatment. Such coordination is understandable given that human-raised chimpanzee infants are known to develop several communicative gestures and to actively engage in various kinds of play with human caregivers (Bard *et al.*, 2014). Indeed, even researchers who are skeptical about chimpanzees' capacity to imitate have admitted that some human-raised chimpanzees seem to focus more on actions (Tennie *et al.*, 2009). Additionally, researchers

have demonstrated interesting similarities in the developmental process of chimpanzee and human children. For example, like human babies, chimpanzee babies are born with distinctive primitive reflexes such as the Moro reflex, rooting reflex (the reflex by which a newborn infant will turn his/her head toward anything that strokes his/her cheek or mouth, searching for the object by moving his/her head or mouth in steadily decreasing arcs), and the sucking reflex (Matsuzawa, 2006). Moreover, human and chimpanzee infants exhibit neonatal smiling (Tomonaga *et al.*, 2003; Matsuzawa, 2005), neonatal imitation (Myowa, 1996), and general movements (a series of gross movements of variable speed and amplitude that involve all parts of the body) (Tomonaga *et al.*, 2003). The features of eyesight are more or less identical between humans and chimpanzees (Matsuzawa, 2006). Chimpanzees even come to 'laugh' in association with vocalization during the course of development (Matsuzawa, 2005; also see the review of chimpanzee facial expressions in Waller and Micheletta, 2013).

45 Human trainers teased the chimpanzees several times, which sounded like accusations about certain chimpanzee behaviors. For example, when MZ held HT upside down and kissed HT around the genitals, F made an accusatory utterance "why [((do you)) (turn her upside down)?" to MZ (line 7). MZ did not respond to F. Nevertheless, F did not make further accusations. F thus appears not to have expected that MZ would understand the meaning of his accusatory utterance when he made it in line 7. Rather, he appears to have intended the surrounding humans to be the hearers of his utterance addressed at MZ. Note that 'hearer' does not necessarily coincide with 'addressee' —an 'addressee' is the speaker's view of a recipient, whereas the 'hearer' is a party other than the speaker who participates in a portion of the talk (Goffman, 1981: 131–133; Goodwin and Goodwin, 2004). F's later utterance, "things are going to be complicated because you do like that" (line 62), exhibited a similar function of twitter.

4 Concluding Remarks

46 Previous studies have reported that despite the well-known intelligence of chimpanzees, they have very a limited ability to use symbols, compared with humans. Some scholars have proposed the use of symbols as a distinctive feature of humans, playing a central role in communication (Piaget, 1937/1952, 1942/1951; Tomasello, 1999; Tennie *et al.*, 2009; Cartmill and Byrne, 2010; Tomasello *et al.*, 2012; Cartmill *et al.*, 2014). The logical consequence of these claims is that the style of communication between humans and chimpanzees would be very constrained and imbalanced. However, this was not the case during the actual interactions between humans and chimpanzees examined here. Additionally, a number of researchers have expressed attitudes sympathetic to the behaviors of chimpanzees and have written about the emotional rapport they developed with them (Goodall, 1986; Matsuzawa, 2000; Nakamura, 2009; Bard *et al.*, 2014).

47 Our results suggest that humans and chimpanzees are able to mutually coordinate their behaviors to a considerable extent using diverse semiotic resources other than symbols. Using various kinds of body movements and vocal sounds (including hand gestures, scratching, facial expressions, grunts, whimpers, and screams), the chimpanzees demonstrated how they perceived their situation or what they would like to do. Human trainers also enacted various meanings by using their body movements and verbal utterances. In particular, they encouraged chimpanzee–human interactions through turn-taking, a distinctive style of human communication, by introducing several types of

adjacency pairs. Additionally, when they did not expect clear responses from the chimpanzees, they used other types of utterances, such as offering a candidate understanding of chimpanzee behaviors, making comments about chimpanzee behaviors, and chanting together with the onset of chimpanzee behaviors, to help smooth the flow of the interactions.

48 Semiotic resources used by humans overlap partially with those used by chimpanzees. Additionally, environmental settings affect which resources are available for the actual interactions. A multimodal approach is thus necessary to unravel how human–chimpanzee interactions are organized (cf., Goodwin, 2000; Waller *et al*., 2013). Our results suggest that the captive chimpanzees at GARI lived in accordance with the rhythm of the human trainers and researchers. The humans enabled the chimpanzees, on which they depended for their professional livelihood, to develop skills they would never have developed in the absence of interactions with humans while also adjusting their own actions in accordance with the rhythm of the chimpanzees. In this sense, the chimpanzees also domesticated the humans (Lestel, 1998). As they have accumulated interactional histories, the chimpanzees at GARI have formed a common context with human trainers and researchers despite the differences between species. Most of the 'abilities' that were attributed to chimpanzees were extracted from the behavioral patterns observed in those close humans.

49 In contrast, the interactions between HT and adult chimpanzees reveal that their interactional history is currently insufficient to ensure stable interaction patterns among them. This resulted in serious interactional problems between HT and the other chimpanzees, which made it difficult for them to get along. This is quite different from Rossano's (2013) findings about mother–infant interactions among captive bonobos: Mothers, and infants who were raised by their mothers, regularly engaged in successful adjacency pair-like sequences and persisted in soliciting responses when they were not forthcoming. The behavior of respondents was generally very cooperative and did not require much coercion or insistence by initiators.

50 The interaction patterns between HT and adult chimpanzees reflects both the interactional history of these individuals and the more general features of captive chimpanzees who have spent a considerable proportion of their life in close contact with humans. Further research is needed to systematically distinguish these aspects from each other.

51 By attempting to analyze how these cross-species interactions are organized, we worked to disentangle the deep congruence between nature and society from the perspective of the participants in the interactions (Sugawara, 2002). Furthermore, by accumulating such attempts, we may be able to redraw the boundaries between humans and chimpanzees.

52 Most ethology and cognitive science research involving captive chimpanzees has tried to assess what chimpanzees can achieve within a framework of methodological individualism. These studies tend to be based on individualistic ability, especially the universal ability that allows each individual chimpanzee to operate objects or signs. In contrast, we did not disconnect the sender and the receiver of information in the actual interactions, but used the relationship between them as the unit of analysis. We also tried to clarify the mechanisms by which each action was embedded in the proximate social context as well as how it constructed the proximate social context for the next action.

53 The two kinds of studies differ only in terms of approach. We cannot say which approach is 'right,' but an individualistic approach is less able to focus on sociality among humans and chimpanzees. As is often said, society is more than the sum of its individuals. By clarifying the mechanisms by which interactions are spatiotemporally organized, we will be able to reconsider the foundations of societies built by humans, those built by chimpanzees, and those co-built by humans and chimpanzees. This kind of approach will also open the way to empirical research about the dynamic processes by which individuals are socialized into a given society and how they may change the society.

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NOTES

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ABSTRACTS

This study deepens our understanding of sociality established between chimpanzees and humans by analyzing the sequential organization of interactions in a laboratory setting. We conducted an interaction analysis of two short video clips that recorded a physical measurement event at the Great Ape Research Institute (GARI), Tamano, Japan. The results indicated that captive chimpanzees demonstrated how they perceived their situation, or what they would like, using various kinds of body movements and vocal sounds including hand gestures, scratching, whimpers, and screaming. Human trainers also enacted various meanings using body movements and verbal utterances. In particular, they encouraged chimpanzee–human interactions to include turn-taking, a distinctive style of human communication, by introducing various types of adjacency pairs. They also used other types of utterances, such as providing comments to clarify chimpanzee behaviors to smooth the flow of interactions when a chimpanzee was unlikely to provide a clear response. Analyses of the accumulated interactional histories revealed that most captive chimpanzees and humans in GARI appear to have formed mutually coordinated interaction patterns despite the differences in available semiotic resources between the two species. One exception was an infant chimpanzee raised by humans, who had not yet accumulated a sufficient interactional history to form stable interaction patterns with other chimpanzees. This caused serious problems for the infant and other chimpanzees, making it difficult for them to get along. Our results suggest that captive chimpanzees can adapt to live in accordance with the rhythm of humans in an environment largely constructed by humans, and that humans can coordinate their actions in accordance with the rhythm of chimpanzees. These findings are particularly important and suggest that analyses of human–chimpanzee interactions may help inform research about the foundations of societies built by humans, built by chimpanzees, and co-built by humans and chimpanzees.

Cette étude approfondit notre compréhension de la socialité qui s’instaure entre chimpanzés et humains en examinant l’organisation séquentielle de leurs interactions dans un contexte de laboratoire. Nous entreprenons une analyse interactionnelle de deux courts extraits vidéo à propos d’une situation de prise de mesures physiques sur des chimpanzés à L’Institut de Recherche sur les Grands Singes (GARI), Tamano, Japon. Les résultats indiquent que les chimpanzés manifestent comment ils perçoivent leur situation ou expriment ce qu’ils veulent par des mouvements du corps et des sons vocaux, tels que des gestes de la main, se gratter le corps, geindre, et crier. Les soigneurs produisent également des significations variées par des mouvements du corps et des déclarations verbales. Dans l’interaction avec les chimpanzés, ils

favorisent notamment l'inclusion d'un type de communication typiquement humaine, le « tour de parole », en introduisant différents types de paires adjacentes. Ils produisent également d'autres types d'énoncés, par exemple des commentaires qui clarifient les comportements des chimpanzés, permettant de fluidifier le déroulement des interactions lorsque la réponse de ces derniers est obscure. La plupart des chimpanzés captifs et des humains du GARI semblent avoir formé des patterns d'interaction mutuellement coordonnés au cours de leurs histoires interactionnelles, ceci en dépit des différences entre les ressources sémiotiques des deux espèces. Une exception est un nourrisson chimpanzé élevé par les humains : celui-ci n'a pas encore accumulé suffisamment d'histoires interactionnelles qui pourraient donner lieu à des configurations d'interaction stables avec les autres chimpanzés. Ceci a posé de sérieuses difficultés tant au nourrisson qu'aux autres chimpanzés, les empêchant notamment de bien s'entendre. Nos résultats suggèrent que les chimpanzés captifs peuvent s'adapter à une vie rythmée par les humains, au sein d'un milieu largement construit par ceux-là, et que les humains peuvent quant à eux coordonner leurs actions avec le rythme des chimpanzés. Ces résultats sont particulièrement importants et suggèrent que l'analyse des interactions humains-chimpanzés peut informer la recherche sur le fondement des sociétés humaines, chimpanzières, ainsi que de leurs sociétés partagées.

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