LA PRIMATOLOGÍA EN LATINOAMÉRICA 2
A PRIMATOLOGIA NA AMERICA LATINA 2

Tomo II Costa Rica-Venezuela

Editores

Bernardo Urbani

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Índice

Barbados

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Guatemala

Puerto Rico

Uruguay

Venezuela

From Overprotection of Habitats to Uncontrolled Overharvesting: Paradoxal Conservation Strategies and Success for Primates in French Guiana

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Abstract

The region of the Guianas covers more than 2 million km^2 of northeast Amazonia, with historic absence of large-scale deforestation. The region is consequently an area of recognized importance for conservation of large terrestrial mammals. Notably, French Guiana benefits from a good network of protected areas, shows an efficient policy for forest preservation, and can rely on a wide range of regulations to promote, as far as possible, sustainable use, and to prevent important forest loss. However, rather than threats on habitat, primates (and other wildlife) are widely threatened by hunting, which, paradoxically, is still almost unmanaged and poorly controlled in this country. Hunting is practiced almost everywhere, by all communities, with few or no regulation, and widespread evidence of overharvesting. Empty forests are expanding and key ecological processes are likely not guaranteed anymore in many areas. This lack of initiative of governmental agencies to mitigate this issue will have serious consequences for long-term ecosystem conservation, but also results in important social disorders in native communities.

Resumen

De la sobreprotección del hábitat a la sobreexplotación descontrolada: La paradoja de las estrategias y éxito de conservación de los primates de la Guyana Francesa

La región de las Guayanas cubre más de 2 millones de km^2 de la Amazonia nororiental y cuenta con una ausencia histórica de deforestación a gran escala. Consecuentemente, la región es un área de gran importancia para la conservación de mamíferos terrestres grandes. Notablemente, la Guayana Francesa se beneficia de una red de áreas protegidas, muestra una política de preservación de bosques eficiente y tiene una amplia serie de regulaciones que permiten promover el uso sustentable de los bosques y prevenir pérdidas importantes de los mismos. Sin embargo, más que las amenazas directas a su hábitat, los primates (y otra fauna silvestre) están altamente amenazados por la cacería, la cual, paradójicamente, aún existe prácticamente sin manejo y está pobremente controlada en este país. La cacería se practica casi en todo el país, por todas las comunidades locales, con poca o nula regulación, y con una amplia evidencia de sobreexplotación. Los bosques vacíos están expandién-

Key words Conservation, forest management, hunting, monkeys.
Palabras clave Cacería, conservación, manejo de bosques, monos.

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dose y los procesos ecológicos clave, muy probablemente, ya no se pueden asegurar en muchas áreas. La falta de iniciativa de las agencias gubernamentales para mitigar este problema tendrá consecuencias serias para la conservación de los ecosistemas a largo plazo, pero también resulta en importantes desórdenes sociales en las comunidades nativas.

INTRODUCTION

Global forest loss in South America, and in Amazonia, faces increasing and alarming rates, threatening diversity and ecosystem services. Forest loss remains nevertheless much lower north of the Amazon basin, and in the Guiana shield region that includes Guyana, Suriname, French Guiana, and the Brazilian state of Amapá (Eva *et al.* 2012; Hansen *et al*. 2013). This region is the largest contiguous region of exposed Precambrian rock in South America, covering more than 2 million km^2 of northeast Amazonia (Goodwin 1996). Historic absence of large-scale deforestation makes this region the largest repository of tropical forest vegetation on Precambrian terrain worldwide (Hammond 2005). But rather than the problems with agriculture, deforestation, and fires that occur elsewhere in Amazonia, gold mining is the main threat in the region for freshwater ecosystems and species (Hammond *et al*. 2007; Alvarez-Berrios & Aide 2015). Although terrestrial habitat loss remains low (Hansen *et al*. 2013), threats to wildlife are nevertheless present and growing in the region, due to increasing human population growth, no regulation of hunting, and widespread unsustainable harvesting (de Thoisy *et al*. 2005, 2010). More than direct deforestation, those cryptic pressures threaten the future of vertebrate communities, but remain challenging to bring out due to lack of precocious indicators and/or proxies of population collapses, regional and local variation of pressures and consequently of populations responses, and almost no detectable effects on habitats.

Eight primate species occur in French Guiana (Figure 1). Seven of these species are widely distributed: the black spider monkey *Ateles paniscus,* the red howler monkey *Alouatta macconnelli*, the tufted and wedge-capped capuchins *Sapajus apella* and *Cebus olivaceus,* the white-faced saki *Pithecia pithecia,* the squirrel monkey *Saimiri sciureus*, and the golden-handed tamarin *Saguinus midas.* The bearded saki (*Chiropotes sagulatus*) is restricted to the South of the country. To date, the Regional Red Listing process suggests that for all species the remaining large areas of undisturbed habitats imply a Least Concern status, although some species (e.g., the Black spider monkey and the wedge-capped capuchin) are close to the "Near Threatened" threshold (Huguin & de Thoisy 2016).

Setting-up priorities for conservation in largely undisturbed regions such as the Guianas may differ from those commonly applied to highly disturbed and human-dominated regions (Schipper *et al*. 2007). Conservationists are expected to provide policymakers and managers with integrative strategies that (i) are representative of major biodiversity features: distribution of richness, maintenance of ecological processes, source-sink systems, (ii) benefit from adequate indicators of failures and successes, (iii) incorporate all socioeconomic components, notably, but not only, those of traditional communities, (iv) are flexible to adapt and change, according to the trends of threats, pressures, and successes, (v) overcome substantial information gaps, (vi) are financially sustainable and are developed across disciplines to maximize efficiency and stakeholder to buy-in (Schipper *et al*. 2007).

Here we aim to use the status of primates in French Guiana exploring current population levels and trends, as well as the extent and strengths of threats and pressures, to illustrate and discuss this portfolio of conservation measures, highlight efficiency and weaknesses of current initiatives, and make suggestions for improving conservation efforts and efficiency.

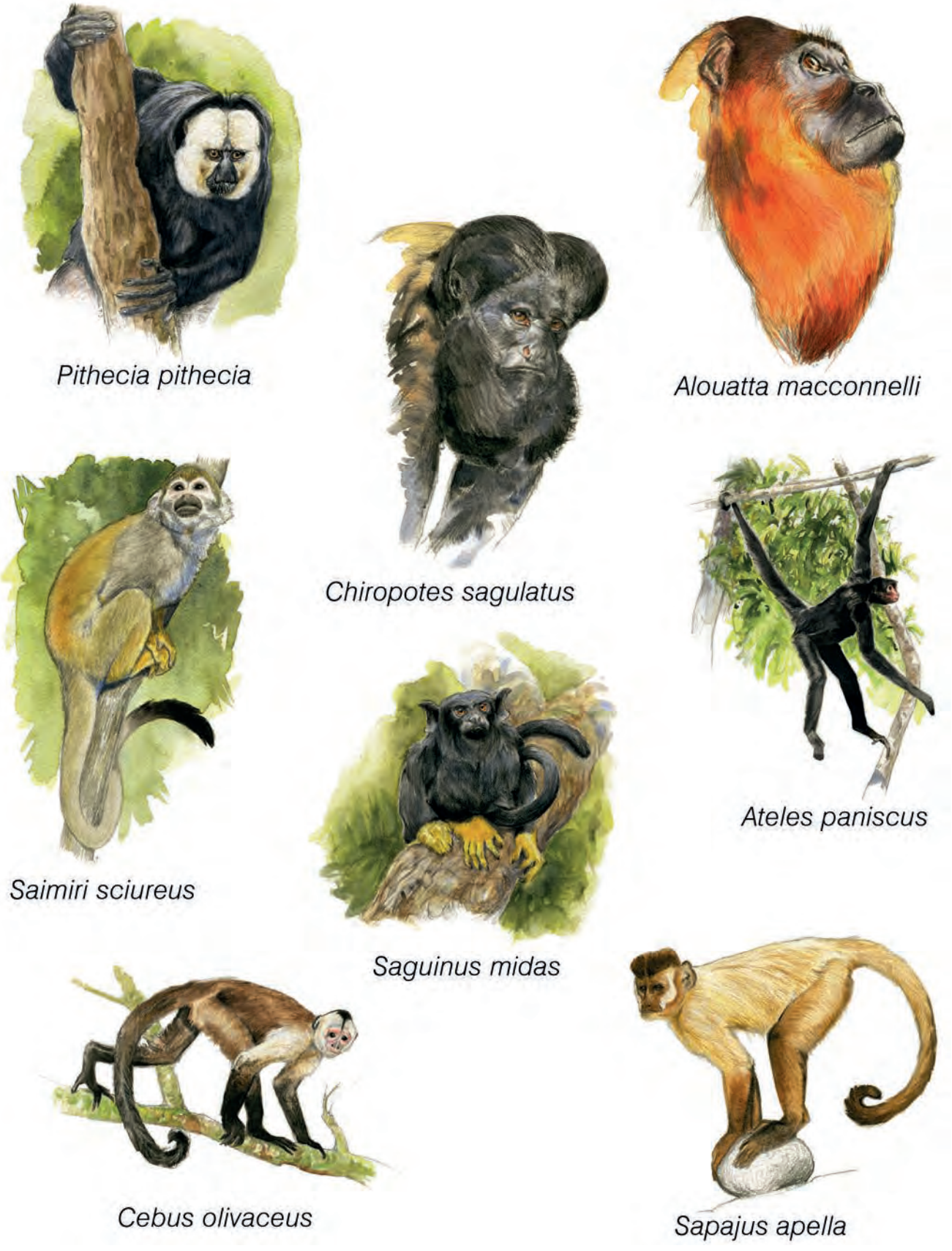

Figure 1. Illustrations of the eight primate species that occur in French Guiana (Author: Céline Lecoq / CPIE Cotentin)

MATERIALS AND METHODS

The country

French Guiana is a French administrative unit of 84,000 km^2. Eighty percent of French Guiana is covered by upland moist forests occurring on generally well-drained clayic ferralic soils over altitudes of 0–600 m. Canopy reflectance has allowed defining five main types of vegetation on the basis of forest structure: low dense forests, high forests with regular or disrupted canopy, mixed high and open forests, and *Euterpe* palm forests (Gond *et al*. 2011). Within those types, tree species composition varies according to the relief: forest communities are highly diversified on all-slope reliefs, although rather dominated by Lecythidaceae on the northern hilly multi-convex reliefs, by Leguminosae-Caesalpinioideae on the central tablelands, and by Burseraceae on the southern inland plains (Guitet *et al*. 2015a). The alluvial coastal plain is covered by marsh forests, savannas, transition forests, herbaceous swamps, and is rather narrow on this part of the Guiana shield (de Granville 1988).

Habitat conservation and management measures

French Guiana benefits from an extensive network of protected areas (Figure 2), including five Nature Reserves, located by patches on the northern half of the country, and a National Park in the south. The five Nature Reserves, cover 3% of the territory on the north: Nouragues (100,000 ha; IUCN category I), Trinité (76,000 ha; IUCN category Ia), Kaw Roura (94,500 ha; IUCN category IV), Amana (14,800 ha, IUCN category IV), and Trésor (2,500 ha, IUCN category Ib). The protected area of the Amazonian National Park covers some 20,300 km² for the central area (where full protection is enforced) and 13,600 km² for the secondary area. Thus, the overall protected area represents some 33,900 km² of rain forest.

Outside protected areas, management of the forest areas is under the responsibility of governmental agencies. The logged areas are restricted to the north of the country. About 24,000 km² are directly managed by the National Forest Agency (Office National des Forêts, ONF) and include areas of production and areas dedicated to protection of forest resources (Brunaux & Demenois 2003). Selective logging (wood extraction, commerce) is carried out by small private companies, but management of logged areas, opening of logging tracks, and identification of wood resources is under the responsibility of the ONF. The continuous presence of the Forest Agency on the field prevents large-scale illegal wood harvesting. Within logged areas, management units are defined for one or two years of activity, and then released. Management units have a mean size of 500–1,000 ha, the average surface area forest of cutting blocks is approximately 300 ha, and harvest intensity varies from three to six trees/ha (10–15 m^3/ha) (Pithon *et al*. 2013). Rotation periods are planned to occur every 30–50 years. In French Guiana, as a European administrative unit, the Pan European Forest Council (PEFC) eco-certification has been mandatory and a double Forest Stewardship Council (FSC)/PEFC certification process is underway. The PEFC criteria include, among others, (i) the maintenance and appropriate enhancement of forest resources and their contribution to the global carbon cycle, (ii) the regulation, monitoring and control of the exploitation of non-timber forest products, including hunting and fishing, and (iii) the obligation of maintenance, conservation and appropriate enhancement of biological diversity in forest ecosystems (PEFC 2010). This certification process guarantees a relevant and efficient framework for protection of logged forests in French Guiana.

Primates and the threats they face

In French Guiana hunting is strictly forbidden only in nature reserves (3% of the country, Figure 2). Outside protected areas, only three out of the eight primate species are fully protected: *Ateles paniscus*, *Pithecia pithecia,* and *Chiropotes chiropotes*. For the other five, harvest is legal, as soon

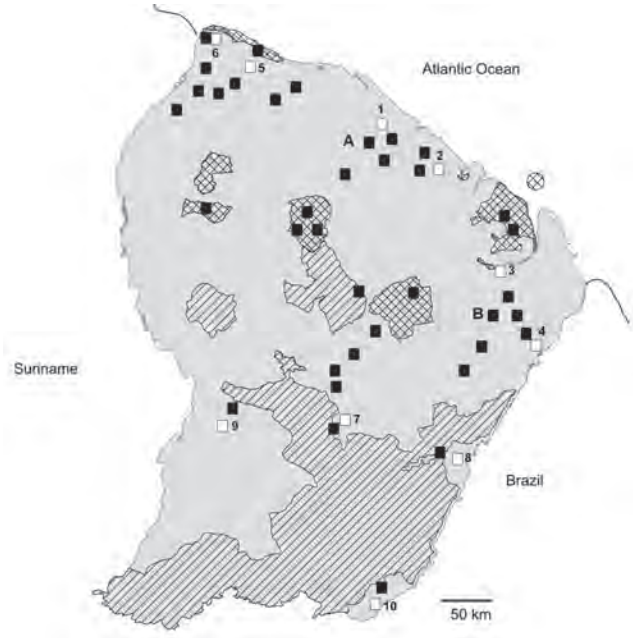

Figure 2. Map of French Guiana, showing Protected Areas (single and crosshatchings). Hunting is prohibited only in areas with crosshatching. White squares: places where sustainability of harvesting was assessed. Black squares: places analyzed for primate abundance.

as they remain for the own consumption of the hunters. Quotas were implemented in 2011 and it is expected that they have been applied since 2014. According to the regulatory text, two howler monkeys, two brown capuchins, and one wedge-capped capuchin can be harvested, by hunter and by trip. Quotas do not apply within the National Park, and do not apply to traditional communities using nature resources for their own uses and needs.

To assess primate status, we focused our approach on the two main threats for forest mammals in French Guiana: hunting and decrease of habitat quality (de Thoisy *et al*. 2005, 2010). We used both direct surveys and quantifications of harvests. Sites were surveyed with line transects by walking slowly (mean speed: 1–1.3 km/hour) along a forest path; each site was surveyed using a single transect of 4–5 km. A set of 60 surveys (Figure 2), including previously published (n=41, de Thoisy *et al*. 2009), and new ones (n=19) was considered in this analysis. On each site, several descriptors were recorded, including biogeographic and botanic factors: (a) mean slope, (b) slope rage, (c) biogeographic regions (Guitet *et al*. 2015a), (d) vegetation classes defined from remote-sensing analysis of canopy reflectance (Gond *et al*. 2011), (e) above-ground biomass (AGB, Guitet *et al*. 2015b), (f) canopy height (Fayad *et al*. 2014). Also, (g) the human footprint (HF) index was considered, which summarizes anthropogenic threats (de Thoisy *et al*. 2010). The index was developed by superimposing geographical and human demographic and activity data, including human population densities, land use, settlements and camps, mining and forest activities, tracks, roads and rivers. The associated grades were: (i) Logging: 0 = no logging, 1 = ancient logging (<10 years), 2 = recent and short (1-year period) logging, 3 = recent and long logging period; (ii) Hunting: 0 = no hunting, 1 = light hunting pressure, 2 = medium hunting pressure, 3 = heavy hunting pressure; (iii) Fragmentation: 0 = no fragmentation, 1 = one forest track close (<3 km), 2 = several tracks in the immediate vicinity, 3 = site isolated from the continuous forest block; and (iv) access by motorized engine (boat or car): 0 = >10 km from the closest access, 1 = closest access 5–10 km away, 2 = closest access 2–5 km away, 3 = closest access <2 km from the survey site.

Species richness and relative abundance were used to compare the primate communities among different sites, using canonical correspondence analysis (McGarigal *et al.* 2000). To illustrate pairwise similarities among sites, we also performed non-metric multidimensional scaling (NMDS) with a Gray-Curtis similarity index: this iterative method circumvents the linearity assumption of metric ordination methods and is consequently adapted to abundance data (Kenkel & Orlóci 1986).

Primate harvest was described on ten sites (Figure 2) distributed throughout the country, including those hunted by Amerindian and/or mixed communities (de Thoisy *et al*. 2009). Among these sites, game harvest was monitored for 5 to 14 months. Data were collected with both direct interviews and questionnaires provided to hunters of the communities surveyed. The information requested was: personal data (age, name), trip duration, transport methods, weapons, harvest sites, and age and gender of harvested species. The hunting sites were specified on the basis of the toponymy known by hunters in order to locate the harvests, and subsequently to define the size of the hunting areas. Sustainability was assessed using Robinson & Redford

maximal sustainable harvest model (Robinson 2000). The observed harvest was the number of primates hunted annually in the hunting area. This observed offtake was compared to a maximal offtake, which was the number of primates that could be sustainably hunted in the same area with no significant risk of overharvesting. Calculation of this maximal offtake requires data on the density of primates, size of the hunting area, and a threshold value derived from life history and species growth rate data. For primates, this threshold value is 3% of the population, and offtake is calculated as density x hunting core area size x 0.03 (Robinson 2000). Corrections were made on the number of hunters, and on the harvest areas, in order to cover interview biases (Renoux & de Thoisy 2016).

RESULTS

Abundance of primates: regional variation and trends

The Canonical Correspondence Analysis shows a major contribution of human footprint, biogeography, and altitude to explain primate abundances (Figure 3). On the basis of the abundance of the four large primates (*A. macconnelli*, *A. paniscus*, *S. apella* and *C. olivaceus*), the NMDS and Minimum Spanning tree based on the abundances of large primates propose four groups of sites that are mainly explained by the hunting pressure (Figure 4). Additionally, based on our longitudinal study (surveys were repeated every 2–3 years, on a 15 years-long period, sites A and B in Figure 2) two sites that experienced progressive increase of HF associated to logging and establishment of new tracks, and consequently accesses for hunters, show a clear negative trend of diversity and abundance of large species (Figure 5).

Community richness and species abundances show a strong negative correlation with Human Footprint (r^2=-0.66, p<0.001 for community richness, and r^2=-0.38 p=0.003, r^2=-0.47 p<0.001, r^2=-0.38 p=0.002, and r^2=-0.47 p<0.001 for *S. apella*, *A. maconnelli*, *C. olivaceus*, and *A. paniscus* abundances, respectively). Focusing on *A. paniscus*, abundance begins to decrease as soon as the

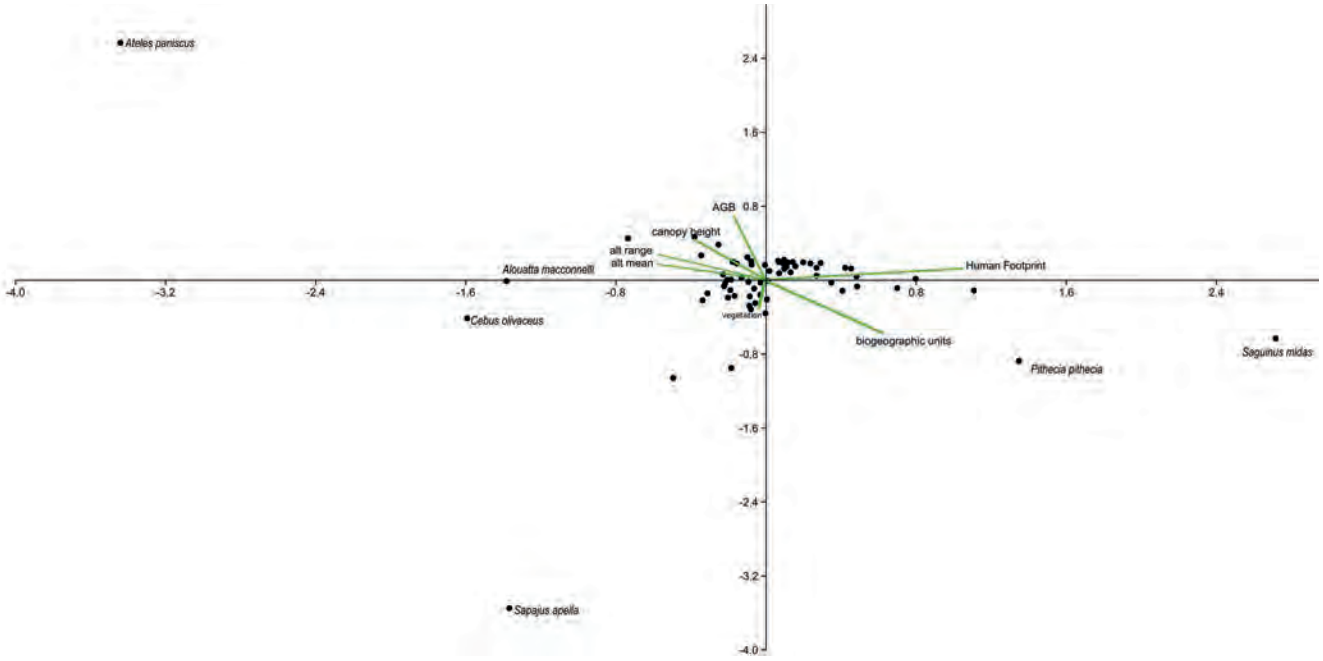

Figure 3. Canonical Correspondance Analysis (CCA) showing the relations between primate abundance and habitat descriptors and threat assessments, on the basis of 60 surveys.

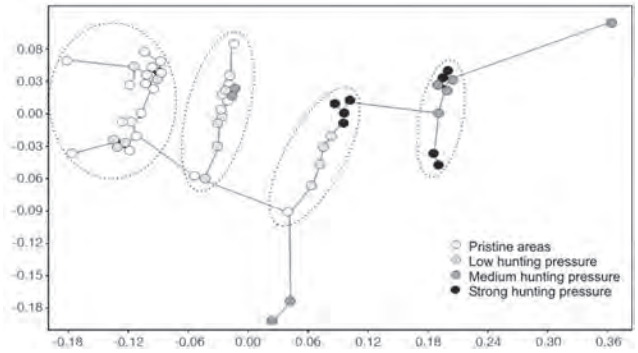

Figure 4. Non-metric multidimensional scaling and Minimum Spanning Network showing the organization of 60 sites, according to the abundances of large primates (*Alouatta macconnelli*, *Ateles paniscus*, *Cebus olivaceus*, *Sapajus apella*).

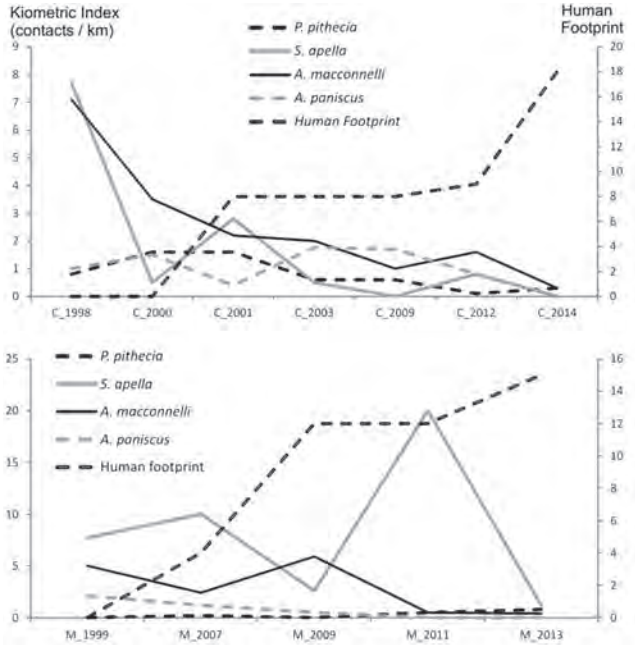

Figure 5. Change of the abundance of large primates in two sites (A and B in Figure 2), concomitantly to Human Footprint increase.

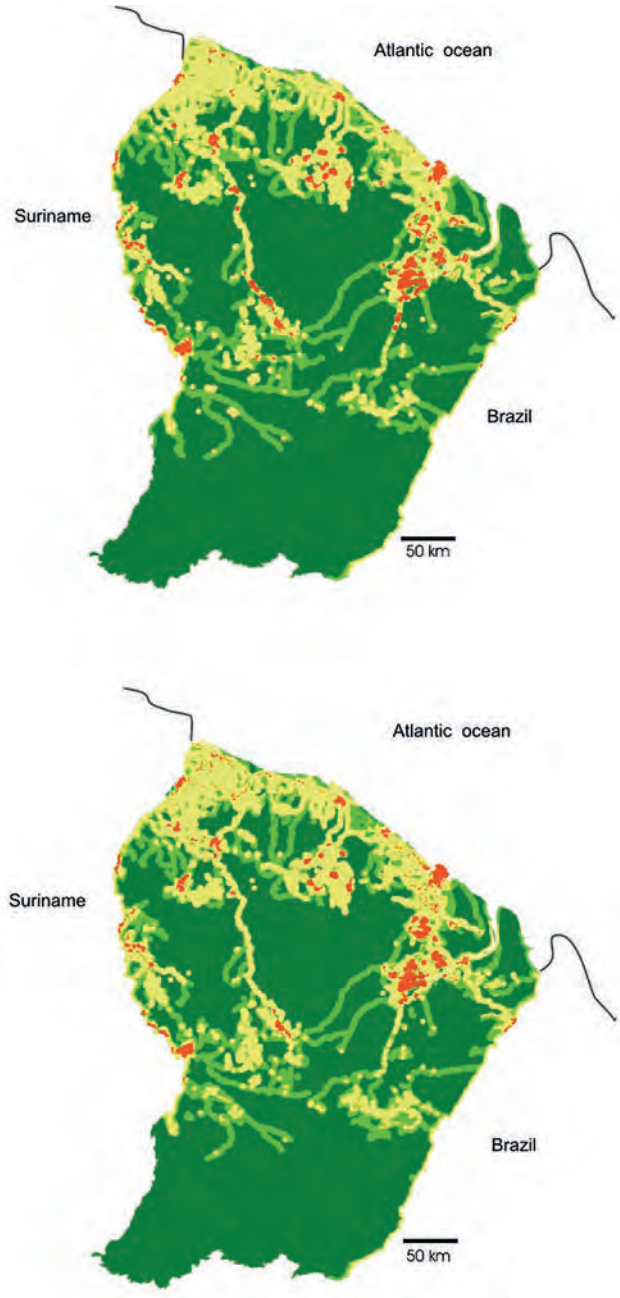

Figure 6. Key threshold values of Human Footprint in French Guiana, year 2000 (up) and 2013 (down). Dark green: HF < 5, no impact detected on primate populations. Light green: 5 > HF < 13, decreases of more sensitive species are evidenced. Yellow: 30 > HF > 13, decreases of all species. Red: HF > 30, local extinctions of most sensitive species.

HF reach a score of 5, and the species is almost locally extinct above a score of 12. If we consider that at the country level in 2000 29,300 km² had a score ≥ 5, and by 2013 30,600 km² reached that score, with an overall loss of 2% of the pristine habitat during that decade, and 18,700 km² were ≥ 12 in 2000, and 19,800 km² in 2013, we estimate a habitat loss for *Ateles* slightly below 2% (Figure 6). For other more tolerant species, considering that decrease of densities and local extinctions occur at higher HF scores, decrease of quality and habitat loss remain rather limited and geographically circumscribed.

Hunting

On the ten studied sites (open squares in Figure 2), the number of hunters ranged from 13 to 105, and the size of the hunting area ranged from 225 to 1,250 km². Comparing our harvest monitoring with the estimates of sustainable har-

Table 1. Number of primates harvested per species in each of the ten study sites in French Guiana (numbers refer to those in Figure 2), and estimates of sustainable harvest based on the Robinson model (Robinson 2000). The model was adjusted according to Renoux & de Thoisy (2016). Bold numbers indicate overharvesting.

Study sites	Type of communities	Use of game	Species	Number of individuals harvested	Estimates of sustainable harvest
1. Counami	mixed	Subsistence	*A. paniscus*	1.3	6
			A. macconnelli	**13**	11
			S. apella	7.5	12
2. Macouria	Amerindians	Commerce & Subsistence	*A. macconnelli*	**53**	5
			S. apella	**70**	56
3. Régina	mixed	Commerce	*A. paniscus*	11	12
			S. apella	19	27
4. Saint Georges	mixed	Commerce	*A. paniscus*	1.3	23
			A. macconnelli	8	41
			S. paella	30	57
5. Mana	mixed	Commerce & Subsistence	*P. pithecia*	4	32
			A. macconnelli	**38**	4
			S. apella	5	54
			S. sciureus	5	28
6. Yalimapo	Amerindians	Subsistence	*S. apella*	**11**	6
7. Saül	mixed	Subsistence	*A. paniscus*	4	2.5
			S. apella	3.3	10
8. Camopi	Amerindians	Subsistence	*A. paniscus*	**178**	20
			A. macconnelli	**340**	36
			S. apella	**297**	16
			P. pithecia	**22**	18
9. Elahé	Amerindians	Subsistence	*A. macconnelli*	**76**	2.5
			S. apella	**43**	2.5
			C. olivaceus	**30**	2
			P. pithecia	**5**	2
10. Trois Sauts	Amerindians	Subsistence	*A. macconnelli*	**88**	2.5

vest (Table 1) it is evident that current hunting practices are unsustainable, regardless of the communities (i.e., traditional, or mixed) and the purposes of hunting (sell or own consumption). Critically, we observed extreme overharvesting behaviors in Amerindian communities from the south of the country, in the current National Park. We also recorded that those unsustainable harvests do not only affect the more sensitive species (i.e., *Ateles*, *Alouatta*, *Cebus*, *Sapajus*), but also small primates (i.e., *Saimiri*, *Pithecia* and even Callitricids).

DISCUSSION

Efficient species conservation plans may involve a wide spectrum of tools and means, including protection areas hosting significant levels of biodiversity, from species (i.e., alpha-diversity) to communities and ecosystems (i.e., beta-diversity), as well as adequate habitat management and zoning of landscape (including source-sink systems, maintenance of corridors, refuge areas), and sustainable wildlife use. Using the example of French Guiana, here we explore how the status of primates, among the more sensitive and best indicator species for healthy forest habitats, can help to identify success and failures of conservation policy. We also make suggestions for improvements in this area.

First, identifying areas where more appropriate environmental conditions exist and are prone to re-

main stable over long periods of time is vital for the planning of conservation projects aimed at maintaining the richness of species communities, the diversity of ecological processes, and to contribute to ecological connectivity, gene flow, and ecosystem services. In French Guiana, recent remote-sensing monitoring (Hansen *et al*. 2013) suggests a forest loss of 440 km² over the last decade (2000-2012), i.e. less than 1% of complete habitat loss for primates. Despite recent alarms (Alvares-Berrios & Aide 2015), this loss is still among the lowest rates in all Amazonian countries (De Sy *et al*. 2015). The country also benefits from an extensive network of protected areas, and a huge and efficient series of policies to preserve habitats and ecosystems, from European community laws, from national decrees and laws (e.g., the Loi sur la Biodiversity, 2016, that introduces for the first time not more the preservation of species only, but a focus on the preservation of ecological interactions and networks), and from local initiatives. Definitively, governmental management of forests, REDD+ initiative, eco-certification, reduced-impact logging techniques and protected areas benefiting from adequate management, have safeguarded a satisfactory status of forest habitats.

Species Distribution Models (SDM) associated with the habitat connectivity approach have shown their usefulness to identify areas hosting higher abundances of species and to demonstrate ecological continuity between those areas (Clément *et al*. 2014; de Thoisy *et al*. 2016). SDMs allowed suggesting that in French Guiana almost all key conservation areas are protected, or at least habitats benefited from efficient conservation strategies (de Thoisy 2016). Besides the importance to understanding the ecological status of different areas, these types of analytical tools are also important for policy issues. They can help land planning and management decisions, when strategic information (e.g., threats, projections of infrastructures) can easily be superimposed with ecological constraints to determine conservation costs and social and political acceptability. Those tools can also be associated to forest monitoring *via* new techniques such as development of remote sensing and Lidar-Radar data (Fayad *et al*. 2014; Guitet *et al*. 2015a), and allow monitoring both habitats and species. Finally, and likely as importantly, they can be used to promote participatory science, since very rough information from networks of local naturalists and citizen participants can be utilized, and consequently, contribute to public awareness and sensitization (Clément *et al*. 2014).

Sustainable use of wildlife relies on limits and pressures imposed by regulation, together with incentive measures, and education and environmental awareness. But the main threat for primates in French Guiana is hunting, and not deforestation. Hunting is totally out of control, even though the habitats are efficiently managed. Most of our study sites show evidence of unsustainable hunting. Other species, such as the tapir (*Tapirus terrestris*), also suffer from this cryptic threat (Tobler *et al*. 2013). Strong decreases of large primate populations are already noticed in many areas. The unsustainable harvesting is not caused by a single type of human community or the type of wildlife use, but instead are widespread and observed in both mixed and Amerindians communities. This unsustainable use of wildlife is likely a consequence of complex and diverse causes, including other pressures on hunting areas (e.g., fragmentation, logging), loss of traditional social cohesion in the hunter communities, loss of traditional knowledge regarding harvest management, low incomes that push hunters to over-exploit their natural resources, sedentarization imposed by modern exogenous constraints and facilities.

Management of overhunting by mixed, non-native communities that do not rely on forest resources for subsistence could be easily established by means of adequate regulatory measures and controls, through the implementation of an active and ambitious policy. Nonetheless, the problem of traditional communities is much more complex. As in other tropical areas, hunting practiced by those communities allowed maintaining microscale economic activity based on the harvesting and selling of natural resources, which keeps communities out of a dynamic of impoverishment (Renoux 2002). Those traditional harvest activities may occur in areas, or close to areas, that may benefit from conservation measures. Also, practical and legal conditions have to guarantee the opportunity for those communities to continue their traditional way of

life. Two problems are likely to be faced for these communities and the natural resources. Either they turn to an inconsistent mode of subsistence, or they invest more human and technical resources in hunting practices to penetrate more and more effectively into a speculative market. Those two orientations can be considered as early sociological indicators announcing a social disorganization of communities. Therefore, the long-term maintenance of the stocks of game species is not only important for ecological reasons, but may also have an economic and social role that needs to be considered.

CONCLUDING REMARKS

Wildlife in French Guiana indeed faces a quite paradoxical situation, having likely one of the most efficient forest management policies among all Amazonian countries, and one of the laxest and uncontrolled hunting policies. Absence of hunting regulations for decades, underestimation of indirect impacts of gold-mining such as widespread harvest of wild species (which also results in territorial and ethnic conflicts), and an increased demographic expansion of local communities with few access to alternative resources, result in the transformation of biologically rich forests into empty areas. Insufficient hunting management is definitively the more important threat for primates, although their habitat is being effectively protected by one of the most efficient conservation plans. The status of French Guiana as a European overseas department, with the divergent ambitions of local (i.e., French Guianan) authorities and national (i.e., French) government agencies complicates and delays the political implementation of a consolidated conservation vision for the country. This is particularly critical in the north of the country, where threats are more incisive, and where protected areas are more restricted.

The significant interest in biodiversity conservation is regional, including the aggregate comprised by the French Guianan Parc Amazonien, the Tumucumaque National Park (3.8 million ha), the Ecological Station of Grão-Pará (4.3 million ha), and the Maicuru Reserve (1.2 million ha), which are now under single coordinated legal protection legislation, under the responsibility of both France and Brazil. Forthcoming challenges for large animal species conservation include: (i) better assessments of regional and local variation of population densities, with a reliable assessment of harvest, in order to avoid over- and under-estimations of take-off by local communities; (ii) better transnational collaborative initiatives among countries with adequate policy decisions for both threat mitigation and land planning, and identifying source and sink systems, and (iii) better considerations for social issues. Those initiatives will require adequate proxies to detect cryptic population collapses for sensitive species. Analyses focusing on primary consumers such as monkeys, with the help of the latest remote sensing and plane imaging techniques, can be used to understand breaks in ecological interactions. But for most of Amazonian native communities, game is either a food resource necessary for subsistence, or a market resource for local economies to keep out of poverty. Monitoring game species may consequently inform on risks of social disruptions in native communities that may result in the collapse of natural resources, and thus it should be an important component of global conservation initiatives that consider wildlife, habitats, and traditional use of resources.

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