

A Survey of the Large Mammal Fauna of the Kwamalasamutu Region, Suriname

Authors: Gajapersad, Krisna, Mackintosh, Angelique, Benitez, Angelica, and Payán, Esteban

Source: A Rapid Biological Assessment of the Kwamalasamutu region, Southwestern Suriname: 150

Published By: Conservation International

URL: <https://doi.org/10.1896/054.063.0115>

The BioOne Digital Library (<https://bioone.org/>) provides worldwide distribution for more than 580 journals and eBooks from BioOne's community of over 150 nonprofit societies, research institutions, and university presses in the biological, ecological, and environmental sciences. The BioOne Digital Library encompasses the flagship aggregation BioOne Complete (<https://bioone.org/subscribe>), the BioOne Complete Archive (<https://bioone.org/archive>), and the BioOne eBooks program offerings ESA eBook Collection (<https://bioone.org/esa-ebooks>) and CSIRO Publishing BioSelect Collection (<https://bioone.org/csiro-ebooks>).

Your use of this PDF, the BioOne Digital Library, and all posted and associated content indicates your acceptance of BioOne's Terms of Use, available at www.bioone.org/terms-of-use.

Usage of BioOne Digital Library content is strictly limited to personal, educational, and non-commercial use. Commercial inquiries or rights and permissions requests should be directed to the individual publisher as copyright holder.

BioOne is an innovative nonprofit that sees sustainable scholarly publishing as an inherently collaborative enterprise connecting authors, nonprofit publishers, academic institutions, research libraries, and research funders in the common goal of maximizing access to critical research.

Chapter 12

A survey of the large mammal fauna of the Kwamalasamutu region, Suriname

Krisna Gajapersad, Angelique Mackintosh, Angelica Benitez, and Esteban Payán

INTRODUCTION

Historically, humans have used animals for food and a variety of other uses (Leader-Williams et al. 1990; Milner-Gulland et al. 2001). Examples all over the world show the effects of overhunting from humans, causing population declines and extinction (Diamond 1989). Overexploitation was almost certainly responsible for historical extinctions of some large mammals and birds (Turvey and Risley 2006). Large mammals are more sensitive to hunting due to their slow reproductive rates, long development and growth times, and large food and habitat requirements (Purvis et al. 2000; Cardillo et al. 2005). Today, roughly two million people depend on wild meat for food or trade (Fa et al. 2002; Milner-Gulland et al. 2003), yet the majority of hunting is unsustainable (Robinson and Bennett 2004; Silvius et al. 2005).

Subsistence hunting of terrestrial vertebrates is a widespread phenomenon in tropical forests (Robinson and Bennett 2000). In many parts of Latin America, cracid (Aves: Cracidae) populations are declining (Thiollay 2005). Subsistence hunting is an important cause of these declines (Thiollay 1989; Ayres et al. 1991; Silva and Strahl 1991; Strahl and Grajal 1991; Vickers 1991; Hill et al. 2003). The direct impacts of hunting on animal populations and the subsequent effects of exploitation on the ecosystem make attaining sustainable harvests an international conservation priority (Fa et al. 2003; Milner-Gulland et al. 2003; Bennett et al. 2007). Thus, the first step in making harvests more sustainable is to determine current levels of harvest (Milner-Gulland and Akcakaya 2001).

Mammals as a group provide the main protein source for indigenous peoples of Amazonia. Indigenous tribes have lived in Amazonia for tens of thousands of years (Redford 1992) and many, including the Trio of Suriname, still remain within the forest and hunt mammals actively. Abundances of large mammals have decreased in areas where they have been hunted (Peres 1990; Cullen et al. 2000; Hill et al. 2003). Unmanaged hunting is commonplace in the Amazon and tends to deplete game populations, often to levels so low that local extinctions are frequent (Redford 1992; Bodmer et al. 1994). Overhunting then becomes a double-edged threat: to the biodiversity of the tropics and to the people that depend on those harvests for food and income.

At the present time, little information is available on the occurrence, spatial variability in richness, and sensitivity to hunting and other disturbances of medium and large mammals in Suriname. The goal of this survey was to assess the diversity and abundance of medium- and large-bodied mammals in the Kwamalasamutu region.

METHODS AND STUDY SITES

We surveyed medium- and large-bodied mammals by means of three main methods: camera trapping, searching for scat and animal tracks, and making visual and aural observations. We also characterized hunting habits of the Trio through interviews with residents of Kwamalasamutu.

Camera traps were set 500 meters apart along hunting and game trails, some of which were cut shortly before the RAP survey. The camera traps operated day and night, photographing all ground-dwelling mammals and birds that walked in front of them. Camera traps were attached to trees approximately 30 cm above the forest floor.

At the Kutari site 25 camera traps were set up, divided over 4 trails, and run for a total of 181 camera trap days. At the Sipaliwini site 12 camera traps were set up, divided over 3 trails, and were active for a total of 104 camera trap days. At Werehpai, there was no trail cutting due to preexisting trails and 10 camera traps were set up along 2 trails and run for 304 camera trap days. Cameras were placed in different habitats at each of the study sites. At the Kutari site 15 camera traps were set up in terra firme, five in swamp, four in flooded forest and one in a dry creek bed. At the Sipaliwini site nine camera traps were set up in terra firme, two in swamp and one in a creek. At the Werehpai site, eight cameras were set up in terra firme and two near creeks. Elevations of camera trapping points were similar among the three sites, ranging between 213 and 278 meters.

Photographs from camera traps were identified to species, and independent photographs were used as single occurrences for analysis. Independent photographs were those from different species or individuals, or any photographs taken at least 30 minutes apart (O'Brien et al. 2003). Rarefied species accumulation curves and biodiversity indices were calculated with program EstimateS 8.2 (Colwell 2009). Occurrences from photographs were compared with the nonparametric richness estimator Chao 1 among camps, and Simpson's Biodiversity Index was also calculated per camp (Magurran 2004). Additionally, a relative abundance index was estimated per species for every 100 trap-nights (O'Brien et al. 2003).

Tracks and scat were also recorded when walking the trails to set up and pick up the camera traps. The tracks were identified with the help of local guides that accompanied the field excursions, and the tracks that could not be identified in the field were photographed and identified with the help of field guides. Visual and aural observations were important for the primates, because this group of animals is not captured by the camera traps, have diurnal habits and do not leave tracks on the forest floor. Interviews were conducted with hunters and elders from the area. We sought information on hunting habits, frequency, weapons, and the abundance of preferred and actual prey.

RESULTS

We detected 29 species of medium- and large-bodied mammals (Appendix). We recorded 22 mammal species from the Kutari site, including all eight primate species that occur in Suriname. At the Sipaliwini site we found 18 mammal species, including four primate species; at Werehpai we found 21 mammal species including five primate species.

The large caviomorph rodents, especially Paca (*Cuniculus paca*), Red-rumped Agouti (*Dasyprocta leporina*) and Red Acouchy (*Myoprocta acouchy*), were the most frequently photographed by the camera traps (Table 1); this group was assumed to include the most common medium- and large-bodied nonvolant mammals in the area. The Brazilian Tapir (*Tapirus terrestris*) was recorded by the camera traps at all three sites and was observed by several of the RAP scientists. A large number of tracks were found on the trails, indicating that the Brazilian Tapir is common in the area.

Of the six species of cats known to occur on the Guiana Shield, the Jaguar (*Panthera onca*), Puma (*Puma concolor*) and Ocelot (*Leopardus pardalis*) were found during the survey. Ocelot was the most frequently recorded cat species during this survey and is common in the area. The Jaguar and Puma were each recorded by the camera traps only once, both in the Werehpai area (Table 1). Tracks of Puma were also found at the Kutari site. It is very likely that the Jaguar also occurs in the Kutari and Sipaliwini area, but was only recorded in the Werehpai area because the trail system at Werehpai is used frequently by large cats. The Trio do not actively hunt cats, but they occasionally kill the large cats when they encounter them in the forest, because they are afraid of being attacked.

In all three camps both the Red-brocket and Grey-brocket Deer (*Mazama americana* and *M. gouazoubira*) were recorded by the camera traps and detected by tracks. Tracks of the Collared Peccary (*Pecari tajacu*) were found at all 3 camps, and this species was also recorded frequently by the camera traps. The White-lipped Peccary (*Tayassu pecari*) was only photographed once by the camera traps in the Werehpai area, and seems to be uncommon in the Kwamalasamutu region.

Three armadillo species were found during the RAP: Great Long-nosed Armadillo (*Dasybus kappleri*), Nine-banded Armadillo (*Dasybus novemcinctus*), and Giant Armadillo (*Priodontes maximus*). The Giant Anteater (*Myrmecophaga tridactyla*) was recorded by the camera traps only once at the Kutari site. Four species of ground-dwelling birds were recorded by the camera traps and observed during the RAP: Black Curassow (*Crax alector*), Grey-winged Trumpeter (*Psophia crepitans*), Variegated Tinamou (*Crypturellus variegatus*), and Great Tinamou (*Tinamus major*).

All surveys were incomplete. Species accumulation curves from photographs at the three sites show that more species could be expected to occur at the sites (Fig. 1). The Chao 1 diversity estimator confirms this, showing the expected number of species available for detection (Fig. 2). Chao 1 estimates that the survey of the Kutari site was close to completion, with less than 5% of expected species remaining to be detected. In contrast, the Sipaliwini and Werehpai site surveys appeared to be far from complete, with more than 27% of expected species at Sipaliwini and 53% at Werehpai remaining to be detected. The slope of the curve denotes the detection rate, which was highest at the Sipaliwini site ($m = 0.9$), followed by the Kutari

site ($m = 0.5$) and finally Werehpai ($m = 0.2$; Fig. 2). This is congruent with Simpson's diversity index, for which Werehpai had the least even species abundance distribution

($d = 3.4$), whereas the Kutari and Sipaliwini sites had very similar and more even abundances of species ($d = 8.7$ and $d = 9.5$, respectively).

Table 1. Total independent photographs and relative abundance indices (RAI) for all vertebrate species detected by camera traps per RAP site.

	Kutari		Sipaliwini		Werehpai	
	Photos	RAI	Photos	RAI	Photos	RAI
<i>Proechymis</i> sp.	9	7.2	4	4.5	4	1.6
<i>Neacomys</i> sp.	3	2.4	1	1.1	1	0.4
<i>Cuniculus paca</i>	5	4	7	7.9	10	3.9
<i>Dasyprocta leporina</i>	6	4.8	6	6.7	1	0.4
<i>Myoprocta acouchy</i>	19	15.2	4	4.5	10	3.9
<i>Dasybus kappleri</i>	2	1.6	2	2.2	1	0.4
<i>Dasybus novemcinctus</i>	2	1.6	0	0.0	1	0.4
<i>Priodontes maximus</i>	0	0	1	1.1	2	0.8
<i>Mazama americana</i>	4	3.2	2	2.2	4	1.6
<i>Mazama gouazoubiria</i>	1	0.8	2	2.2	0	0.0
<i>Metachirus nudicaudatus</i>	3	2.4	0	0.0	2	0.8
<i>Philander oposum</i>	2	1.6	0	0.0	0	0.0
<i>Didelphis marsupialis</i>	3	2.4	1	1.1	0	0.0
<i>Psophia crepitans</i>	20	16	0	0.0	0	0.0
<i>Pecari tajacu</i>	4	3.2	2	2.2	0	0.0
<i>Tapirus terrestris</i>	2	1.6	0	0.0	2	0.8
<i>Eira barbara</i>	0	0	0	0.0	1	0.4
<i>Nasua nasua</i>	1	0.8	0	0.0	1	0.4
<i>Leopardus pardalis</i>	3	2.4	0	0.0	7	2.7
<i>Panthera onca</i>	0	0	0	0.0	1	0.4
<i>Puma concolor</i>	0	0	0	0.0	1	0.4
Total photos	89		32		49	

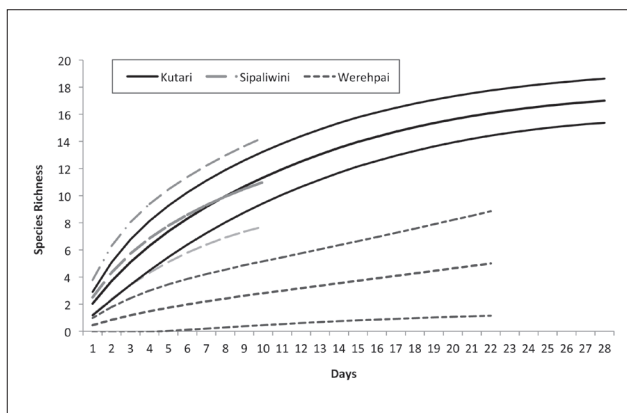


Figure 1. Observed species accumulation curves with confidence intervals (95%; upper and lower) from camera trap pictures.

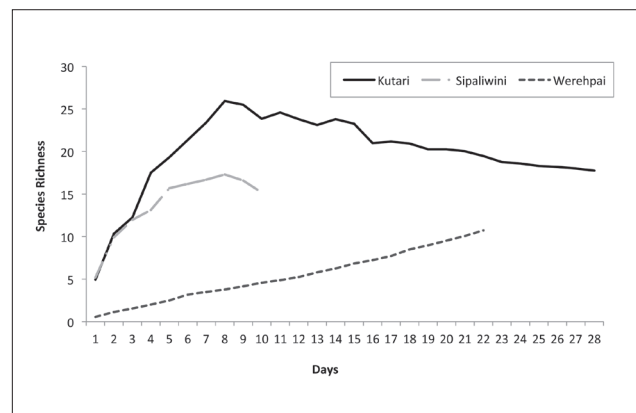


Figure 2. Chao 1 estimator of expected species to be detected by camera traps at each RAP survey site.

INTERVIEWS

The interview data provided an overview of the hunting areas, hunting techniques, frequency of hunting, and species hunted. All hunters interviewed were men from the village of Kwamalasamutu. Hunting techniques are generally learned at the age of 10–15 from the father or grandfather. Most of the interviewed men first learned to hunt with bow and arrow and later (at age 14–16) with a gun. All of the interviewed men hunt to supply their families with food, and sometimes the meat is sold on the market or given to other family members. They normally hunt once a week, and a hunting trip generally lasts one day and one night (24 hours). Hunting is done alone or with a family member or friend. Most of the hunters first go two hours by boat upstream or downstream from Kwamalasamutu, and then walk several hours into the forest to hunt. Black curassow (*Crax alector*) was the preferred species among interviewees. Other large ground-dwelling bird species, such as tinamous (*Tinamus major*; *Crypturellus* spp.) and Grey-winged Trumpeters (*Psophia crepitans*), were also favorites. Paca (*Cuniculus paca*), Collared Peccary (*Pecari tajacu*), and Red Acouchy (*Myoprocta acouchy*) were the preferred mammal species.

The most hunted mammal is the Guianan Red Howler Monkey (*Alouatta macconnelli*), because this species is easily spotted in trees along the river. Other frequently hunted species are White-lipped Peccary (*Tayassu pecari*), Red-rumped Agouti (*Dasyprocta leporina*), Red Acouchy (*Myoprocta acouchy*), Paca (*Cuniculus paca*), and Black Curassow (*Crax alector*). Large mammals that are less common, but hunted for food when encountered in the forest, are Brazilian Tapir (*Tapirus terrestris*), Red-brocket Deer (*Mazama americana*), Giant Armadillo (*Priodontes maximus*), and Giant Anteater (*Myrmecophaga tridactylus*). With the exception of Red-brocket Deer, all of these animals are listed on the IUCN Red List of Threatened Species.

Some of the interviewed hunters also mentioned that they use a traditional hunting calendar and hunt different species in different seasons. These hunters said that they do not hunt when the animals are “fat”; meaning that they do not kill animals when it is visible that they are in the gestation period.

CONSERVATION RECOMMENDATIONS

The number of mammal species found during this survey does not differ much from what was expected. Most of the large terrestrial mammal species expected to occur in the region were recorded by the camera traps. The difference in number of species per site suggests that hunting pressure in the different areas varies. The Kutari site was the richest in species, especially primates, suggesting limited hunting pressure. This site also had a high value of Simpson's Index from the camera trap data, indicating a high diversity and abundance of medium- and large-bodied terrestrial mammals,

as well as presence of some sensitive bird species such as Gray-winged Trumpeter (*Psophia crepitans*), and the highest relative abundance index for Brazilian Tapir of any of the three sites (Table 1). We attribute the richness of the Kutari mammal fauna to its isolation from Kwamalasamutu, relative to the Sipaliwini and Werehpai sites. Of the three sites, the Sipaliwini site had the highest value of Simpson's Index, but also the smallest number of species recorded by camera traps, tracks and observations, suggesting higher hunting pressure in the area. The value of Simpson's Index for this site was a result of the even abundance of several species of rodents, as well as deer (*Mazama* spp.), which tolerate disturbance quite well; only one photograph of a sensitive species (Giant Armadillo) was obtained at this site. This area is used as a hunting ground by the local people, and hunting trails were encountered during camera trap setup. During the RAP, several shots from hunters were heard near the Sipaliwini camp. The Werehpai site was within the indigenous protected area established by the local village authority in 2004. We found more species at Werehpai than at Sipaliwini, even though it is only ten kilometers from Kwamalasamutu. Werehpai had a low value of Simpson's Index, due to the high abundance of two species of rodents, but we did record both Brazilian Tapir and Jaguar at this site.

The results of this survey suggest that richness and evenness of the medium- and large-bodied mammal fauna both increase with distance from Kwamalasamutu. Nevertheless, the presence of species sensitive to hunting and disturbance, such as tapir, jaguar, curassows and large primates, suggests that hunting pressure is not pervasive. Hunting is probably limited by reduced river access to some areas in the dry season, and more generally by distance from Kwamalasamutu. The concentration of the Trio in Kwamalasamutu reduces hunting pressure on large vertebrates in the region as a whole. The extensive surrounding forest acts as a source to offset local population depletion due to hunting, up to a point. The current village is relatively large with an estimated 700–800 people who all depend on the surrounding forest for sustenance. This puts much pressure on the medium- and large-bodied mammals in the area surrounding the village. Our interview results indicate that the effort required to find desired prey (i.e. large vertebrates) is increasing, and hunters reported that they often have to travel far from Kwamalasamutu to hunt successfully. Prey depletion around the edges of hunting villages is an expected phenomenon. The size of the area affected by hunting can be expected to increase as human population density forces more frequent long-distance hunting expeditions. Therefore, uncontrolled hunting from Kwamalasamutu represents the most significant potential threat to the mammal species in the region. Declaring the Werehpai area as a protected area is a good initiative by the village authority to conserve the species on which they depend for food, but this is only a small area compared to the hunting areas. More monitoring is required to determine if the Werehpai protected area is sufficient to maintain populations of medium- and large-bodied

mammals in the surroundings of Kwamalasamutu. Further, it is recommended that all hunters from Kwamalasamutu use hunting seasons, map zoning areas and set quotas for hunting on the different species to maximize long-term viability of game populations in the area. These hunting seasons should be developed together with the people from Kwamalasamutu, with traditional local knowledge augmenting a scientific approach. Zoning must be established to achieve population source (e.g. game reserves) and sink (i.e. hunting) areas for wild meat, ensuring a permanent supply for subsistence (Novaro 2004). Sale of meat should be restricted to the village. Hunting quotas should be based on sustainability measures (Wilkie et al. 1998; Robinson and Bennett 2004; Payan 2009) and harvest profiles. Small- and medium-bodied rodents and species with high reproductive rates should be favored, whereas hunting of large animals (e.g., tapir) and other less resilient species should be highly controlled (Bodmer 1995).

A more thorough study of the medium- and large-bodied mammal fauna of the Kwamalasamutu region is recommended, including a longer camera trapping study and a detailed sustainability evaluation of wild meat hunting.

REFERENCES

- Alvard, M. (1995). Shotguns and sustainable hunting in the Neotropics. *Oryx* 29(1): 58–66.
- Ayres, J., D. Lima, E. Martins, and J. Barreiros. (1991). On the track of the road: changes in subsistence hunting in a Brazilian Amazonian Village. *Neotropical Wildlife Use and Conservation*. J. G. Robinson and K. H. Redford, eds. University of Chicago Press.
- Bennett, E. L., E. Blencowe, K. Brandon, D. Brown, R. W. Burn, G. Cowlishaw, G. Davies, H. Dublin, J.E. Fa, E.J. Milner-Gulland, J.G. Robinson, J.M. Rowcliffe, F.M. Underwood and D.S. Wilkie. (2007). Hunting for Consensus: Reconciling Bushmeat Harvest, Conservation, and Development Policy in West and Central Africa. *Conservation Biology* 21(3): 884–887.
- Bodmer, R. (1995). Managing Amazonian wildlife: Biological correlates of game choice by detribalized hunters. *Ecological Applications* 5(4): 872–877.
- Bodmer, R. E., T. Fang, L. Moya and R. Gill. (1994). Managing wildlife to conserve Amazonia forests: population biology and economic considerations of game hunting. *Biological Conservation* 67: 29–35.
- Cardillo, M., G.M. Mace, K.E. Jones, J. Bielby, O.R. Bininda-Emonds, W. Sechrest, C.D. Orme, A. Purvis. (2005). Multiple Causes of High Extinction Risk in Large Mammal Species. *Science* 309(5738): 1239–1241.
- Colwell, R. 2009. EstimateS: Statistical estimation of species richness and shared species from samples. Viceroy University.
- Cullen, L., R.E. Bodmer, and C.V. Pa. (2000). Effects of hunting in habitat fragments of the Atlantic forests, Brazil. *Biological Conservation* 95(1): 49–56.
- Diamond, J. (1989). The Present, Past and Future of Human-Caused Extinctions. *Philosophical Transactions of the Royal Society of London. Series B, Biological Sciences* (1934–1990) 325(1228): 469–477.
- Dinata, Y., A. Nugroho, I.A. Haidir, and M. Linkie. (2008). Camera trapping rare and threatened avifauna in west-central Sumatra. *Bird Conservation International* 18(01): 30–37.
- Fa, J.E., D. Currie, and J. Meeuwig. (2003). Bushmeat and food security in the Congo Basin: linkages between wildlife and people's future. *Environmental Conservation* 30(01): 71–78.
- Fa, J.E., C. Peres, and J. Meeuwig. (2002). Bushmeat Exploitation in Tropical Forests: an Intercontinental Comparison. *Conservation Biology* 16(1): 232–237.
- Hill, K., G. McMillan, and R. Fariña. (2003). Hunting-Related Changes in Game Encounter Rates from 1994 to 2001 in the Mbaracayu Reserve, Paraguay. *Conservation Biology* 17(5): 1312–1323.
- Kelly, M. J. (2008). Design, evaluate, refine: camera trap studies for elusive species. *Animal Conservation* 11(3): 182–184.
- Leader-Williams, N., S. Albon and P. Berry. (1990). Illegal exploitation of black rhinoceros and elephant populations: Patterns of decline, law enforcement and patrol effort in Luangwa Valley, Zambia. *Journal of Applied Ecology* 27(3): 1055–1087.
- Lok, C. B., L. K. Shing, Z. Jian-Feng, and S. Wen-Ba. (2005). Notable bird records from Bawangling National Nature Reserve, Hainan Island, China. *Forktail* 21: 33.
- Magurran, A. E. 2004. Measuring Biological Diversity. Blackwell Publishing.
- Milner-Gulland, E.J., M.V. Kholodova, A. Bekenov, O.M. Bukreeva, A. Grachev, L. Amgalan and A.A. Lushchekina. (2001). Dramatic declines in saiga antelope populations. *Oryx* 35(4).
- Milner-Gulland, E. J. and H. R. Akcakaya (2001). Sustainability indices for exploited populations. *Trends in Ecology and Evolution* 16(12): 686–692.
- Milner-Gulland, E.J., E.L. Bennett and the SCB 2002 Annual Meeting Wild Meat Group. (2003). Wild meat: the bigger picture. *Trends in Ecology and Evolution* 18(7): 351–357.
- Noss, A.J., R. Pena, and D.I. Rumiz. (2004). Camera trapping *Priodontes maximus* in the dry forests of Santa Cruz, Bolivia. *Endangered Species Update* 21: 43–52.
- Noss, A.J., R. L. Cuéllar, J. Barrientos, L. Maffei, E. Cuéllar, R. Arispe, D. Rómiz & K. Rivero. (2003). A camera trapping and radio telemetry study of lowland tapir (*Tapirus terrestris*) in Bolivian dry forests. *Tapir Conservation* 12(1): 24–32.
- Novaro, A. J. (2004). Implications of the Spatial Structure of Game Populations for the Sustainability of Hunting

- in the Neotropics. *People in Nature: Wildlife Conservation in South and Central America*. K. Silvius, R. Bodmer and J. Fragoso, eds. New York, Columbia University Press.
- O'Brien, T. G. (2008). On the use of automated cameras to estimate species richness for large-and medium-sized rainforest mammals. *Animal Conservation* 11(3): 179–181.
- O'Brien, T.G., M.F. Kinnaird, and H.T. Wibisono. 2003. Crouching tigers, hidden prey: Sumatran tiger and prey populations in a tropical forest landscape. *Animal Conservation* 6: 131–139.
- Payan, E. (2009). Hunting sustainability, species richness and carnivore conservation in Colombian Amazonia. PhD thesis, Department of Biology and Anthropology. London, University College London.
- Peres, C. (1990). Effects of hunting on western Amazonian primate communities. *Biological Conservation* 54(1): 47–59.
- Purvis, A., P.M. Agapow, J.L. Gittleman and G.M. Mace. (2000). Nonrandom Extinction and the Loss of Evolutionary History. *Science* 288(5464): 328.
- Redford, K. H. (1992). The empty forest. *Bioscience* 42(6): 412–422.
- Robinson, J. and E. Bennett (2004). Having your wildlife and eating it too: an analysis of hunting sustainability across tropical ecosystems. *Animal Conservation* 7(04): 397–408.
- Robinson, J. G. and E. L. Bennett (2000). *Hunting for Sustainability in Tropical Forests*. New York, Columbia University Press.
- Rovero, F., T. Jones, and J. Sanderson. (2005). Notes on Abbott's duiker (*Cephalophus spadix* True 1890) and other forest antelopes of Mwanihana Forest, Udzungwa Mountains, Tanzania, as revealed by camera-trapping and direct observations. *Tropical Zoology* 18(1): 13.
- Rowcliffe, J. M. and C. Carbone (2008). Surveys using camera traps: are we looking to a brighter future? *Animal Conservation* 11(3): 185–186.
- Silva, J. L. and S. D. Strahl. (1991). Human impact on populations of chachalacas, guans, and curassows (Galliformes: Cracidae) in Venezuela. *Neotropical Wildlife Use and Conservation*. J. G. Robinson and K. H. Redford. Chicago, Chicago University Press: 37–52.
- Silvius, K.M., R.E. Bodmer, and J.M. Fragoso. (2004). *People in Nature*. Columbia University Press.
- Strahl, S. and A. Grajal (1991). Conservation of large avian frugivores and the management of Neotropical protected areas. *Oryx* 25(1): 50–55.
- Thiollay, J. (1989). Area Requirements for the Conservation of Rain Forest Raptors and Game Birds in French Guiana. *Conservation Biology* 3(2): 128–137.
- Thiollay, J. M. (2005). Effects of hunting on guianan forest game birds. *Biodiversity and Conservation* 14(5): 1121–1135.
- Tobler, M.W., S.E. Carrillo-Percastegui, R. Leite-Pitman, R. Mares, and G. Powell. (2008). An evaluation of camera traps for inventorying large-and medium-sized terrestrial rainforest mammals. *Animal Conservation* 11(0): 169–178.
- Turvey, S. and C. Risley (2006). Modelling the extinction of Steller's sea cow. *Biology Letters* 2(1): 94–97.
- Vickers, W. T. (1991). Hunting yields and game composition over ten years in an Amazon Indian territory. *Neotropical Wildlife Use and Conservation*. Chicago, University of Chicago Press: 53–81.
- Wilkie, D.S., B. Curran, R. Tshombe and G.A. Morelli. (1998). Modeling the Sustainability of Subsistence Farming and Hunting in the Ituri Forest of Zaire. *Conservation Biology* 12(1): 137–147.
- Yoccoz, N.G., J.D. Nichols and T. Boulinier. (2001). Monitoring of biological diversity in space and time. *Trends in Ecology and Evolution* 16(8): 446–453.
- Yost, J. and P. Kelley (1983). Shotguns, blowguns, and spears: the analysis of technological efficiency. *Adaptive Responses of Native Amazonians*. R. Hames and W. T. Vickers. New York, Academic Press: 189–224.

Appendix. List of large mammals observed during the Kwamalasamutu RAP survey. CT = camera trap; K = Kutari; S = Sipaliwini; W = Werehpai.

* Birds; included here for documentation of Trio names.

Scientific name	Common name	Trio name	Detection method	Site
<i>Cuniculus paca</i>	Paca	Kurimau	CT	K, S, W
<i>Alouatta macconnelli</i>	Guianan Red Howler Monkey	Aluatá	Heard	K
<i>Ateles paniscus</i>	Guianan Black Spider Monkey	Arimi; Tanonkonpe	Observed	K, S, W
<i>Cebus apella</i>	Brown Capuchin	Tarípi	Observed	K, S, W
<i>Cebus olivaceus</i>	Wedge-capped Capuchin	Ako	Observed	K, S, W
<i>Chiropotes chiropotes</i>	Guianan Bearded Saki	Isoimá	Observed	K
<i>Dasyprocta leporina</i>	Red-rumped Agouti	Akuri	CT	K, S, W
<i>Dasyptus kappleri</i>	Great Long-nosed Armadillo	Kapai	CT	S
<i>Dasyptus novemcinctus</i>	Nine-banded Armadillo	Kapai	CT	K, W
<i>Eira barbara</i>	Tayra	Ēkērēpukē	CT, observed	W
<i>Leopardus pardalis</i>	Ocelot	Pakoronko	CT	K, W
<i>Mazama americana</i>	Red Brocket Deer	Wikapao	CT, tracks	K, S, W
<i>Mazama gouazoubira</i>	Grey Brocket Deer	Kajaké	CT	K, S, W
<i>Myoprocta acouchy</i>	Red Acouchy	Pasinore	CT	K, S, W
<i>Myrmecophaga tridactyla</i>	Giant Anteater	Masiwē	CT	K
<i>Nasua nasua</i>	South American Coati	Seu	CT, observed	K, S, W
<i>Panthera onca</i>	Jaguar	Kaikui; Aturae	CT	W
<i>Philander opossum</i>	Common Gray Four-eyed Opossum	Aware	CT	K, S, W
<i>Pithecia pithecia pithecia</i>	White-faced Saki	Ariki	Observed	K
<i>Priodontes maximus</i>	Giant Armadillo	Morainmē	CT	S, W
<i>Proechymis</i> sp.	Spiny Rat	Kurimau	CT	K, S, W
<i>Pteronura brasiliensis</i>	Giant River Otter	Jawi	Observed	S
<i>Puma concolor</i>	Puma	Arawatanpa	CT, tracks	W,K
<i>Saguinus midas</i>	Golden-handed Tamarin	Makui	Observed	K, W
<i>Saimiri sciureus sciureus</i>	Guianan Squirrel Monkey	Karima; Akarima	Observed	K, S, W
<i>Tapirus terrestris</i>	Brazilian Tapir	Pai	CT, tracks	K, S, W
<i>Tayassu pecari</i>	White-lipped Peccary	Poneke	CT	W
<i>Pecari tajacu</i>	Collared Peccary	Pakira	CT, tracks,observed	K, S, W
<i>Neacomys</i> spp(?)	Mouse spp.		CT	S
<i>Crax alector</i>	Black Curassow*	Ohko	CT, observed	K, S, W
<i>Crypturellus variegatus</i>	Variegated Tinamou*	Sororsoroí	CT	K, W
<i>Tinamus major</i>	Great Tinamou*	Suwi	CT	K, W
<i>Penelope</i> spp.	Guan*	Marai	Observed	K
<i>Psophia crepitans</i>	Grey-winged Trumpeter*	Mami	CT	K, S, W

A Rapid Biological Assessment of the Kwamalasamutu region, Southwestern Suriname

Participants and Authors	4
Organizational Profiles.....	7
Acknowledgments	10
Report at a Glance, English	11
Report at a Glance, Trio (Iponohto Pisi Serë).....	25
Report at a Glance, Dutch (Rapportage in Vogelvlucht)	27
Executive Summary.....	29
Map and Photos	13
Chapters	38



Conservation International
2011 Crystal Dr., Suite 500
Arlington, VA 22202 USA

Tel: +1 703 341-2400
Web: www.conservation.org



Conservation International Suriname
Kromme Elleboogstraat no. 20
Paramaribo, Suriname

Tel: 597-421305
Web: www.ci-suriname.org

**With generous support from the
Alcoa Foundation**

