

Polycymaker Summary

State of the Apes

Industrial Agriculture and Ape Conservation



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Introduction

For decades, the expansion of industrial agriculture into the planet's tropical rainforests has caused forest loss, contributed to climate change and endangered wildlife populations. The trend is far from subsiding: in Africa, Latin America and Southeast Asia, forests are currently being cleared and replaced with monoculture plantations of oil palm, rubber, soy, sugar, and other commodities.

In tropical Africa and Asia, the spread of industrial agriculture is among the principal threats to ape populations; it has led to significant decreases in the number of bonobos, chimpanzees, gibbons, gorillas and orangutans. Since the 1990s, suitable habitat for gorillas across central Africa has shrunk by 30% to 55% (Junker *et al.*, 2012). In Asia, the decline in forested great ape and gibbon habitat has been equally or even more severe. From 1973 to 2014, for instance, forest cover in Cambodia shrank from 72% to 48% as land was cleared for rubber and other crops (Open Development Cambodia, 2015). Gibbons in Cambodia have lost most of their forest habitat. On the island of Borneo, 65,000 km² (6.5 million ha)—an area twice the size of Belgium—have been converted to palm oil plantations and at least another 10,000 km² (1 million ha) have given way to monoculture tree plantations for the paper industry (Gaveau *et al.*, 2014).

The cutting of forests, the burning of land and the draining of peat have had deleterious effects on people and wildlife

alike. In Borneo and Sumatra alone, thousands of orangutans have been killed every year as a result of such practices. Genetic studies in Kinabatangan, on the island of Borneo, show that 95% of the original orangutan population has been lost over the past two hundred years; that decline can largely be attributed to hunting and forest clearance for oil palm development and other crops (Goossens *et al.*, 2006)

Palm oil—used in food, cosmetics, toiletries and biofuels—is the fastest-growing monoculture in the world, and more research has been carried out on its production than on that of any other commodity. Due to its extensive industrial production, it is also the commodity that has had the greatest impact on ape habitats in Asia and that poses the most significant threat to those in Africa.

In addition to detailing the forces that are driving industrial agriculture, *State of the Apes: Industrial Agriculture and Ape Conservation* identifies its myriad repercussions for great ape and gibbon populations, many of which are already struggling to cope with multiple other threats, including disease, hunting, illegal trade and logging (see the first volume of *State of the Apes* for more information on the extractive industries). This volume also discusses the alternatives to destructive practices, such as the channeling of industrial agriculture towards the vast expanses of degraded land across the tropics. In Indonesia, for instance, degraded land accounts for more than 73,000 km² (7.3 million ha) (JPNN, 2010; Ruysschaert *et al.*, 2011). The cultivation of such low-carbon-density land

Photo: In most cases, the development of industrial crops involves the removal and conversion of natural forest. Stranded orangutan being rescued by IAR in Indonesia.
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“Even in areas where plantations are not fully developed, however, land clearance operations can devastate landscapes, decimate wildlife populations, disrupt the lives of indigenous communities in their ancestral homes and severely distort economic conditions.”

avoids the release of carbon from the conversion of intact tropical forest, while also helping to protect biodiversity and local communities that depend on forests. This book also highlights how the application of innovative cultivation methods in forest-agriculture mosaic landscapes can promote the long-term regional survival of apes.

The context in which industrial agriculture operates is changing rapidly. Around the world, consumers are demanding to know where their food comes from and that it be produced in a manner consistent with their values. They have organized global campaigns to insist that companies eliminate deforestation and human rights abuses from their agricultural supply chains. Companies are responding and, at times, leading the change, in many cases ahead of the certification bodies established to drive such change.

The most important voluntary standard in relation to great apes and gibbons, and perhaps for tropical biodiversity generally, is currently the palm oil standard governed by the Roundtable on Sustainable Palm Oil (RSPO). While certified sustainable palm oil (CSPO) represents a mere 20% of global palm oil production and ensuring its sustainability is a continuing challenge, encouraging signs are emerging. Indeed, the percentage of globally traded palm oil covered by strong “no deforestation” policies grew from 5% to more than 90% over the course of 2014. In the first six months of 2015, two of the largest South American soy buyers that also source palm oil—Archer Daniels Midland Company (ADM) and Bunge—adopted corresponding forest conservation policies (ADM, 2015; Bunge, 2015; Cushing, 2015; Gillis and St. Fleur, 2015). The two dominant Southeast Asian pulp and paper companies, Asia Pacific Resources International Ltd. (APRIL) and Asia Pulp and Paper (APP), have also pledged to halt deforestation (APP, n.d.; Otto, 2015). There is a rapidly growing movement to spread these expectations to other commodities, such as cattle, cocoa, coffee, rubber and sugar.

Indeed, this movement has become so widespread that the protection of forests and other natural ecosystems—as well as human rights—has become a condition for access to some of the highest-value international agricultural markets. Moreover, international financiers and buyers have become increasingly hesitant to underwrite companies that threaten forests, wildlife or community rights. As a result, protecting



viable great ape and gibbon populations has become increasingly relevant for policymakers, including those focused primarily on agricultural and economic development. Put simply, expanding a country's agricultural economy can become more challenging if the country's policies and practices do not protect endangered wildlife.

Yet, as this volume shows, the private sector's realignment must progress swiftly if it is to protect remaining ape habitat from being transformed into plantations; moreover, requisite policies can only be effective if they are implemented, and enforced, on the ground. Industrial agriculture can expand very rapidly, accompanied by equally rapid and often permanent impacts on apes and their habitat. Recent developments in both Africa and Asia show that the potential for industrial agriculture can fade just as quickly in response to changing commodity prices, local resistance or other factors. Both continents are rife with examples of companies that gained concessions for vast areas of land, cleared them of forests—and wildlife—but then never finished the job of planting. In Africa, for instance, 27,000 km² (2.7 million ha) of land have come under contract for industrial agricultural projects in the past 15 years, yet only 2,000 km² (200,000 ha) have actually been planted (Land Matrix, n.d.).

Even in areas where plantations are not fully developed, however, land clearance operations can devastate landscapes, decimate wildlife populations, disrupt the lives of indigenous communities in their ancestral homes and severely distort economic conditions. Economies that experience this kind of environmental destruction may find their ability to access environmentally sensitive international markets significantly impeded over the long term. In contrast, countries and companies that have set up mechanisms to ensure that development happens only on degraded land are attracting new business and investment while protecting their natural resources and their people for the future.

What follows is a policy-relevant discussion of the forces affecting apes and their habitat, as well as recommendations regarding ways to protect them as industrial agriculture expands.

How Industrial Agriculture Affects Great Apes

Research findings indicate that crops as diverse as cacao, cotton, oil palm, rubber and sugarcane affect the integrity of ape habitats across their entire range. While the drivers of deforestation are complex, the cause is largely attributable to a combination of poor planning and ineffective governance in relation to land use and tenure. Great apes and gibbons generally enjoy some legal protection from direct killing or harassment, but these laws often have a limited real-world impact—typically due to corruption or limited government capacity to implement and enforce legislation—and they often provide few, if any, remedies to address the destruction of ape habitats linked to industrial agriculture.

Although orangutans enjoy protected status in Indonesia, for instance, they are subject to killings, harassment and dis-

placement during the many stages of a plantation's establishment. During the initial land-clearing phase, workers who encounter orangutans sometimes shoot, beat or set fire to mother orangutans as they are considered "problem animals" that can damage crops, and the babies can be sold in the illicit pet trade, as baby orangutans can fetch up to \$150; sometimes they kill the babies too, generally to receive a bounty from plantation managers. Later, when palm oil seedlings are planted, orangutans whose previous forest food sources were destroyed may seek to feed on shoots. Once plantations have been established, displaced orangutans may enter villages in search of food, increasing human-orangutan conflicts.

Since the 1990s, the spread of commercial crops such as sugarcane and tobacco in Uganda has caused a dramatic reduction in forest cover. As their traditional habitats and food sources have been destroyed, chimpanzees have increasingly looked for food in human settlements, leading residents to assume—erroneously—that chimpanzee populations have exploded along with the expansion of commercial agriculture. In the absence of their natural food sources, these apes have become reliant on farmed products such as cacao and sugarcane. Researchers have found that even in areas where local people used to be highly tolerant of chimpanzees and did not hunt them for food, this shift in behavior has led apes to be seen as a pest. It is clear that if industrial agriculture continues to target forests, great apes will encounter humans with greater frequency, putting them at increased risk.

Human Impacts

Research has also shown that industrial agriculture impacts the most populous great apes of all: *homo sapiens*. Development of industrial agriculture can exacerbate rural poverty, introduce disease to remote communities and destroy longstanding productive local economies. The establishment of industrial plantations has frequently displaced indigenous people who live in forests—and it continues to fuel violence against local communities across the tropics.

Setting up a plantation often involves clearing a community's diverse agroforestry system to make room for monoculture plantations. While a plantation can dramatically increase the land's total agricultural production when measured in tons, it often destroys or undermines local communities' ability to grow food for themselves. After all, if a palm oil plantation replaces an existing system for fruit, vegetables and mixed livestock, it in no way increases local food supplies. With the loss of locally produced food, communities often become reliant on expensive imports from other areas, which ties them further to international commodities markets and undermines local food security.

At the national, regional and international levels, benefits from the expansion of industrial agriculture tend to accrue to producers and traders, consumer companies, national GDP and global food supplies, and to migrant laborers who move to forest frontier areas to work. In many cases, migrant laborers—particularly those who can establish their own plantations—may experience a significant rise in prosperity over time.

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Across the tropics, however, industries such as cocoa, palm oil and sugar are rife with labor abuses, including ongoing child and forced labor, denial of basic workplace protections for women and de facto prohibitions against the formation of unions.

Some of these problems derive from weaknesses or loopholes in legal structures, which can be manipulated to allow for abuses. In many countries across the tropics, governments retain the right to allocate land, and so the state ends up controlling the vast majority of the land, even if private property is permitted. Recognition of community rights varies enormously across these countries. In most of them, communities can secure their land tenure in the face of industrial agriculture only if they can show they are productively using the land themselves. Since ape habitat is barely used for conventionally conceived “productive purposes,” it is—paradoxically—particularly likely to be allocated to companies for industrial agricultural development.

In addition, even if constitutions, legislation or court rulings formally confer land rights on communities, provisions often allow a government to override those protections. In Gabon, for example, the government may overrule rights if it decrees that doing so serves a public purpose; in Indonesia, the constitution allows the government to void community rights if doing so is determined to be in the national interest. One reason these loopholes are frequently abused is that ministries and agencies charged with agricultural development tend to be more politically powerful—and typically have a larger field of formal jurisdiction—than those charged with environmental protection.

The Private Sector Transformation

While all of these issues remain serious across industrial agricultural areas in the tropics, leading consumer companies and agricultural traders are starting to do something about them. They have increasingly imposed requirements that industrial agricultural production be free not only of deforestation, but also of human rights abuses. The “no deforestation” policies adopted by leading palm oil, paper and soy producers, for instance, include provisions that require them to obtain the free, prior and informed consent of indigenous communities, and to observe a range of workplace protections. Community conflicts can be thorny and difficult to resolve, however, and company reporting on compliance routinely lags behind reporting on conservation, restoration and other ecological issues.

It is important to note that much of the progress in recent years has been fueled by voluntary commitments of major companies, which have been largely driven by a desire to maintain access to increasingly environmentally sensitive

markets. Yet, over the long term, it may be difficult to maintain and expand great ape habitat if doing so depends on the mercies of private-sector CEOs.

Indeed, Indonesia has provided a brutal lesson in this regard: following the publication of *State of the Apes* in 2015, the country saw a massive surge in deforestation as more than 20,000 km² (2 million ha) burned during the extended dry season, fueled by an especially intense El Niño. This disaster occurred *after* the leading paper and palm oil companies had adopted and had begun to implement strong forest conservation policies and were clamoring for the government to do its part by improving its own enforcement efforts. Unfortunately, some small- and medium-sized—and a few large—plantation companies wanted to continue business as usual and were able to sway their allies in government; as a consequence, the enforcement of government bans against burning was extremely limited.

Once the rains came—in other words, after the bulk of the damage had been done—Indonesia’s government announced criminal enforcement actions against a number of companies and a series of policy reforms to reduce future burning. It also put an experienced conservationist in charge of a newly established peat agency and pronounced a ban on clearing peat forests. It is unclear, however, to what extent Indonesia really is ready for the next dry season, and there are doubts in global markets about the country’s ability to deliver environmentally responsible products, regardless of the good intentions of progressive companies or of the government.

Policy Recommendations

The Indonesian disaster shows that governments must complement private-sector action with the requisite tools and the will to support conservation. Largely driven by that insight, this volume of *State of the Apes* offers numerous recommendations for policymakers who seek to protect great apes, gibbons and their habitat, support human rights, and secure the market access and economic growth that accompanies responsible production. Those recommendations include the following:

- **Improve land use planning to ensure that agricultural expansion is targeted at the more than 1.25 million km² (125 million ha) of degraded land across the tropics—not at forested lands that great apes and gibbons rely on as core habitat.** Great ape and gibbon range states can look to Brazil for inspiration. Numerous Brazilian supermarkets, agricultural traders and meatpackers responded to consumer campaigns by agreeing not to source raw materials from farms and companies engaged in deforestation. The government used its satellite monitoring resources to help scientific experts to identify millions of hectares of previously cleared, abandoned land that could be planted without endangering forests. The government also established a robust monitoring system to track deforestation down to the farm level, established hundreds of millions of hectares of new protected areas and

launched a crackdown on illegal logging and land clearance. The result: a decline of more than 70% in the rate of deforestation in the Amazon since its peak in 2004 (INPE, 2013). Meanwhile, soy and cattle production has doubled and Brazil has dramatically expanded its international markets, showing that it is possible to break the link between agricultural expansion and deforestation.

- **Adopt strong national “no deforestation, no peat, no exploitation” policies such as those implemented by many agricultural commodity companies.** In response to civil society campaigns and international market emphasis on sustainability, Southeast Asia’s two largest pulp and paper companies, APRIL and APP, as well as palm oil companies representing more than 90% of global trade, have adopted a robust forest and landscape conservation methodology known as the high carbon stock (HCS) approach. A number of related efforts to reduce exploitation and deforestation in great ape and gibbon range states have already been implemented. Indonesia, Malaysia and Nigeria, for example, have agreed to protect mature, secondary and regrowing forests; in these countries, the HCS Approach Toolkit assists growers in pinpointing low-carbon landscapes that can be developed with relatively minimal ecological costs. In Liberia, the government has won international acclaim and attracted development dollars and private-sector investment by adopting a policy that requires any agricultural commodity company that operates within its borders to adhere to rigorous conservation guidelines. The country is also implementing the Extractive Industries Transparency Initiative and the Norway–Liberia deal to halt deforestation of intact forests.
- **Implement ape-friendly management practices in existing mixed forest–agriculture landscapes.** While the presence of industrial agriculture represents clear threats to apes, mosaic landscapes can be made more hospitable to them and other wildlife. In the mixed forest–agriculture landscape of northern Sumatra, orangutans spend more time resting and less time feeding, as well as less time eating fruits and more time consuming bark, than orangutans who live in intact forest. They also have a smaller home range than other orangutans. Nonetheless, natural fruits still constitute 80% of their diet. In comparison to forest orangutans, their conspecifics in acacia and eucalyptus plantations travel longer distances and remain active later into the night to gather crops after humans have stopped working. While life is more difficult for these orangutans, it is still possible for them to survive. Chimpanzees, the most omnivorous of great apes, can eat a wide array of cultivars wherever they are tolerated by humans. Although plantation landscapes lack the food diversity and shelter needed to support long-term great ape populations, measures can be taken in plantations that abut forests to protect animals that enter or even nest within plantations. For instance, trenches and netting that are installed to prevent great apes from eating saplings can be replaced with bridges once the saplings mature to facilitate ape dispersal. Education of workers and community members about living with apes may also help alter negative attitudes. Recent research by Marc Ancrenaz

“The expansion of industrial agriculture has led apes to be confined to ever-shrinking pockets of forest and has brought hunters and disease into their former strongholds.”

and others demonstrates that, despite their destructive impacts, palm oil plantations can—to a limited extent—serve as food sources for orangutans in mosaic landscapes that include significant areas of protected forest and nearby forest patches.

- **Maintain connectivity even in a forest mosaic landscape.** The Bossou chimpanzees in Guinea, West Africa, are expected to go extinct because they are semi isolated from their neighbors. Their area is far away from habitats of other chimpanzee populations, and other apes are unlikely to make their way there as they would have to cross a savanna–agricultural landscape that would expose them to danger. As a result, despite good short-term survival rates for chimp infants among the Bossou chimpanzees—partly attributable to the diversity of available food sources—long-term survival prospects for the chimpanzee community are poor. Restoration of a forest corridor and habitat could remedy this situation, allowing for genetic interchange among different populations of chimpanzees. In many other places around the world, corridors would greatly benefit apes and other wildlife.
- **Improve transparency.** Commodity agriculture has traditionally been characterized by opacity. Companies wanted to keep the identities of their suppliers and their practices secret from each other and the public, for fear that rivals might get a commercial advantage or that governments might regulate their activities. At the same time, limited opportunities for democratic scrutiny through parliament, public participation and other deliberative and accountability mechanisms facilitated large land deals that flew in the face of social and environmental concerns. The past two years, however, have seen a transparency revolution in commodity agriculture, particularly in the palm oil industry. The leading palm oil and Southeast Asian paper producers have put the identities and mill locations of their suppliers online so that anyone can monitor whether there is deforestation in their supply chain—including through ground-truthing and the use of open-source satellite maps, such as the publicly available Global Forest Watch. Some countries are making corresponding improvements in transparency so that governments and the public alike can monitor company practices to make sure they are adhering both to the law and their own commitments. A 2011 Democratic Republic of Congo decree requires the publication of forestry contracts, although it remains unclear if this applies to agribusiness. Liberia recently adopted a comprehensive policy requiring disclosure of contracts for extractive industries, agriculture and forestry. Transparency can make environmental protection far more affordable and effective; instead of relying exclusively on publicly funded

personnel and programs, governments can enlist the public as eyes and ears to watch for violations.

- **Implement and align laws.** In many cases, countries have passed strong conservation laws without adopting the necessary implementing legislation or regulations. For example, Cameroon's 1996 Framework Law on Environmental Management contains a wide array of provisions that require the government to enact further implementing decrees and regulations—some of which have not yet been adopted, more than 20 years after the primary text was first promulgated (Cameroon, 1996; Fuo and Semie, 2011). Many countries also have policies that strictly prohibit direct killing or harassment of great apes, but that allow wholesale destruction of the habitat on which they rely. Habitat protection should be aligned with great ape—and broader endangered species—protection policies, which would help to channel development onto the landscapes that would be the most appropriate and whose exploitation would be least destructive.
- **Improve enforcement of laws and regulations.** Across great ape and gibbon range states, enforcement of environmental laws often lags behind the adoption of the laws themselves. The protection of apes and ape habitat from the impacts of industrial agriculture is hobbled by gaps in the capacity of government institutions to implement and enforce legislation, by political economy considerations that affect incentives for government agencies to apply and enforce legislation, and by uncoordinated government or legislative action that creates legal uncertainty capable of undermining conservation efforts. There is an urgent need to strengthen both procedural and substantive safeguards, including impact assessment studies (at the project and macro levels) and accurate documentation of illegal activities. Greater accountability for enforcement can also be secured by explicitly allowing governments to terminate private-sector concessions when concessionaires commit environmental violations.
- **Increase financial resources for forest conservation through programs such as REDD+.** Governments and international financial institutions can provide support to protect natural resources and to secure governance improvements in great ape and gibbon range states. Liberia's recent agreement with Norway—designed to reduce the rate of deforestation by strengthening support for protected areas, forest policies and governance—can provide a model for other forest nations. As in Norway's agreements with other countries—including Brazil, Guyana and Indonesia—part of the financing is results-based; outside of seed funding, countries receive financial support only after they have secured reductions in deforestation, while also protecting indigenous people's rights. This mechanism can provide an enduring incentive for all stakeholders in a country to continue conservation efforts over the long term, while also providing an important safeguard for taxpayers in donor countries.
- **Limit biofuel mandates.** Governments can limit mandates and incentives for production of biofuels that either directly or indirectly threaten forest landscapes. Starting

in 2004, European and other biofuel mandates dramatically increased interest in the development of biofuels, leading to a surge of investment in the production of *jatropha*, a perennial plant whose seeds can be crushed to produce vegetable oil and whose potential as a major source of biofuel was once widely touted. At its peak, more than 30% of land acquisition in Africa was for *jatropha*. In 2009, however, the European Union repealed its previous Biofuels Directive and required that biofuel feedstocks generate a net reduction in greenhouse gas emissions without negatively impacting biodiversity or land use. Further weakened by a decline in the availability of capital due to the global financial crisis, investment in African biofuels projects collapsed. The limited number of biofuel projects that did get off the ground experienced disappointing yields and were abandoned or sold. In 2014, the European Union implemented another cap on biofuels, limiting food-based biofuels such as palm oil and rapeseed to 7% of total fuel consumption, thus significantly limiting any prospects for conventional biofuel expansion in Africa. Nevertheless, in 2015, Indonesia announced plans to triple biofuel subsidies (Khairnur, 2015; Reuters, 2015). Advocates have pushed for the country to ensure that any biofuel comes from companies that are implementing strong “no deforestation” policies, but the government has not yet made any commitments to do so.

- **Expand and restore protected areas.** While the destructive impact of conversion of natural ecosystems to plantations is clear, new protections can reverse previous damage. A study of the well-known Sabangau peat forest in Central Kalimantan, the largest in Borneo, documents the impacts of the ill-conceived Mega Rice Project, which, alongside associated illegal logging, drained and burned 10,000 km² (1 million ha) of orangutan habitat to clear land for rice farms that were never established (Notohadiprawiro, 1998). Orangutans were progressively pushed into a low pole forest area, which witnessed its greatest concentration of orangutans ever—triggering conflict between orangutans and competition for scarce food. From 2000 to 2001, 40% of the orangutans died as a result. Thanks in significant part to advocacy from non-governmental organizations, efforts to crack down on illegal logging in the region began soon thereafter, and a significant part of Sabangau was declared a national park in 2004. Since then, orangutan populations have slowly grown in parts of the park. While they have not yet achieved their original levels, the growth has been remarkable given great apes' relatively slow reproductive cycles. Outside of the park and at its margins, however, deforestation has continued, putting pressure on overall orangutan populations in the region—and illustrating the need for landscape-level action to protect great apes. Such action can take the form of legislation that specifically protects apes or, as occurred in Aceh, Indonesia, forest fire regulations and public moratoria that indirectly protect ape habitats.
- **Support community initiatives to conserve forests and great ape habitat.** In Tanzania, around the Gombe Stream National Park, for example, the Jane Goodall Institute facilitated village-by-village land use plans in collaboration with

communities that volunteered to set up forest reserves and safeguard natural resources, for the benefit of the communities as well as the apes. To encourage local participation, the institute included community development objectives in its plans, alongside conservation goals—thus ensuring widespread buy-in.

A Pivotal Moment

The expansion of industrial agriculture has led apes to be confined to ever-shrinking pockets of forest and has brought hunters and disease into their former strongholds. All apes are endangered or vulnerable according to the IUCN Red List (IUCN, 2015)—and all are legally protected in each of their range states. Yet their survival will continue to be under serious threat unless:

1. key habitats are taken into consideration in land use planning;
2. industry players and other stakeholders implement best management practices; and
3. human communities that share habitat with apes contribute to and benefit from conservation.

A failure to embrace any of these approaches will seriously threaten the future of all apes.

New private-sector initiatives have changed the economic and political landscape in ways that provide powerful incentives to channel development into areas of degraded land, rather than natural forest, in tropical forest countries—and to adopt management practices that are more aligned with conservation objectives. Countries and companies that are committed to these approaches are maintaining and expanding access to buyers and global capital markets that require the protection of forests, wildlife and community rights. More great ape and gibbon range states could replicate these successes by seizing the opportunity created by the private sector's realignment and instituting an array of governance improvements. International donors can support this transformation in global agriculture through results-based funding incentives, while also limiting policies that drive deforestation, such as biofuel mandates. Governments should also implement complementary policies, such as laws against trade in illegally logged wood and agricultural products.

This is a moment of great opportunity for apes and other endangered wildlife: from here on in, their protection and the economic prosperity of the countries in which they live can be more closely aligned. It is a moment that we must seize. ■

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Bonobo (*Pan paniscus*)

Location and Population

The bonobo is only present in the Democratic Republic of Congo (DRC), biogeographically separated from chimpanzees and gorillas by the Congo River. The population size is unknown, as only 30% of its historic range has been surveyed; however, estimates place the population somewhere between 29,500 (Myers Thompson, 1997) and 50,000 (Dupain and Van Elsacker, 2001) individuals, with numbers decreasing. The bonobo is included in the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) Appendix I, and is categorized as endangered (EN) on the International Union for Conservation of Nature (IUCN) Red List (Fruth *et al.*, 2008); for more information, see Box 2: IUCN Red List categories and criteria, and CITES Appendices. Activities causing population decline include poaching for the commercial wild meat trade, civil conflict and habitat destruction (Fruth *et al.*, 2008).

Physiology

Male adult bonobos reach a height of 73–83 cm and weigh 37–61 kg, while females are slightly smaller, weighing 27–38 kg. Bonobos are moderately sexually dimorphic and similar in size and appearance to chimpanzees, although with a smaller head and lithier appearance.

The bonobo diet is mainly frugivorous (more than 50% fruit), supplemented with leaves, stems, shoots, pith, seeds, bark, flowers, honey and fungi, including truffles. Animal matter—such as insects, small reptiles, birds and medium-sized mammals, including other primates—accounts for 3% of their diet. The maximum life span in the wild is 50 years (Robson and Wood, 2008).

Social Organization

Bonobos live in fission–fusion communities of 10–120 individuals, consisting of multiple males and females. When foraging, they split into smaller mixed-sex subgroups, or parties, averaging 5–23 individuals.

Male bonobos cooperate with and tolerate one another; however, lasting bonds between adult males are rare, in contrast to the bonds between adult females, which are strong and potentially last for years. A distinguishing feature of female bonobos is that they are co-dominant with males and will form alliances against certain males within the community. Among bonobos, the bonds between mother and son are the strongest, prove highly important for the social status of the son and last into adulthood.

Together with chimpanzees, bonobos are the closest living relatives to humans, sharing 98.8% of our DNA (Varki and Altheide, 2005; Smithsonian Institution, n.d.).



Chimpanzee (*Pan troglodytes*)

Location and Population

Chimpanzees are distributed across equatorial Africa, with discontinuous populations from southern Senegal to western Uganda and Tanzania (Oates *et al.*, 2008a).

Chimpanzees are listed in CITES Appendix I, and all four subspecies are categorized as endangered (EN) on the IUCN Red List (Oates *et al.*, 2008a). There are approximately 70,000–116,000 central chimpanzees; 21,300–55,600 western chimpanzees; 200,000–250,000 eastern chimpanzees; and 3,500–9,000 Nigeria–Cameroon chimpanzees. Populations are believed to be declining, but the rate has not yet been quantified.

Decreases in chimpanzee numbers are mainly attributed to increased poaching for the commercial wild meat trade, disease (particularly Ebola) and mechanized logging (which facilitates poaching) (Oates *et al.*, 2008a).

► Physiology

Male chimpanzees are 77–96 cm tall and weigh 28–70 kg, while females measure 70–91 cm and weigh 20–50 kg. They share many facial expressions with humans, although forehead musculature is less pronounced and they have more flexible lips. Chimpanzees live for up to 50 years in the wild.

Chimpanzees are mainly frugivorous and opportunistic feeders. Some communities include 200 species of food items in a diet of fruit supplemented by herbaceous vegetation and animal prey, such as ants and termites, but also small mammals, including other primates. Chimpanzees are the most carnivorous of all the apes.

Social Organization

Chimpanzees show fission–fusion, multi-male–multi-female grouping patterns. A large community includes all individuals who regularly associate with one another; such communities comprise an average of 35 individuals, with the largest-known group counting 150, although this size is rare. The community separates into smaller, temporary subgroups, or parties. The parties can be highly fluid, with members moving in and out quickly or a few individuals staying together for a few days before rejoining the community.

Typically, home ranges are defended by highly territorial males, who may attack or even kill neighboring chimpanzees. Male chimpanzees are dominant over female chimpanzees and are generally the more social sex, sharing food and grooming each other more frequently. Males will cooperate to hunt, but the level of cooperation involved in social hunting activities varies between communities. Chimpanzees are noted for their sophisticated forms of cooperation, such as in hunting and territorial defense.



Gorilla (*Gorilla* species (spp.))

Location and Population

The western gorilla (*Gorilla gorilla*) is distributed throughout western equatorial Africa and has two subspecies: *Gorilla gorilla gorilla*, or the western lowland gorilla, and *Gorilla gorilla diehli*, or the Cross River gorilla. The eastern gorilla (*Gorilla beringei*) is found in the DRC and across its border into Uganda and Rwanda. There are two subspecies of the eastern gorilla: *Gorilla beringei beringei*, or the mountain gorilla, and *Gorilla beringei graueri*, or Grauer's gorilla (also referred to as the eastern lowland gorilla).

Population estimates for the western gorilla range between 140,000 and 160,000, while as few as 300 Cross River gorillas remain (Oates *et al.*, 2008a). All gorillas are listed as critically endangered (CR) on the IUCN Red List, except for the endangered (EN) Grauer's gorilla, whose status will be reviewed in 2015. Population estimates for Grauer's gorilla are between 2,000 and 10,000 (Robbins and Williamson, 2008). Estimates for the mountain gorilla are between 780 and 880 individuals (Roy *et al.*, 2014b). The main threats to both species are poaching for the commercial wild meat trade, habitat destruction and disease (the Ebola virus in particular) (Robbins and Williamson, 2008; Walsh *et al.*, 2008).

Physiology

The adult male of the eastern gorilla is slightly larger (159–196 cm, 120–209 kg) than the western gorilla (138–180 cm, 145–191 kg). Both species are highly sexually dimorphic, with females being about half the size of males. Their life span ranges from 30 to 40 years in the wild. Mature males are known as “silverbacks” due to the development of a gray saddle with maturity.

The gorillas' diet is predominantly ripe fruit and terrestrial, herbaceous vegetation. More herbaceous vegetation is ingested while fruit is scarce, in line with seasonality and fruit availability, and protein gain comes from leaves and bark of trees as well as animal supplements in the form of ants and termites; gorillas do not eat meat. Mountain gorillas are largely herbivorous, feeding mainly on leaves, pith, stems, bark and, occasionally, ants.

Social Organization

Western gorillas live in stable groups with multiple females and one adult male (silverback), whereas eastern gorillas are polygynous and can be polygynandrous, with one or more silverbacks, multiple females, their offspring and immature relatives. Eastern gorillas can live in groups of up to 65 individuals, whereas the maximum group size for the western gorilla is 22. Western gorillas are not territorial and home ranges overlap extensively. Chest beats and vocalizations are used when neighboring silverbacks come into contact, but mutual avoidance is normally the adopted strategy. Gorillas have also been known to adopt offspring from other females (orphans usually) and raise them as their own (Smuts *et al.*, 1987).



Orangutan (*Pongo* spp.)

Location and Population

The orangutan range is now limited to the forests of Sumatra and Borneo, but these great apes were once present throughout much of southern Asia (Wich *et al.*, 2008, 2012). Survey data indicate that in 2004 there were approximately 6,500 remaining Sumatran orangutans and at least 54,000 Bornean orangutans (Wich *et al.*, 2008). As a result of continuing habitat loss, the Sumatran orangutan is classified as critically endangered (CR) and the Bornean orangutan as endangered (EN) (Ancrenaz *et al.*, 2008; Singleton, Wich and Griffiths, 2008). Both species are listed in Appendix I of CITES. The main threats to the species are habitat loss, killings due to human–ape conflict, hunting and the international pet trade (Wich *et al.*, 2008; Gaveau *et al.*, 2014).

Physiology

Adult males can reach a height of 94–99 cm and weigh 60–85 kg (flanged) or 30–65 kg (unflanged). Females reach a height of 64–84 cm and weigh 30–45 kg, meaning that orangutans are highly sexually dimorphic. Sumatran orangutans are generally slither than their Bornean relatives. In the wild, males have a life expectancy of 58 years and females 53 years.

Fully mature males develop a short beard and protruding cheek pads, termed “flanges.” Some male orangutans experience “developmental arrest,” maintaining a female-like size and appearance for many years past sexual maturity; they are termed “unflanged” males. Orangutans are the only great ape to exhibit bimaturation.

Their diet mainly consists of fruit, but they also eat leaves, shoots, seeds, bark, pith, flowers, eggs, soil and invertebrates (termites and ants). Carnivorous behavior has also been observed, but at a low frequency (preying on species such as slow lorises).

Social Organization

The mother–offspring unit is the only permanent social unit among orangutans, yet social groupings between independent individuals do occur, although their frequency varies across populations (Wich *et al.*, 2009b). While females are usually relatively tolerant of each other, flanged males are intolerant of other flanged and unflanged males (Wich *et al.*, 2009b). Orangutans on Sumatra are generally more social than those on Borneo and live in overlapping home ranges, with flanged males continually emitting “long calls” to alert others to their location (Delgado and van Schaik, 2000; Wich *et al.*, 2009b). Orangutans are characterized by an extremely slow life history, with the longest interbirth interval (6–9 years) of any primate species (Wich *et al.*, 2004, 2009b).

Gibbons (*Hoolock* spp.; *Hylobates* spp.; *Nomascus* spp.; *Symphalangus* spp.)

All four genera of gibbon generally share ecological and behavioral attributes, such as monogamy in small territorial groups; vocalization through elaborate song (including complex duets); frugivory and brachiation (moving through the canopy using only the arms). Due to their dependence on fruit, gibbons rarely have multi-female groups (polygyny) and instead remain in small monogamous groups with few offspring. They are diurnal and sing at sunrise and sunset, with a significant part of their day dedicated to finding fruit trees within their territories.



Hoolock genus

Location and Population

There are two species within the Hoolock genus: the western hoolock (*Hoolock hoolock*) and the eastern hoolock (*Hoolock leuconedys*). A new subspecies of the western hoolock was discovered in 2013: the Mishmi Hills hoolock (*Hoolock hoolock mishmiensis*) (Choudhury, 2013). The western hoolock's distribution spans Bangladesh, India and Myanmar. The eastern hoolock's distribution is in China, India and Myanmar. With an estimated population of 2,500 individuals, the western hoolock is listed as endangered (EN) on the IUCN Red List. The population of eastern

hoolock is much higher at 293,200–370,000, and it is listed as vulnerable (VU) on the IUCN Red List. Both species are listed in CITES Appendix I, with the main threats identified as habitat loss and fragmentation, and hunting for food, pets and for medicinal purposes.

Physiology

The hoolock's head and body length ranges between 45 and 81 cm; they weigh 6–9 kg, with males slightly heavier than females. Like most gibbons, the Hoolock genus is sexually dichromatic, with the pelage (coat) of females and males differing in terms of patterning and color. The eastern hoolock also differs from its western counterpart in its pelage, in particular because they have complete separation between the white brow markings and a white preputial tuft.

The diet of the hoolock is primarily frugivorous, supplemented with vegetative matter such as leaves, shoots, seeds, moss and flowers. While little is known about the diet of the eastern hoolock, it most likely resembles that of the western hoolock.

Social Organization

Hoolocks live in family groups of 2–6 individuals, consisting of a mated adult pair and their offspring. They are presumably territorial, although no specific data exist. Hoolock pairs vocalize a "double solo" rather than the more common "duet" of various gibbons.



***Hylobates* genus**

Location and Population

Nine species are currently included in the *Hylobates* genus, although there is some dispute about whether Müller's gibbon (*Hylobates muelleri*), Abbott's gray gibbon (*Hylobates abbotti*), and the Bornean gray gibbon (*Hylobates funereus*) represent full species.

This genus of gibbon occurs discontinuously in tropical and sub-tropical forests from southwestern China, through Indochina, Thailand and the Malay Peninsula to the islands of Sumatra, Borneo and Java (Wilson and Reeder, 2005). The overall estimated minimum population for the *Hylobates* genus is about 360,000, with the least abundant species being the moloch

gibbon, and most abundant being, collectively, the 'gray gibbons' (Müller's, Abbott's and Bornean gray gibbons). All species are listed as endangered (EN) on the IUCN Red List and are in CITES Appendix I. A number of hybrids of these species occur naturally and continue to coexist with the unhybridized species in the wild. The main collective threats facing the *Hylobates* genus are deforestation, hunting and the illegal pet trade.

Physiology

Average height across all species is approximately 46 cm for both males and females and their weight ranges between 5 and 7 kg. With the exception of the pileated gibbon, species in the genus are not sexually dichromatic, although the lar gibbon has two color phases, which are not related to sex or age.

Gibbons are mainly frugivorous, with figs being an especially important part of their diet, supplemented by leaves, buds, flowers, shoots, vines and insects, while small animals and bird eggs form the protein input.

Social Organization

Hylobates gibbons are largely monogamous, forming family units of two adults and their offspring; however, polyandrous and polygynous units have been observed, especially in hybrid zones. Territorial disputes are predominantly led by males, who become aggressive toward other males, whereas females tend to lead daily movements and ward off other females.

***Nomascus* genus**

Location and Population

Seven species exist in the *Nomascus* genus. See Table AO1: Great apes and gibbons.

The *Nomascus* genus is somewhat less widely distributed than the *Hylobates* genus, being present in Cambodia, Lao PDR, Vietnam and southern China (including Hainan Island). Population estimates exist for some taxa: there are approximately 1,500 western

black crested gibbons, 130 Cao Vit gibbons and 23 Hainan gibbons. Population estimates for the white-cheeked gibbons are not available except for some sites, yet overall numbers are known to be severely depleted. The yellow-cheeked gibbons have the largest populations among the *Nomascus* gibbons. All species are listed in CITES Appendix I, with four listed as critically endangered (CR) on the IUCN Red List, two as endangered (EN) and one (*Nomascus annamensis*) yet to be assessed (IUCN, 2014b). Major threats to these populations include hunting for food, pets and for medicinal purposes as well as habitat loss and fragmentation.

Physiology

Average head and body length across all species of this genus, for both sexes, is approximately 47 cm; they weigh around 7 kg. All *Nomascus* species have sexually dimorphic pelage, with adult males being predominantly black while females are a buffy yellow. Their diet is much the same as that of the *Hylobates* genus: mainly frugivorous, supplemented with leaves and flowers.

Social Organization

Gibbons of the *Nomascus* genus are mainly socially monogamous; however, most species have also been observed in polyandrous and polygynous groups. More northerly species appear to engage in polygyny to a greater degree than southern taxa. Extra-pair copulations outside monogamous pairs have been recorded, although infrequently.

***Symphalangus* genus**

Location and Population

Siamang (*Symphalangus syndactylus*) are found in several forest blocks across Indonesia, Malaysia and Thailand; the species faces severe threats to its habitat across its range. No accurate estimates exist for the total population size. The species is present in CITES Appendix I and is listed as endangered (EN) on the IUCN Red List.

Physiology

The siamang's head and body length is 75–90 cm, and adult males weigh 10.5–12.7 kg, while adult females weigh 9.1–11.5 kg. The siamang is minimally sexually dimorphic, but the pelage is the same across sexes. The pelage is black, and the species has a large inflatable throat sac.

The siamang's diet relies heavily on figs and somewhat less on leaves, which allows it to be sympatric with *Hylobates* gibbons in some locations, since the latter focus more on fleshy fruits. The siamang diet also includes flowers and insects.

Social Organization

Males and females call territorially, using their large throat sacs, and males will give chase to neighboring males. One group's calls will inhibit other groups nearby, and they will consequently take turns to vocalize. The groups are usually based on monogamous pairings, although polyandrous groups have been observed. Males may also adopt the role of caregiver for infants.

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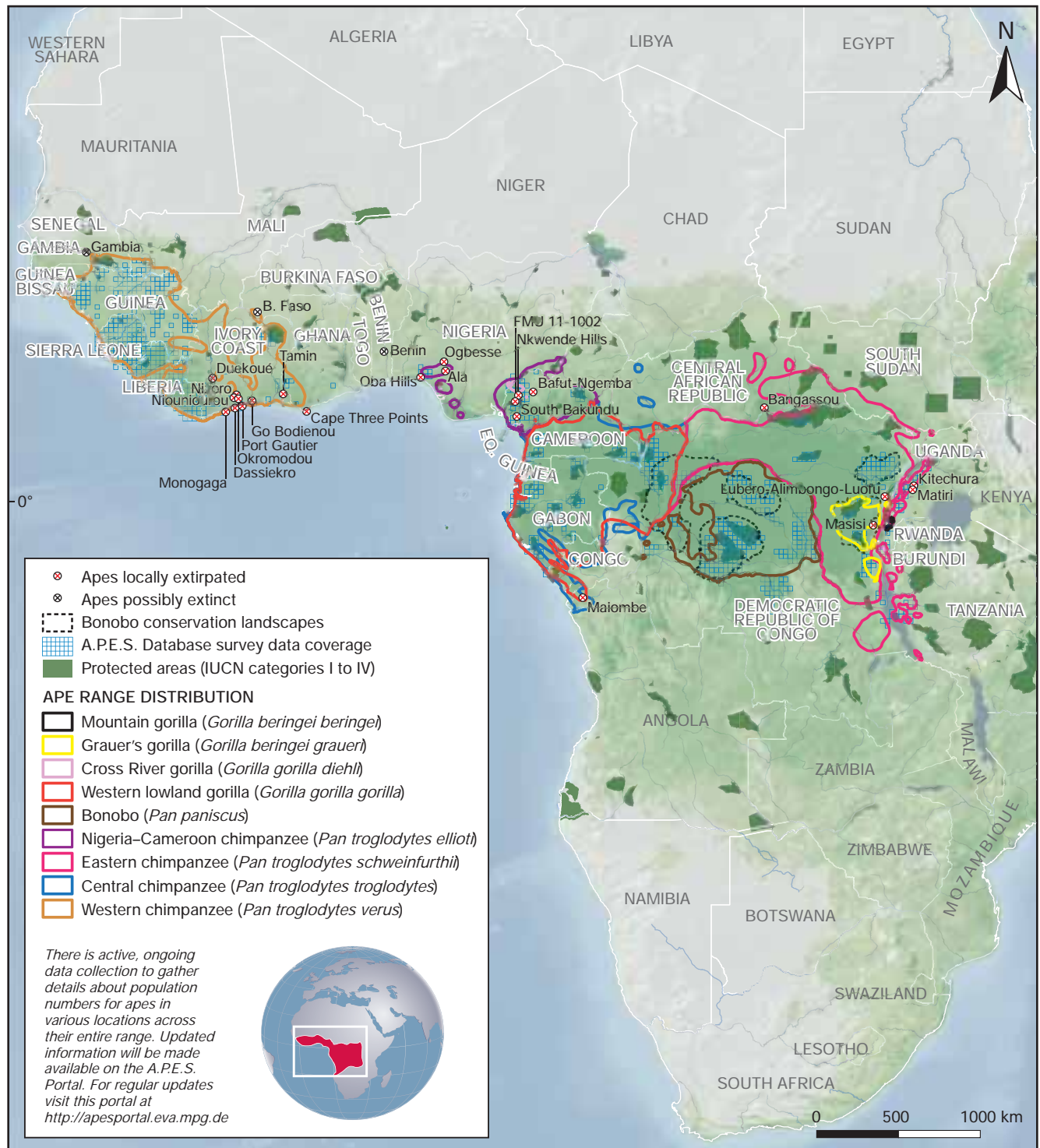
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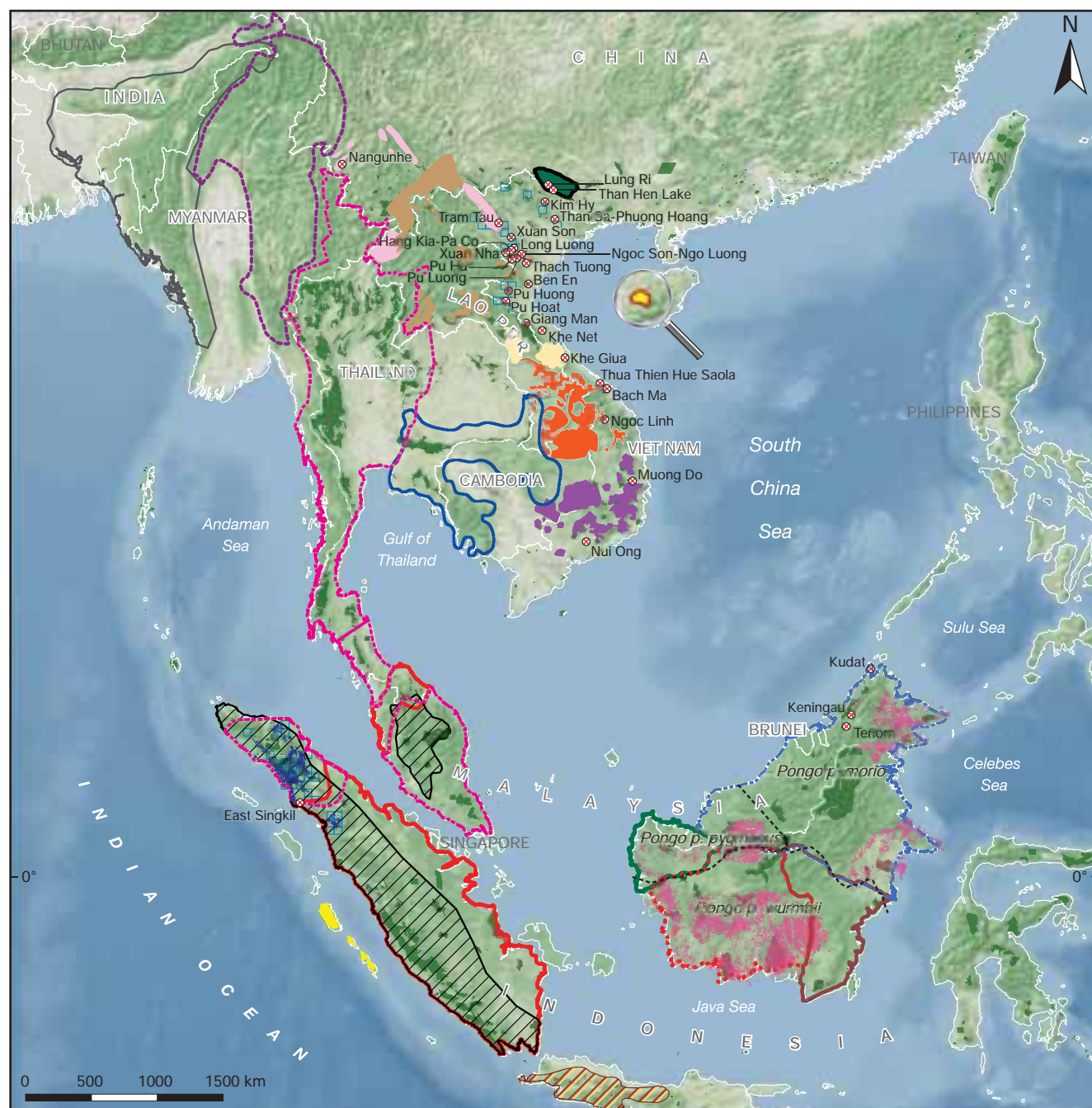
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Ape Distribution in Africa



Ape Distribution in Asia



- ⊗ Apes locally extirpated
 - ▤ A.P.E.S. Database survey data coverage
 - Protected areas (IUCN categories I to IV)
- APE RANGE DISTRIBUTION**
- Gibbons**
- ▢ Abbott's gray gibbon (*Hylobates abbotti*)
 - ▢ Agile gibbon (*Hylobates agilis*)
 - ▢ Bornean white-bearded gibbon (*Hylobates albibarbis*)
 - ▢ Bornean gray gibbon (*Hylobates funereus*)
 - ▢ Kloss's gibbon (*Hylobates klossii*)
 - ▢ Lar gibbon (*Hylobates lar*)
 - ▢ Moloch gibbon (*Hylobates moloch*)
 - ▢ Müller's gibbon (*Hylobates muelleri*)
 - ▢ Pileated gibbon (*Hylobates pileatus*)
 - ▢ Western hoolock (*Hoolock hoolock*)
 - ▢ Eastern hoolock (*Hoolock leuconedys*)
 - ▢ Northern yellow-cheeked crested gibbon (*Nomascus annamensis*)
 - ▢ Western black-crested gibbon (*Nomascus concolor*)
 - ▢ Southern yellow-cheeked crested gibbon (*Nomascus gabriellae*)
 - ▢ Hainan gibbon (*Nomascus hainanus*)
 - ▢ Northern white-cheeked crested gibbon (*Nomascus leucogenys*)
 - ▢ Cao Vit gibbon (*Nomascus nasutus*)
 - ▢ Southern white-cheeked crested gibbon (*Nomascus siki*)
 - ▢ Siamang (*Symphalangus syndactylus*)
- Orangutans**
- ▢ Sumatran orangutan (*Pongo abelii*)
 - ▢ Bornean orangutan (*Pongo pygmaeus*)
 - ▢ Bornean orangutan subspecies boundaries



There is active, ongoing data collection to gather details about population numbers for apes in various location across their entire range. Updated information will be made available on the A.P.E.S. Portal. For regular updates visit this portal at <http://apesportal.eva.mpg.de>

Social and economic systems worldwide are changing rapidly. These changes are accompanied by an increasing global demand for natural resources, including land, water, minerals, energy sources, food and timber. Today's foremost challenge lies in finding the tools not only to address the complexity of these interrelated trends, but also to implement strategies to balance environmental needs with socio-economic requirements. This volume of *State of the Apes* contributes to this search by presenting original research and analysis, topical case studies and emerging best practice from a range of key stakeholders to examine the interface between ape conservation and industrial agriculture. In assessing the drivers behind agricultural expansion and land investments, it sheds light on governance challenges and legal frameworks that shape land use.

Aimed at policy-makers, industry experts and decision-makers, academics, researchers and NGOs, this edition is designed to inform debate, practice and policy in ways that will help to reconcile the goals of industrial agriculture with those of ape conservation and welfare, and social and economic development.

“*State of the Apes* is one of those rarely seen, truly groundbreaking publications. Through keen analysis and vivid research, the series considers the survival of the world's ape species in light of both long-standing and newly emerging threats, such as mineral extraction, energy exploration, agricultural expansion and land conversion—forces that will continue to shape not only the future of wild apes, but also of all remaining blocks of wild habitat and the extraordinary biodiversity they contain. By examining the complexity of development forces across range states, *State of the Apes* offers an informed and realistic assessment of the prospects for ape conservation, as well as outlining the potential of policies that may spell the difference between destruction and survival of these extraordinary beings.”

Matthew V. Cassetta
Facilitator, Congo Basin Forest Partnership
U.S. Department of State

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