



GREATER
MEKONG
2021

A black langur monkey is perched on a tree branch, holding a green leaf in its mouth and eating it. The monkey has dark fur and a lighter-colored patch on its chest. The background is a blurred green forest.

Primates of the Greater Mekong:

Status, Threats and Conservation Efforts



Red-shanked douc langur *Pygathrix nemaeus*
© Martin Harvey / WWF



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A WWF Greater Mekong publication

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Robinson's banded langur,

Presbytis robinsoni

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Back cover photo:

Red-shanked douc,

Pygathrix nemaeus

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Glossary & Explanatory Notes

For this report, the Greater Mekong region includes Cambodia, Laos, Myanmar, Thailand and Viet Nam but does not include southwest China.

Where the information is not attributed to a specific source, the source is the IUCN Red List assessment (citations given on pages 70-72). Map data was likewise primarily derived from the IUCN Red List assessments. Where additional data was used, we have added sources and notes in page 73.

IUCN-SSC Red List Categories:

CR – Critically Endangered; EN – Endangered;

VU – Vulnerable; NT – Near Threatened; LC – Least Concern

Information from the IUCN Red List assessments for the featured species was accessed on 30th September 2021, except for the Red List status, which were accessed on 15th December 2021.

Black-shanked douc langur *Pygathrix nigripes*
© Diego Mahecha / Jahoo, Cambodia (www.gibbon.life)





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Introduction

With approximately 512 species across 91 countries, primates are the third most species-rich mammalian group in the world.¹ Of these species, about 125 occur in 22 Asian countries.² The species numbers are not precise because new primate species are still being discovered or described. In 2017, the skywalker hoolock gibbon (*Hoolock tianxing*) was described as a new species from eastern Myanmar and southwestern China.³ In 2020, the Popa langur (*Trachypithecus popa*) was described as a distinct species from central Myanmar.⁴

Including these newly described species, the Greater Mekong region – spanning Cambodia, Laos, Myanmar, Thailand and Viet Nam – is home to 44 primate species. Some of these species exist in only one country, such as the Lao langur or the Tonkin snub-nosed monkey, or in only a small part of a country, such as the Delacour's langur and the Cat Ba langur. These species with restricted ranges are termed endemic species. Representing remarkable evolutionary histories or historical human-caused range reduction, they deserve great conservation attention.

Deforestation, habitat degradation and poaching driven by trade and consumption have forced many primate species to the brink of extinction. Even the newly described species from remote areas, such as the skywalker hoolock gibbon, are already classified as Endangered. The Popa langur, on the other hand, has been proposed for listing as Critically Endangered due to its small population size and the dramatic habitat loss in its range over the past century.

Additionally, there is the potential for human pathogens to jump to primates, threatening them with deadly epidemics. These pathogens include parasites, bacteria and viruses – even those of animal origin, like SARS-CoV-2, the virus that causes COVID-19. The transmission of pathogens from humans to non-human primates happens due to their close evolutionary relationship. The threat of such anthroponoses increases as we destroy or fragment primate habitats and move into closer contact with primates.

But there is hope!





Many conservationists are working tirelessly to protect these unique species from disappearing. There are protected areas established for specific endangered primates, like the Delacour's and Cat Ba langurs. Civil society organizations and community patrol groups are working to safeguard primate habitats. Rescue centres are caring for and in some cases rehabilitating primates that are found in the illegal trade. For instance, the

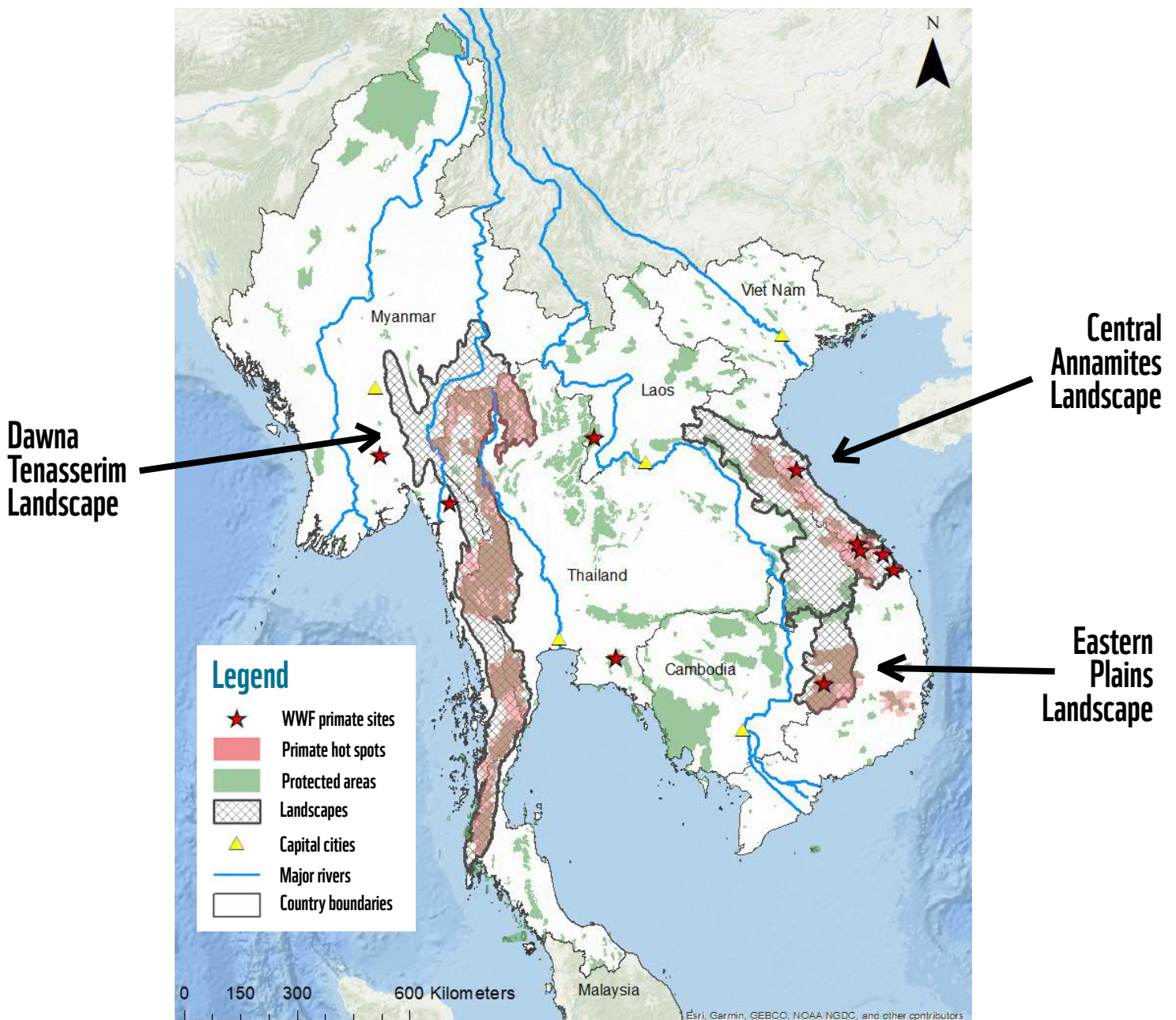
Endangered Primate Rescue Center in Cuc Phuong, Viet Nam, is even breeding threatened species to try and reintroduce them to the wild. Wildlife ranger patrol teams are disarming snares and confiscating firearms that devastate primate species. Researchers from around the world are working to understand the behaviours of these primates and their habitat requirements so that we can design better conservation interventions.

While human activity is threatening primate species widely, our efforts can help save some of them before it is too late.

Black-crested gibbon *Nomascus concolor*
© Souksamlan Laladeth / The Gibbon Experience

The Greater Mekong region

The Greater Mekong harbours a trove of plant, animal and fungal species, including four of the world's ten largest freshwater fish, the endangered tiger, the Asian elephant, and several endemic birds and mammals. The diverse landscapes of the Greater Mekong are made up of a variety of natural biomes, including dry deciduous forests, dense wet evergreen rainforests and limestone karsts, providing diverse habitats for thousands of species. The number of new species of plants, birds, mammals, reptiles, fish and amphibians discovered and described in the region over 20 years alone exceeded 2,500.⁵ The discovery of the saola in the Annamite mountain range was described as one of the most remarkable large mammal discoveries of the last 70 years.





These incredible species and extensive natural habitats share the Greater Mekong with sprawling metropolises, large-scale hydropower dams, mines and transportation infrastructure, and over 200 million people. Enormous economic development activities that have resulted in the destruction of nature make conservation work in the region challenging but of urgent importance.⁶ The loss of forests and wetlands to agriculture and human settlements, as well as to mining and infrastructure projects, in the second half of the 20th century have made Southeast Asia the most threatened region globally for mammals, and the region's land vertebrates the most affected by hunting and capture for trade.^{7, 8, 9}

The pressures humans are placing on the wildlife of the Greater Mekong is particularly devastating for primates. In the recent updates to the International Union for Conservation of Nature's (IUCN) Red List of threatened species, a quarter of the primates in the region, at 11 out of 44, were classified as Critically Endangered, and about half, 21 out of 44, were listed as

Endangered. Only four out of the 44 species are not considered threatened, although three are listed as Near Threatened. The newly described Popa langur has not yet been Red List assessed but has been proposed as Critically Endangered.⁴ The latest Red List assessments show elevated extinction risk for a quarter of the primates compared to the previous assessments, while the rest showed no reduction in their extinction risk. Such statistics point to a bleak future for the many species of primates that occur in the Greater Mekong. Yet, the knowledge and alarm created by these recent Red List assessments also provide an opportunity for furthering conservation.

With urgent and concerted conservation efforts, we can protect the incredible diversity of primates and the ecological functions they perform, ensuring that the biological legacy of the region is sustained for future generations.

Primates of the Greater Mekong



Stump-tailed macaque *Macaca arctoides*
© Tontan Travel / Creative Commons

Ecological functions

Primates play vital roles in forest ecosystems through pollination, seed dispersal and the transport and cycling of nutrients, and by serving as prey for top predators. These functional roles contribute to forest sustenance and regeneration and overall ecosystem health, making primates an essential component of ecosystems. The decline and extinction of primate populations therefore threatens the plant and animal species that share their habitat.

For instance, pig-tailed and stump-tailed macaques are exceptional seed dispersers and thereby assist in spreading and establishing plant species.¹⁰ One study suggested that the extirpation of macaques can reduce the seed dispersal for trees bearing small to medium-sized fruits 20-fold.¹¹ Such a decrease would likely result in a decline in plant diversity and, in turn, impact ecosystem and human well-being.

The positive impacts of primates on forest ecosystems often benefit human communities that depend on forest ecosystem services. Primates also make critical economic contributions in some areas through ecotourism and play important cultural roles throughout Southeast Asia.

As the closest living biological relative to the modern human species, wild primates also offer critical insights into human evolution, biology and behaviour, as well as emerging diseases.



Threats to the primates from wildlife trade

Humans place numerous pressures on primate species, yet the most critical one in the Greater Mekong region is the threat to their survival from consumption and trade. Documenting the primate trade in 2017, Nekaris and Bergin noted that “every family of endemic primate [in Asia] is represented in the trade in some form”, and that national and international trade was one of the most significant threats to primate species in Asia.¹² The number of primates in the wildlife trade steadily increased from 1995 to 2008, with 3,500 additional live animals exported each year.¹³ However, this increase came mainly from the export of captive-bred rather than wild-caught primates. The Convention on International Trade in Endangered Species (CITES) trade database from 1975 to 2019 puts the number of exported primates and specimens globally at over 360 million, of which a few million are live primates.¹⁴ The legal trade in primates was estimated to be worth US\$138 million in 2015, representing a nearly 40 per cent increase from its 2012 value of \$98 million.¹⁵

Live primates are traded to supply biomedical industries, pharmaceutical testing, the entertainment industry and pet markets. In addition, primate meat is consumed globally, while body parts are used for traditional medicine or sold as trinkets.¹³

The trade in primates worldwide, likely involving hundreds of thousands of live animals and millions of dead ones every year, has been identified as a major source of decline for nine of the world’s rarest primate taxa.^{13, 16}

Southeast Asia is one of two global hubs for exporting primates. China, Cambodia, and Viet Nam have been among the largest legal exporters of live primates in the world, with live primate exports in 2017 from China valued at \$48.1 million, followed by Viet Nam at \$12 million and Cambodia at \$11.3 million.¹⁵ That same year, 71 per cent of China’s live primate exports went to the United States, and 43 per cent of Viet Nam’s and 55 per cent of Cambodia’s exports went to Japan (these exports consist largely of captive-bred long-tailed macaques).¹⁵ Meanwhile, the number of undocumented animals being traded illegally is unknown. Weak law enforcement, inaccurate population assessments and a lack of transparency make it difficult to know the scale of illegal trade.¹⁵





Hatinh langur *Trachypithecus hatinhensis*
© Denise Stilley / WWF-Viet Nam

Primates are traded for:

Biomedical research

Although the use of primates for biomedical research appears to have declined in Europe and the United States compared to the levels a few decades ago, it has increased in places like China, even though such use has made disappointingly few contributions to human medical advancements.¹⁷

In the Greater Mekong region, Cambodia, Laos and Viet Nam are known to breed and export macaques for toxicological, pharmaceutical and biomedical research.¹² It is likely that many of the recipient research facilities, which do not prioritise animal welfare, are laundering wild-caught primates through legal trade. This laundering, combined with the stressful and unsanitary living conditions common in macaque farms, create an environment where disease can spread between

Traditional medicine

Over 100 primate species are traded globally for use in traditional medicines,^{13, 18} including almost 60 per cent of the primate species in Asia. The demand created by traditional practices worldwide drives this trade¹⁷ and encourages commercial hunting.

The use of primate parts in medicine varies, with some being put in tonics, as is common in Viet Nam, while others are used to make amulets to protect against disease.¹⁷ While there is no evidence of the efficacy of these treatments, the use and trade of primates may spread dangerous diseases.¹⁹ Shared biological traits increase the risk of viral mutation and spread from primates to humans. Examples of viral diseases transmitted in this way include HIV and Ebola. Also, some coronaviruses, such as the one that caused the COVID-19 pandemic, can easily be transmitted between humans and primates.

Primate meat consumption

In Asia, most primate meat is sold as a luxury item for a high price in urban centres, where they are often directly sold to restaurants. Macaques, langurs and gibbons are common in the region's wild meat trade.¹² Hunting for this trade is resulting in the decline of primate populations, with the resulting rarity leading to price increases that make hunting more financially attractive.¹

The widespread demand and indiscriminate hunting and trading have a tremen-

dous impact on wild primate populations, driving them to extinction.¹³ It is difficult to disentangle the consumption of primates for meat from use in traditional medicine because the consumption of specific animals and their parts is believed to have particular health benefits. For instance, in Cambodia, eating lorises is believed to be an effective treatment for women who have complications from childbirth.²⁰ In the Bago region of Myanmar, langur stomach is consumed due to the belief it can treat kidney disease, and langur and macaque skulls are used for treating hysteria.²⁶

Slow lorises in traditional medicine

Slow lorises have a long history of use in traditional practices, with parts consumed for their perceived medical properties or kept as amulets and voodoo dolls to ward off evil. Although widely used in Southeast Asia, particularly Cambodia and Viet Nam, the demand from China for pygmy slow lorises for medicine is driving high-value trafficking across the Viet Nam-China border.¹⁸ In Cambodia, the domestic trade in the two native slow loris species for traditional medicine is driving them to extinction.^{13, 20}

Entertainment and ‘pet’ trade

Primates, particularly juveniles, are also being traded as pets. While some are bred in captivity, many are taken from the wild by poachers who kill the mothers carrying them. A recent spike in social and conventional media portrayals of baby primates have led to them being seen as attractive pets. This demand has increased as countries have become wealthier, improved their internet connectivity and become more commercialised.¹⁵

The pygmy marmoset, a South American primate, became a trendy pet among wealthy Chinese consumers in 2016, the “year of the monkey” in the Chinese zodiac,

with social media accounts illegally advertising these primates for \$4,500 each.²¹ Slow and slender lorises from South and Southeast Asia were also widely traded as pets, with live animals making up 86.4 per cent of slow loris and 91.4 per cent of slender loris exports from South and Southeast Asia, with Laos, Cambodia, and Thailand being the largest exporters.²²

Unfortunately, many wild primates are poorly adapted to captivity, and buyers are uninformed on how best to feed and care for them, leading to high stress, illness and early mortality. The traders meanwhile are motivated by profit rather than the longevity or wellbeing of the animals they sell.

The history of orangutans in the Greater Mekong

Orangutans once roamed continental Southeast Asia²³ but now exist in this region only in captivity as victims of the illegal trade. On 12 November 2015, 14 orangutans being sent back from Thailand to their native Indonesia became big news. Twelve orangutans had been rescued from the trade in 2010 and kept in captivity by Thailand’s Department of National Parks, Wildlife and Plant Conservation for five years, while the traffickers were being located (but never found). During this time, two offspring were born in captivity. DNA analysis showed that the orangutans were from Borneo, and they were rehabilitated to be reintroduced to the wild. It was not the first time orangutans had been repatriated to Indonesia from Thailand. Seventy-one individuals have been repatriated from Thailand to Indonesia since 2006, the latest batch being two orangutans that were flown home in December 2020, the fifth such repatriation.²⁴ Orangutans are threatened in their native range of Malaysia and Indonesia by massive deforestation. Deforestation and access to remote forests through the construction of roads make it easier for poachers and wildlife traders to find and capture orangutans for the illegal trade.²⁵



Stump-tailed macaque *Macaca arcoides*
© Camille Coudrat / Association Anoulak



Sunda slow loris *Nycticebus coucang*
© Rob Webster / WWF



Northern yellow-cheeked gibbon *Nomascus annamensis*
© Chris Goldberg / Creative Commons

Conservation status of primate species in the Greater Mekong

IUCN-SSC Red List categories:

CR - Critically Endangered

EN - Endangered

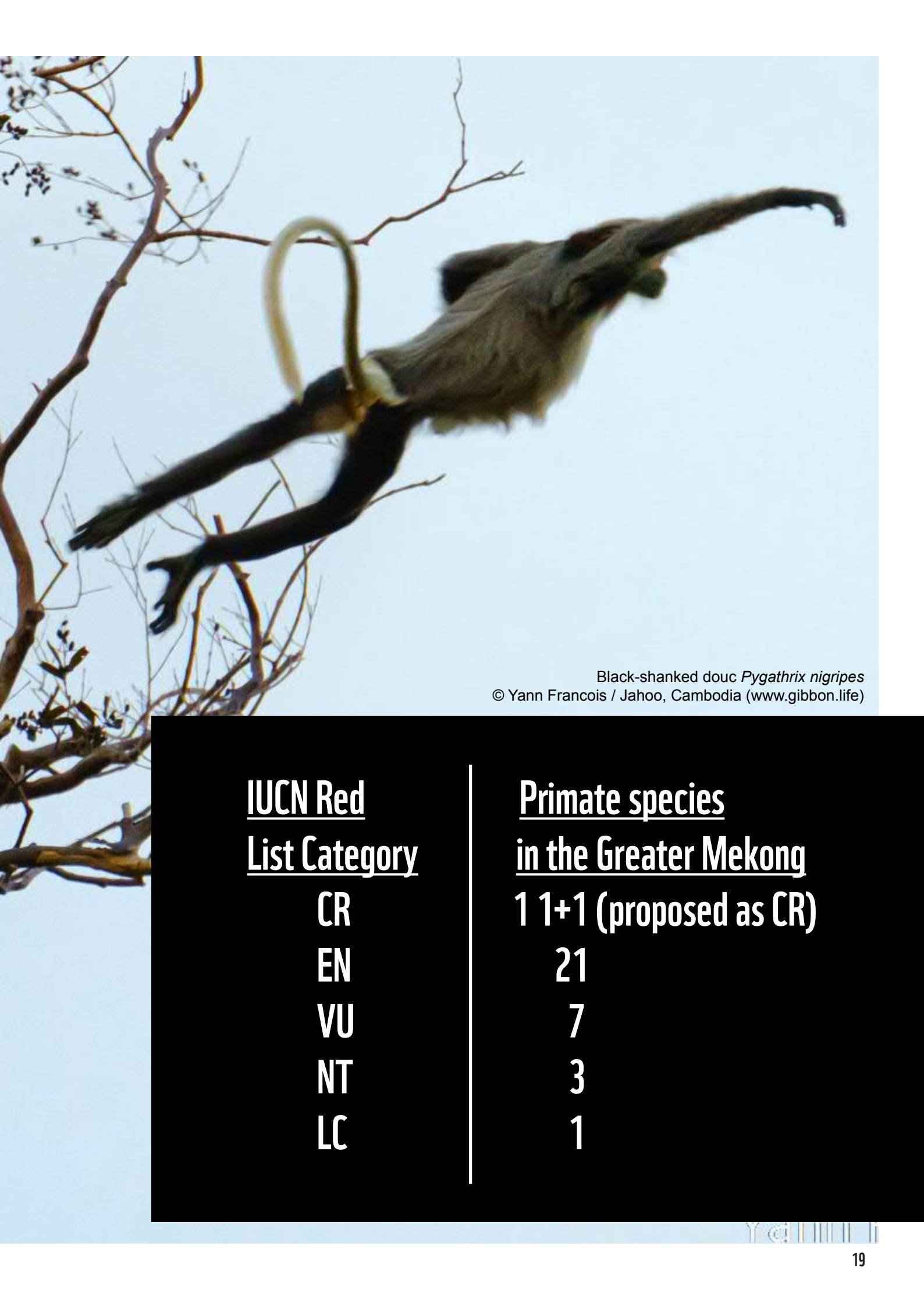
VU - Vulnerable

NT - Near Threatened

LC - Least Concern

Pink shaded areas on maps indicate species range; for species with very small ranges, close-ups are given as inset maps.





Black-shanked douc *Pygathrix nigripes*
© Yann Francois / Jahoo, Cambodia (www.gibbon.life)

IUCN Red
List Category

CR

EN

VU

NT

LC

Primate species
in the Greater Mekong

1 1+1 (proposed as CR)

21

7

3

1





Family Lorisidae | Lorises

Genus *Nycticebus*

Lorises are the only venomous primates, having a gland on their forearm that produces a toxin that becomes more potent when mixed with their saliva. Not only are their bites venomous, but lorises also spread the toxin on their fur as a form of chemical protection against predators, rolling into a ball when threatened. They are nocturnal and arboreal, with large eyes to see in the dark and hands and feet that are adapted to holding onto branches for long periods while looking for food.

Lorises are the most commonly traded of the protected primates in Southeast Asia, threatened by the pet, medicine and wild meat trades. When marketed as pets, their teeth are often removed to protect prospective owners, but this practice often leads to infection and death and makes it impossible to ever reintroduce them to the wild.²⁷

Pygmy slow loris (*Nycticebus pygmaeus*) EN



Found in Cambodia, Laos, and Viet Nam. Pygmy slow lorises are heavily threatened by the wildlife trade. In Viet Nam and Cambodia, they are exploited for traditional medicine, as well as for meat. Their market value has more than doubled in the last 15 years, pointing to reduced numbers in the wild. Internationally, pygmy slow lorises are the most common species in the pet trade. They have been introduced to non-native countries, including Taiwan, Singapore and Thailand, and are the most commonly seen primates in the illegal internet trade and in Japanese pet shops.

Bengal slow loris (*Nycticebus bengalensis*) EN



Found in all five Greater Mekong countries. Like other loris taxa, the Bengal slow loris is hunted and traded as meat and for use in traditional medicine, and as a pet, with exploitation being particularly high in Cambodia. It is also threatened by the tourist photo prop trade, particularly in Thailand, where 94 per cent of lorises photographed in Patong beach were *N. bengalensis*. The release of lorises confiscated from the illegal pet trade with little or no rehabilitation is a threat to lorises in the wild due to the potential for disease transmission.



Sunda/greater slow loris (*Nycticebus coucang*) EN

The Sunda slow loris occurs in the Greater Mekong only in the southern tip of Thailand bordering Malaysia. They inhabit primary and secondary lowland forests and are dietary generalists, having a unique tooth comb used to scrape gum off when foraging. To protect their offspring while they leave to forage, females lick their young, covering them in toxic oil.²⁷



Family Cercopithecidae | Old-world monkeys



Long-tailed macaque *Macaca fascicularis*
© Dani Freund

Genus *Macaca*

About a quarter of the world's macaque species live in the Greater Mekong region. Although macaques are generally adaptable, they are threatened by deforestation for agricultural expansion, tree plantations, mining, roads and urbanisation. Additionally, macaques are often hunted for meat, folk medicine and the pet trade. The killing of macaques in retaliation for crop-raiding or property damage is also a big threat. Many are also trapped to trade for biomedical laboratory use and pharmaceutical testing.

Stump-tailed macaque (*Macaca arctoides*) VU

Found in all five Greater Mekong countries.

Stump-tailed macaques are an important seed-disperser-species but are heavily hunted and traded for food, sport and traditional medicine. In Viet Nam, species is heavily targeted for traditional medicine, both in country and in China, where macaques are exported, hunting them for meat is very common in Laos, Viet Nam

and Cambodia. Overhunting for biomedical purposes had led to reductions in the population of this species in peninsular Thailand before regulations for the international trade in primates were imposed in 1976.



Assamese macaque (*Macaca assamensis*) NT



In the Greater Mekong, found in Laos, Myanmar, Thailand and Viet Nam. Although the Assamese macaque is listed as only being Near Threatened, if the threats posed by hunting and habitat degradation are not reversed, the species may be classified as threatened in future. Habitat destruction is the primary cause of decline in Assamese macaque numbers. However, they are also hunted across the Greater Mekong for meat and medicine and unusually to make footwear in Myanmar. In Laos and Viet Nam, the species has declined by more than 30 per cent in the last 30 years and is expected to decline further.

Long-tailed/crab-eating macaque (*Macaca fascicularis*) VU



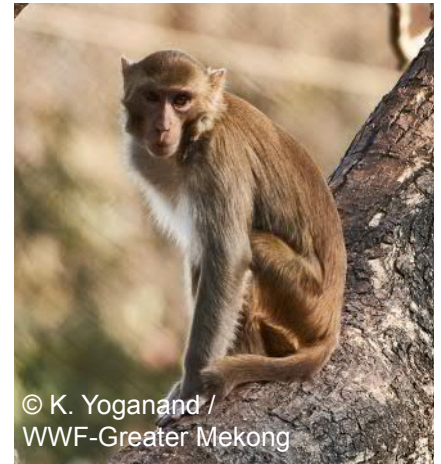
© Donna Armentero



Found in all five Greater Mekong countries. Although this species is widely distributed and known to be adaptive to many living conditions, hunting is a major threat. Female long-tailed macaques are often taken into breeding facilities in Cambodia and Viet Nam, while males are exported internationally for laboratory testing. Given their adaptability and frequent proximity to human settlement, this species is often persecuted as a pest.

Rhesus macaque (*Macaca mulatta*) LC

In the Greater Mekong, found in Laos, Myanmar, Thailand and Viet Nam. Truly an adaptable primate, the rhesus macaque is an omnivore and lives in habitats ranging from dry scrub to wet mangroves and anything in between, including areas cultivated for human habitation. This level of ease around people means that human-macaque conflict is a problem, with waning levels of human tolerance for the animals. In Laos and Viet Nam, the primary threat to the species is hunting, although habitat loss is also a significant issue.



© K. Yoganand /
WWF-Greater Mekong

Northern pig-tailed macaque (*Macaca leonina*) VU



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Found in all five Greater Mekong countries. The population of the northern pig-tailed macaque is suspected to have declined by more than 30 per cent over the last 40 years across its entire range due to multiple threats related to a decrease in habitat quality and widespread hunting and trading. In Laos, Viet Nam and Cambodia, hunting for food and trade is the primary threat, while in Thailand, the males of the species are exploited for picking coconuts, with well-trained macaques sold for around \$1,000 each.



Southern pig-tailed macaque (*Macaca nemestrina*) VU



Found only in Thailand in the Greater Mekong. Pig-tailed macaques get their name from their tails, which are short and carried upwards, resembling that of a pig. Southern pig-tailed macaques spend most of their time on the ground, unlike the more arboreal northern species, making them particularly adept at raiding agricultural fields and plantations for coconut, papaya, corn and cassava. This behaviour has earned the southern pig-tailed macaques the status of a pest in many places.²⁸ Consequently, they are often killed in retaliation by farmers and are therefore at risk of local extinction.

Genus *Pygathrix*

The three species of douc langurs are all endemic to the Annamite mountain range of Viet Nam, Laos and Cambodia. They are sometimes called “costumed apes” because of their bright colouration. The different species can be distinguished by the unique colour of their lower legs, or shanks, after which they are named.²⁹ They mainly eat leaves, making them folivorous, although they sometimes also eat fruits, seeds and flowers depending on the season. Historically, douc langurs lived in large social groups of up to 50

individuals, but hunting has caused groups to shrink. Populations of all douc langur species have declined by 50 to 80 per cent in the last 30 years, and it is believed there are only a few hundred to a few thousand of each species left in the wild.³⁰ Habitat loss is a major threat to this genus, including deforestation for coffee, rubber, cashew and various tree plantations, as well as for mining and hydropower dams. Increasing road development also leads to increased access to remote forests for poachers.

Grey-shanked douc langur (*Pygathrix cinerea*) CR



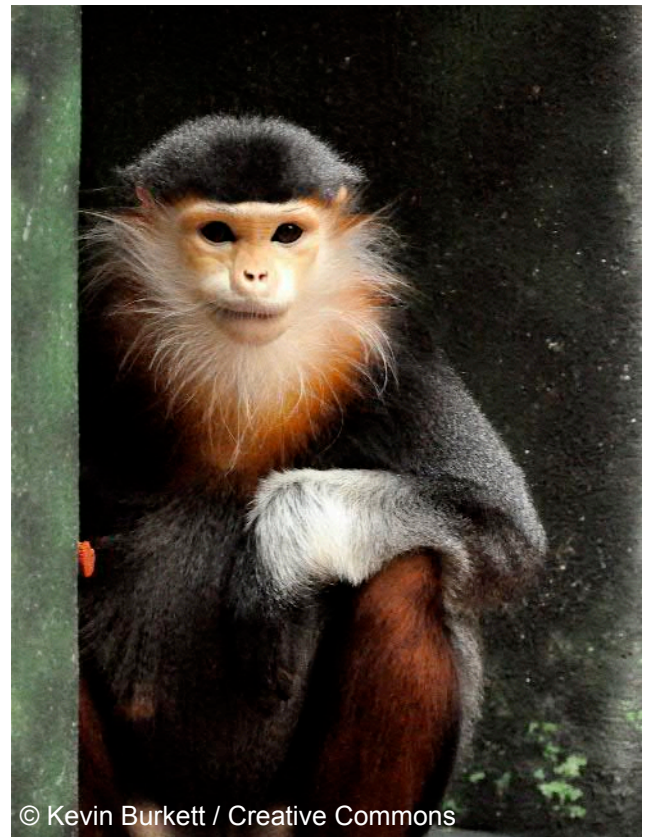
Found only in Viet Nam, and possibly in northeastern Cambodia. Grey-shanked douc langurs live in four different social group types: one male with multiple females; all male; one lone male; and large groupings with multiple males and females.³¹ Currently only found in fragmented populations in the high forest canopy of Viet Nam’s Central Highlands,³² only 500 to 700 individuals are thought to be left in the wild. They are critically endangered, partly because the Central Highlands has lost almost 10,000 hectares of forest annually due to logging, agriculture, hydropower development and road construction. Furthermore, grey-shanked douc langurs are hunted for meat and to make traditional “monkey balm”. When threatened, grey-shanked douc langurs remain motionless in the canopy, making them particularly vulnerable to hunters.³³

Black-shanked douc (*Pygathrix nigripes*) CR

Found only in Cambodia and Viet Nam, and unique among the douc langurs for having a grey-blue face, the global population of black-shanked doucs is suspected of having declined by more than 80 per cent over the last two decades, due in part to hunting for traditional medicine and local meat consumption. The largest known population exists in Keo Seima Wildlife Sanctuary, in Cambodia's Mondulkiri province, where the estimated population in 2007 was approximately 42,000.



Red-shanked douc (*Pygathrix nemaeus*) CR



Found only in Cambodia, Laos and Viet Nam, this pretty-looking species is suspected of having declined by more than 80 per cent in the last 36 years due to forest loss from dams, roads, mines and agricultural plantations, as well as to extensive hunting for the wildlife trade. The largest remaining population is in Laos, particularly in the Nakai Nam Theun and Hin Nam No national parks, which together form what is likely the most extensive contiguous habitat for the species. In Viet Nam, the population has declined dramatically due to intensive hunting and habitat loss; many areas where doucs were recorded during the 1990s are now devoid of them. The largest population remains in the country's Phong Nha Ke Bang National Park, where the species is naturally protected by the difficulty of accessing the limestone karst forests. Doucs are highly valued in Viet Nam for their supposed medicinal qualities, and this demand and the associated illegal trade have devastated local populations.

Douc and langurs saved from the wildlife trade

On 29 January 2021, a baby black-shanked douc was rescued by a WWF-supported mobile enforcement unit from a village near the Eastern Plains Landscape in Mondulkiri province, Cambodia, where it was being illegally kept confined as a pet. Determining that the animal was unfit for release, the rangers arranged for it to be cared for at the wildlife rescue centre at the Phnom Tamao Zoo.

A red-shanked douc was saved from a snare on 25 February 2021 in the Pale area near the Xe Sap National Protected Area in Laos by a patrol group that was trained and deployed through WWF's Carbon and Biodiversity (CarBi II) project. After ensuring that the douc was safe, the patrol group released it back into the wild.

On 23 January 2021, WWF-supported rangers of the Phnom Prich Wildlife Sanctuary in the Eastern Plains Landscape of Cambodia saved a young silvered langur and its mother from a snare while conducting a routine patrol. The pair was released back into the wild shortly afterwards.



Black shanked douc *Pygathrix nigripes*
© PDoE / WWF-Cambodia

Genus Presbytis

The species under this genus are known as surilis, langurs or leaf monkeys. Their German name translates to “capped langurs”, which comes from the characteristic tuft of hair on their head. They occur entirely in Southeast Asia, distributed across the Thai-Malay peninsula, Sumatra, Borneo, Java and smaller nearby islands. This genus is almost entirely arboreal. Eight of the 11 Presbytis species are assessed as threatened with extinction in the IUCN Red List, primarily due to habitat loss. Oil palm and rubber plantations, slash and burn agriculture, logging and road construction are the primary causes of deforestation and habitat conversion.

Robinson’s banded langur (*Presbytis robinsoni*) NT

In the Greater Mekong, found in southern Myanmar and Thailand. This species was formerly considered a subspecies of the banded langur but was reclassified in 2020.³⁴

The other two species that came out of the reclassification – the Raffles’ banded langur, *P. femoralis*; and the East Sumatran banded langur, *P. percura* – are now assessed as Critically Endangered. The researchers who did the reclassification have argued that the small population size and rapid decline justify a Critically Endangered status for all three subspecies. Although the main threat to the species is habitat loss, it is also targeted for the illegal pet trade.



White-thighed surili (*Presbytis siamensis*) NT



In the Greater Mekong, found in the very southern tip of Thailand. The range of this species is separated by that of the banded langur in Thailand and the black-crested Sumatran langur in Sumatra, resulting in several isolated populations. Characterised by the light-coloured patches of fur on the outside of their legs, these leaf monkeys live in small groups with a single dominant male. Deforestation and habitat loss are the main threats to the species outside Thailand due to the rapid expansion of oil palm plantations, although some are threatened by hunting for meat.

Genus *Rhinopithecus*

Snub-nosed monkeys are very rare and severely threatened by hunting. They are often hunted and trapped for folk medicines and or to make trophies out of their body parts, particularly their skulls, but are also unintentionally captured in traps and snares set for deer, wild pigs or bears to supply the local wild meat trade and the bear bile trade. Habitat degradation, logging and hunting due to increased access to remote forests provided by roads, dams and other infrastructure developments are rapidly becoming major threats. Logging also reduces the availability of lichen that these monkeys eat in the colder months, placing pressure on their food source.

Tonkin snub-nosed monkey (*Rhinopithecus avunculus*) CR



Endemic to Viet Nam and found in patches of forests that grow on steep limestone karsts. This species was first described in 1912 and then rediscovered in 1990. Estimates put the current population of mature individuals at no more than 100, making the Tonkin snub-nosed monkey one of the most endangered primates in the region. During the last four decades, the population has decreased by 80 per cent, with hunting being the most immediate threat to this species.

In the Greater Mekong, found only in Myanmar. The Myanmar snub-nosed monkey was discovered in northern Myanmar in 2010, making it the most recently added species to the *Rhinopithecus* genus. There is estimated to be only a few hundred individuals of this species left in Myanmar and adjacent habitats in China, making it particularly susceptible to hunting and habitat loss. In recent years, new development projects in and around the primate's habitat have increased access through roads for hunting.

Myanmar snub-nosed monkey (*Rhinopithecus strykeri*) CR



Genus *Trachypithecus* - The lutungs or langurs

The genus *Trachypithecus* contains 22 species divided into four species groups.⁴ It is the most speciose and geographically dispersed genus among Asian colobines: its range stretches to Bhutan, Bangladesh and Assam in India in the west, Viet Nam and Southern China in the east, and the Malay Peninsula, Sumatra, Borneo and Java in the south, with Myanmar, Thailand, Laos and Cambodia at its centre.

François's langur (*Trachypithecus francoisi*) EN



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In the Greater Mekong, found only in northern Viet Nam. The François's langur has the northernmost distribution of all langurs and is found east of the Red River in Viet Nam, extending across the border into China. Habitat destruction and poaching have resulted in a dramatic decrease in the population: only about 200 individuals are thought to be left in Viet Nam, with no subpopulation containing more than 50 mature individuals. They have been completely extirpated from Cao Bang, Lang Son, Vinh Phuc, Lao Cai and Yen Bai provinces where they previously occurred. The main driver for hunting is traditional medicine; the species is used specifically for the illegal production of "black ape wine" in Guangxi province, China.



© K. Yoganand / WWF-Greater Mekong

Annamese (or Elliot's) silvered langur (*Trachypithecus margarita*) EN



Found only in Cambodia, Laos and Viet Nam. Until recently considered as the Indochinese silvered langur (*T. germaini*), the population occurring to the east of the Mekong River was reclassified as a separate species based on new genetic analysis. It occurs in the Eastern Plains Landscape, a transboundary landscape traversing Cambodia and Viet Nam where WWF is working to support the effective management of protected areas and to reduce the snaring and poaching of wildlife. In Laos, probably the last remaining population, consisting of about 60 animals, occurs in a small part of the Dong Phou Vieng National Protected Area, where it is mainly protected by the nearby community's traditional taboo against hunting them.

Indochinese silvered langur (*Trachypithecus germaini*) EN



Found in all five Greater Mekong countries, but only in a small part of Laos and Viet Nam. It is separated from the Annamese silvered langur by the Mekong River, although this boundary needs to be confirmed through further studies. It is threatened by habitat loss and hunting for traditional medicine and the pet trade. Its possible extinction in Laos, for instance, is due to hunting. In Viet Nam, hunting and habitat loss have resulted in the extirpation of the population in Mui Ca Mau National Park and other populations in the Seven Mountains, Ngoc Hien and Nam Can districts.



Phayre's langur (*Trachypithecus phayrei*) EN



In the Greater Mekong, found only in Myanmar. In its range, the primary threat to its survival is hunting for traditional medicine and wild meat. Recent genetic studies showed that langurs that were previously thought to be the Phayre's langur are now three different species with a common ancestor in the early Pleistocene period, about a million years ago (dated based on mitogenomes). The Shan States langur has now been elevated to a full species, and the Popa langur has been newly described.⁴

Hatinh langur (*Trachypithecus hatinhensis*) EN



Found only in Laos and Viet Nam, this endemic species is heavily hunted for the wild meat and medicine trades. However, it has historically been protected by the difficulty of accessing their karst habitat for hunting. In Laos, research in Hin Nam No National Park has shown that the population has declined significantly since 2006. A 2019 survey of the Hatinh langur in Hin Nam No estimated that there were only about 0.19 individuals/km left compared to the 0.42 individuals/km estimated in a 2009 study. In Phong Nha-Ke Bang in Viet Nam, this species is threatened by indiscriminate snaring.



© Tilo Nadler

Is the Indochinese black langur a separate species?

The taxonomic status of the Indochinese black langur [*Trachypithecus ebenus*] has been in question for years. Some early researchers treated it as a separate species but more recent ones have considered it a dark morph of the Hatinh langur.^{35, 36} The latest IUCN Red List assessment left its taxonomic status unresolved. Recorded only in a small border region of central Laos and Viet Nam, sometimes in mixed groups with Hatinh langurs, this all-black leaf monkey needs further genetic analysis. A new study on the evolutionary status of several Vietnamese langur species has provided further evidence that this langur is just a black variant of the Hatinh langur and not a distinct species (Tilo Nadler, personal communication).

Indochinese grey langur (*Trachypithecus crepusculus*) EN



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WWF-Greater Mekong



In the Greater Mekong, found in Thailand, Laos, Viet Nam and a small part of Myanmar. The Indochinese grey langur eats figs, bamboo shoots, seeds, flowers, gum and leaves, which are its primary food source. Hunting for traditional medicine is the main threat to this species.³⁸



Lao langur (*Trachypithecus laotum*) EN



As its name suggests, the Lao langur is found only in a small part of central Laos and is closely associated with the forests on limestone karsts. They can also be found in non-limestone rock outcroppings on steep hill slopes. The most significant threat to this species presently is hunting for meat and folk medicine. An update of the IUCN Red List, published in 2020, up-listed this species from Vulnerable to Endangered. However, this was a five-year-old assessment based on field data that was more than 10 years old. So, the current conservation status of the Lao langur may be even more dire.

Delacour's langur (*Trachypithecus delacouri*) CR



Found only in Viet Nam. The endemic Delacour's langur is found in an area characterised by limestone mountains spanning about 5,000 km². Its population has declined by more than 80 per cent in the last 35 years due to increasing hunting for traditional medicine and habitat loss. Presently, a population of fewer than 250 mature individuals survives.



Capped langur (*Trachypithecus pileatus*) VU



© Carsten ten Brink / Creative Commons



In the Greater Mekong, found only in Myanmar. The capped langur spends nearly 40 per cent of the day feeding on leaves, flowers and fruit. They live in herds of two to 14 individuals, led by a dominant male. Currently, four subspecies of this langur are thought to exist, with the *T.p. pileatus* being the subspecies that lives in northwestern Myanmar. Threats to this species include habitat destruction for agriculture, timber and bamboo harvesting, and the trade in wildlife sold as meat, pelts and pets.

Shortridge's langur (*Trachypithecus shortridgei*) EN



© Tilo Nadler

In the Greater Mekong, found only in Myanmar. Originally thought to be a subspecies of the capped langur, the Shortridge's langur was recognised as a separate species in 2001. The population in northern Myanmar is threatened by the scheduled inundation of a large swath of the area around the Chindwin River by the Tazone hydro-power dam. This inundation will lead to habitat loss and is expected to increase hunting for the wild meat trade and traditional medicine by labourers constructing the dam.

New species of langur discovered in central Myanmar

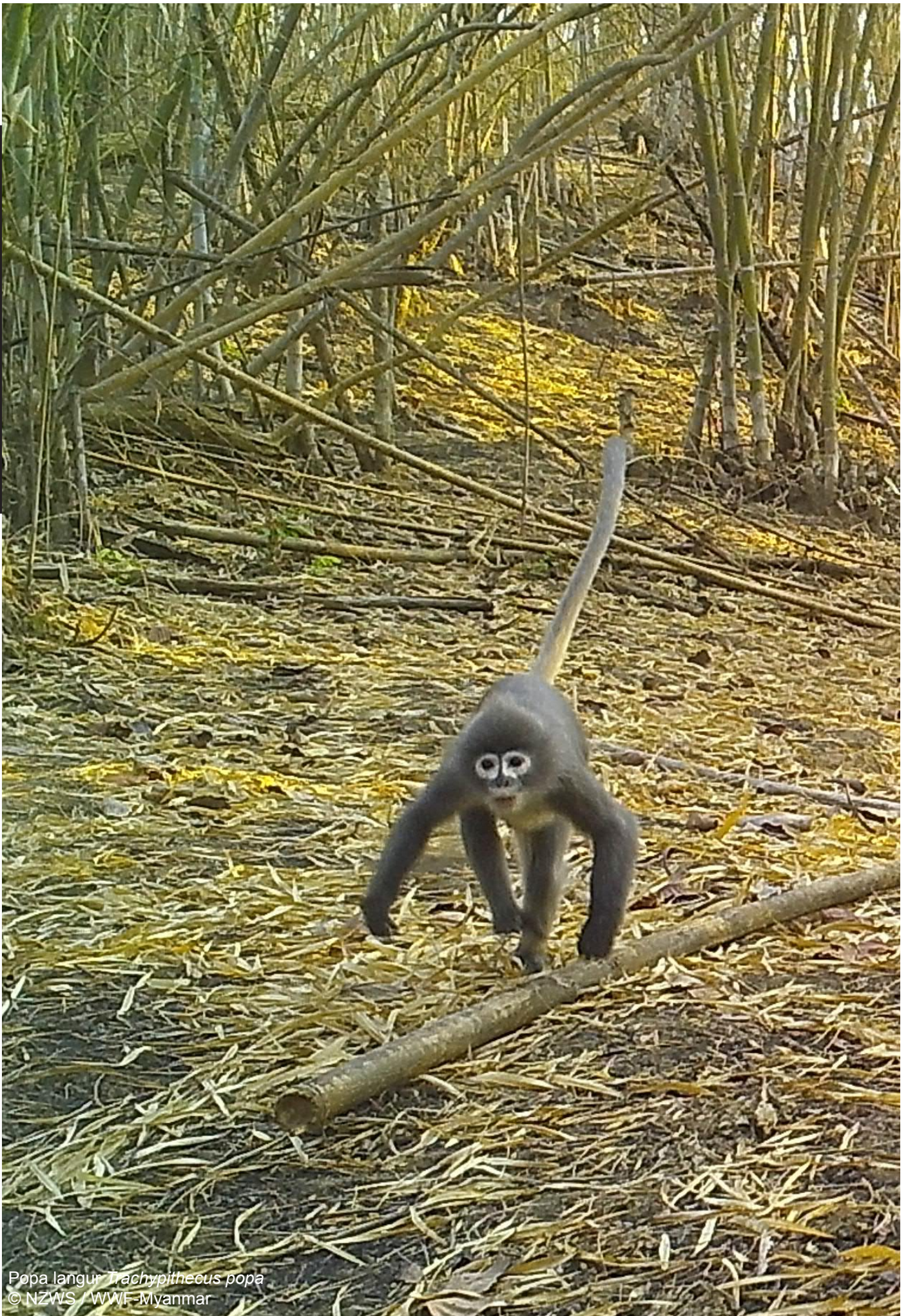
The first evidence of the new Popa langur species was not found in the wild but at the Natural History Museum in the United Kingdom. Genetic analysis of specimens gathered from Myanmar over a century ago revealed that the langurs in the museum were a genetic match with more recently collected bones from central Myanmar, indicating that the species was still alive today. In 2018, the primate was definitively confirmed to exist by camera-trap photographs, which revealed a distinctive set of markings – broad white rings fully encircling the eyes, a crest of hair and forward-facing whiskers. Ngwe Lwin, a primatologist at Fauna & Flora International (FFI), stated, “Additional field surveys and protection measures are urgently required and will be conducted by FFI and others to save the (Popa) langurs from extinction.”³⁷

Popa langur (*Trachypithecus popa*)

Not yet Red List assessed, but proposed as CR



Found only in Myanmar, in the central dry zone between the Ayeyarwady and Thanlwin (Salween) rivers and extending south up to the western foothills of the Kayah-Karen mountains. The species was named after Mount Popa, the extinct volcano home to the largest living population of approximately 100 individuals. Once widespread in the central dry zone, it remains only in four isolated locations. A total of only about 200 to 250 individuals are thought to remain in the wild.⁴ It is threatened by hunting, habitat loss, and forest fragmentation throughout its range, caused by agricultural encroachment and unregulated timber extraction.



Popa langur *Trachypithecus popa*
© NZWS / WWF-Myanmar

Cat Ba langur (*Trachypithecus poliocephalus*) CR



Found only in Viet Nam. With fewer than 50 mature individuals remaining, the entire population of this species exists on Cat Ba Island in Ha Long Bay, occupying an area of less than 22 km². This small range is threatened by fires, tourism and development activities. The Cat Ba langur is one of the few species in the region with a population projected to increase in the future. Historically, hunting for traditional medicine and sport has been the most severe threat to this species. The population declined from an estimated peak of almost 3,000 individuals to around 500 to 600 langurs in the 1970s and 80s. The population continued to decline in the 90s and then dropped further at the turn of the century, from between 104 and 135 individuals to between 40 and 53. With the proper protection and conservation of its habitat, the population of Cat Ba langurs is projected to increase to about 90 individuals by 2050.

Dusky langur or spectacled leaf monkey (*Trachypithecus obscurus*) EN



In the Greater Mekong, found in southern Myanmar and south-western Thailand. It is sometimes called the spectacled leaf monkey because it looks like it is wearing glasses. Seven recognised subspecies of dusky langur occur in Myanmar, Thailand and peninsular Malaysia. Some subspecies are restricted to specific islands off mainland areas, for instance the *T.o. Sanctorum*, which occurs only on Zadetkyi Kyun (St Matthew Island) in the Myeik (Mergui) Archipelago off southern Myanmar. This animal is hunted across its range for the wild meat and pet trades, posing a threat to its populations.

Shan states langur (*Trachypithecus melamera*) EN

(assessed under *T. phayrei shanicus*)

In the Greater Mekong, found only in Myanmar. As the name implies, the Shan states langur occurs in northern Shan state, Myanmar, and in adjacent southwestern China between the Ayeyarwady and Thanlwin (Salween) rivers. The population is thought to have declined significantly due to hunting for the wild meat and pet trades, and for use in traditional medicine.



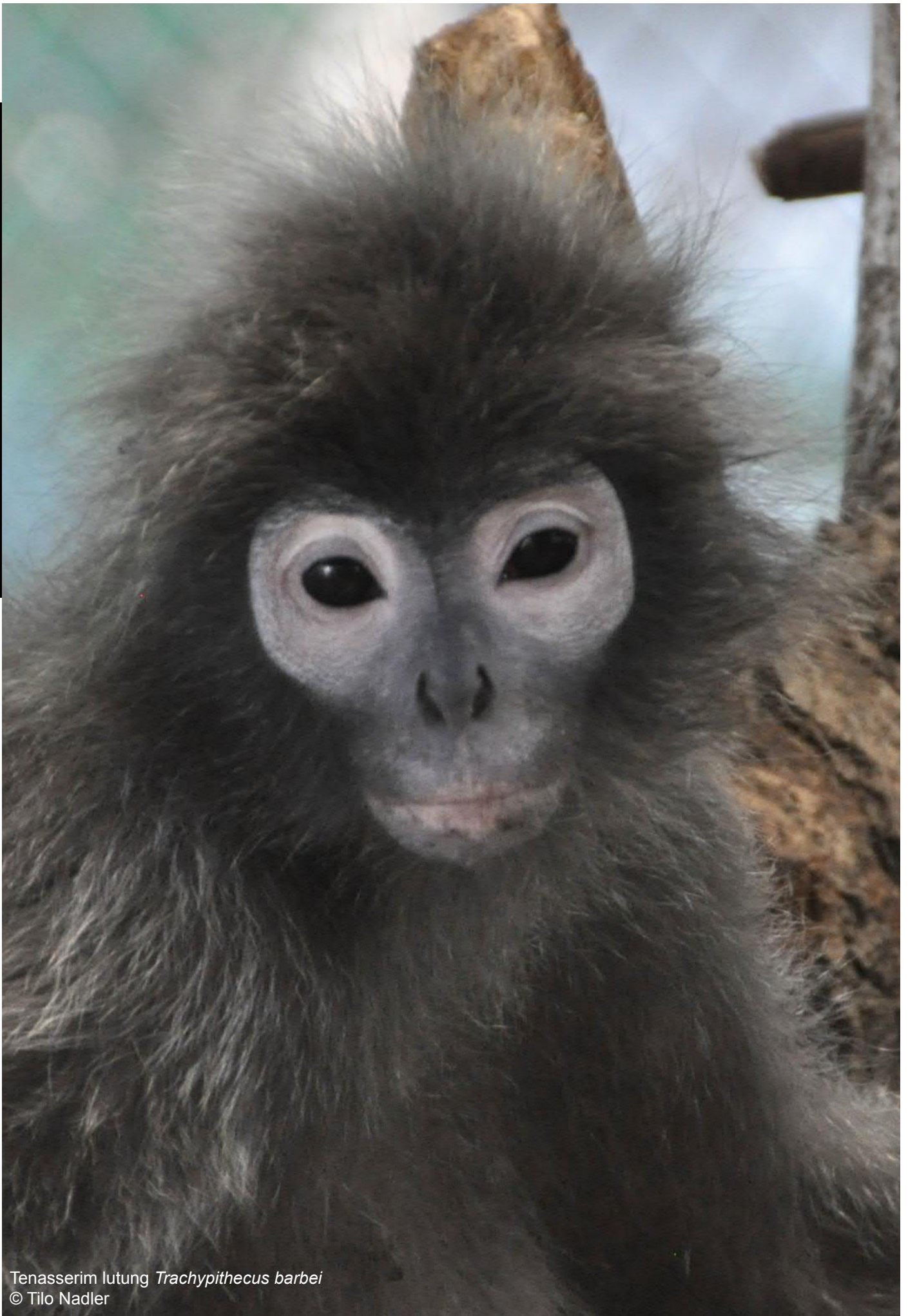
Odd zoo animal became a new species

In 2001, a leaf monkey was found in a zoo in Bangkok that did not belong to any well-known lutung species. The animal's origin was unknown but it was purchased by the zoo at an animal market. At first, scientists thought the mysterious primate might be a hybrid between the dusky langur and the Phayre's leaf monkey, but a genetic study supported its classification as a separate species, the Tenasserim langur. This species is distinct from the closely related dusky langur, the Phayre's leaf monkey and the Indochinese grey langur. Subsequently, an infant was seen in June 2013 in Myanmar's Tanintharyi Nature Reserve. In Thailand, three groups have been recorded, each with 15 to 25 individuals, in the Sai Yok Yai and Thong Pha Phum national parks. Three Tenasserim langurs were known from captive facilities in Thailand: one each in Bangkok's Dusit and Pata zoos (which has died a few years back), and another in the Krabok Koo Wildlife Breeding Center.

Tenasserim lutung (*Trachypithecus barbei*) VU



Found only in Myanmar and Thailand. Occurring in a small part of the transboundary Dawna Tenasserim landscape and named after the Tenasserim mountain range, this species is closely related to the dusky langur. It is restricted to about 4,000 km² on the Myanmar-Thailand border, largely inside the protected areas on either side. It is threatened by hunting for meat and use in traditional medicine.



Tenasserim lutung *Trachypithecus barbei*
© Tilo Nadler

Lar gibbon *Hylobates lar*
© Martin Harvey / WWF

Family Hylobatidae | Gibbons

Gibbons are widely distributed in the rainforests of Southeast Asia. Gibbons have a throat sac used to amplify their calls, allowing the sound to travel over great distances. The most characteristic call of the gibbon is known as the “great call”, used to advertise territories. The great call is most often led by a female, who is then joined by a male. They live in pairs or family groups composed of an adult male and female and their offspring. They move among the branches in the upper to mid canopies of forests with great speed and agility, spanning gaps between trees as wide as 15 metres and reaching speeds up to 55km per hour. Species in this family are sometimes hunted for meat but more often to harvest their body parts for use in traditional medicine. Loss of tree canopy cover due to deforestation for agriculture and plantation development is the biggest threat facing these entirely arboreal species.

Genus Hoolock

Western hoolock gibbon (*Hoolock hoolock*) EN



In the Greater Mekong, found only in Myanmar. The Chindwin River, flowing into the Ayeyarwady River further south in Myanmar, forms the boundary between the Western and Eastern hoolock gibbon. Although no population estimates are available, Myanmar might be home to the largest and most viable populations of this small ape, given the several thousand square kilometres of unsurveyed forest habitat in the central and northwestern parts of the country. Shifting cultivation and hunting threaten the species, while Myanmar's political and ethnic conflicts have hampered conservation activities.

Eastern hoolock gibbon (*Hoolock leuconedys*) VU



Found only in Myanmar,³⁹ where the total population was estimated to be between 10,000 and 50,000 individuals in 2013. However, widespread habitat loss and hunting for meat and traditional medicine have likely led to a severe decline in this population.

Skywalker/Gaoligong hoolock gibbon (*Hoolock tianxing*) EN



In the Greater Mekong, found only in Myanmar. The Skywalker hoolock gibbon was first described only in January 2017. The species was named “skywalker” because the Chinese characters for its scientific name translate to “heaven’s movement”. The scientists who discovered the species said their love of the Star Wars films also influenced the name. Scientists first noticed the skywalker gibbon when they observed a distinction between the markings and calls of certain individuals in their study area. A full physical and genetic comparison later confirmed that the differences were wide enough to classify them as a separate species. There are an estimated 10,000 individuals in Myanmar, which is thought to contain the world’s largest population, compared to approximately 200 individuals estimated for China.

Genus *Symphalangus*

Siamang (*Symphalangus syndactylus*) EN



In the Greater Mekong, found only in the southern tip of Thailand. Primarily found in Malaysia and Indonesia, a small number of siamang can also be found in the Hala Bala Wildlife Sanctuary in Thailand. This population is threatened primarily by the extensive conversion of forests to plantations for rubber and other crops, but also by the illegal hunting and capture of the young for sale as pets.

Genus *Nomascus*

Found only to the east of the Mekong river in the Greater Mekong region

Black-crested gibbon (*Nomascus concolor*) CR

In the Greater Mekong, found only in Laos and Viet Nam, to the west of the Red River.

Lao black-crested gibbon (*N. c. lu*), Laos



This subspecies occurs only in northwestern Laos. Its presence is confirmed in the Nam Ha National Protected Area in Luang Namtha province and the Nam Kan National Protected Area in Bokeo province. This latter area is thought to contain the largest population of this species. The core population is in the centre of the Gibbon Experience ecotourism project, which, together with local taboos against hunting gibbons, provides protection. However, the most recent and comprehensive survey found only 39 individuals, with estimates placing the total number of mature individuals at fewer than 50. The population in Nam Ha may be on the verge of being extirpated due to rapid forest conversion and weak management. Hunting for meat, traditional medicine and the pet trade is the primary threat to the species.

Tonkin (western) black-crested gibbon (*N. c. concolor*), Viet Nam



In the Greater Mekong, this subspecies occurs in northern Viet Nam. It is thought to have declined over 80 per cent in the last 45 years, with the most significant population remaining in southern China. In Viet Nam, the Tonkin black-crested gibbon occurs mainly in the contiguous Mu Cang Chai Species Habitat Conservation Area in Yen Bai province and Muong La forests of Son La province. The biggest threats to this species in Viet Nam are habitat loss and hunting for meat.

Cao-Vit (eastern) black-crested gibbon (*Nomascus nasutus*) CR



In the Greater Mekong, found only in Viet Nam. It occurs in a very small area of karst forest on the border between Jingxi county in China's Guanxi province and Trung Khanh District in Viet Nam's Cao Bang province. Its population has declined by at least 80 per cent over the past 45 years due to hunting and habitat loss. It was earlier thought to have gone extinct, but a surviving population was found in 2002.

Northern yellow-cheeked crested gibbon (*Nomascus annamensis*) EN



Found only in Cambodia, Laos and Viet Nam. The largest known population of this species is found in northeastern Cambodia. However, the expansion of infrastructure and agriculture, habitat degradation and improved access for hunters are leading to a decline in their numbers across their range. This species is the most sought-after primate species for use as a pet in communities surrounding the Veun Sai-Siem Pang National Park in Cambodia, with 43.75 per cent of people surveyed saying they would keep one as a pet.

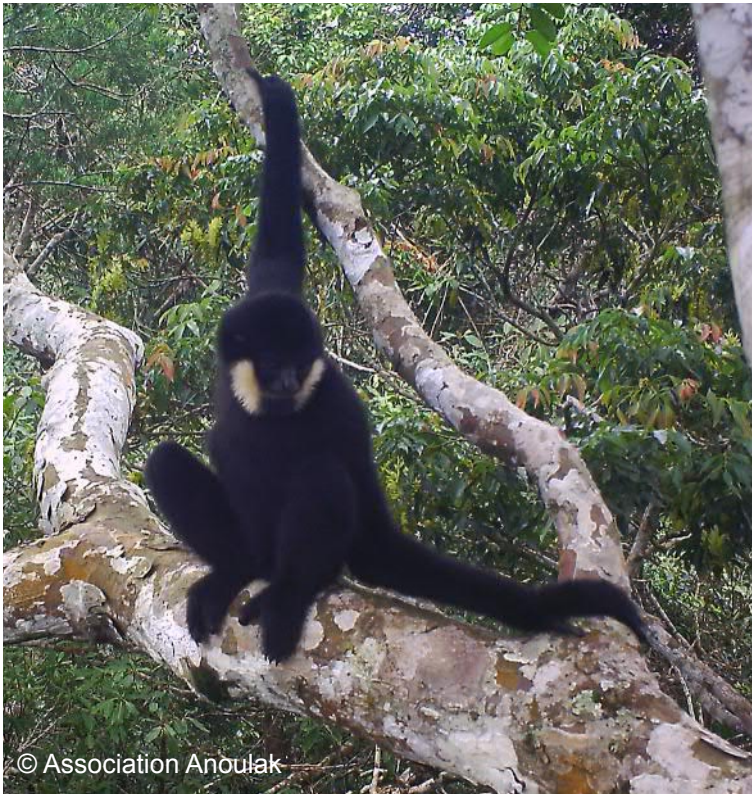
Northern white-cheeked gibbon (*Nomascus leucogenys*) CR



Found only in Laos and Viet Nam. Although historically found in southwestern China, northwestern Viet Nam and northern Laos, this species is thought to be extinct in China. Hunting for the pet trade, traditional medicine and local meat consumption is seriously impacting the populations in Laos and Viet Nam. Hunting taboos had historically protected these gibbons in some parts of Laos, but these local traditions are disappearing, and hunting is increasing.



Southern white-cheeked gibbon (*Nomascus siki*) CR

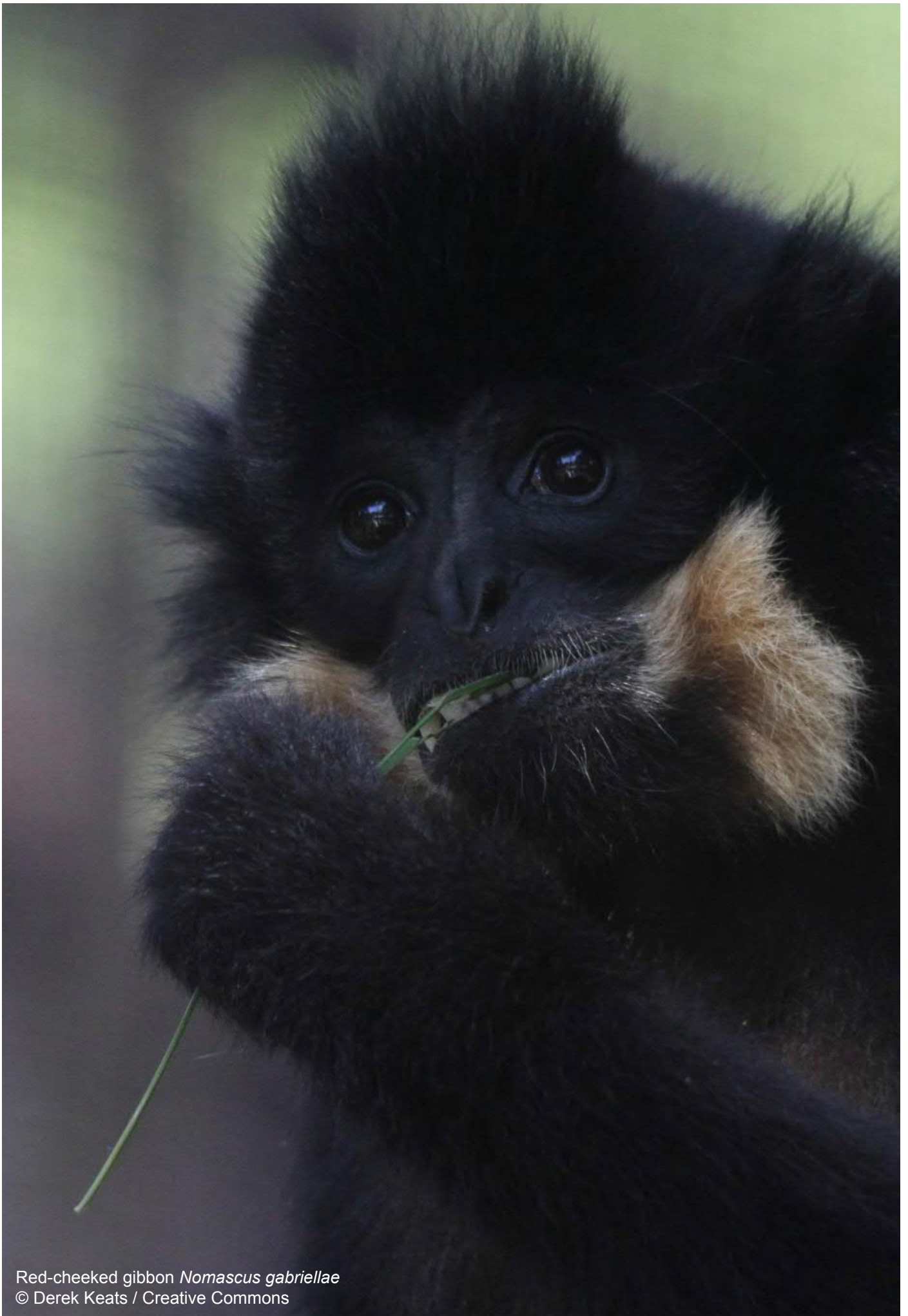


Found only in Laos and Viet Nam. With about 600 mature individuals thought to remain in the wild, this gibbon species lives in the forests of the Annamite mountain range that spans the border between Laos and Viet Nam. Hunting for traditional medicine, meat and the pet trade is a major threat. Hunting often occurs opportunistically when people gain access to previously difficult-to-reach gibbon habitat through new roads and other infrastructure projects.

Red-cheeked (southern yellow-cheeked) gibbon (*Nomascus gabriellae*) EN



Found only in eastern Cambodia and southern Viet Nam. Cambodia hosts the most significant populations of the species, including in the Phnom Prich Wildlife Sanctuary, where WWF works on wildlife protection. Killing mothers to capture young gibbons for zoos, private collections and the pet trade is common in Viet Nam and poses a major threat to the survival of the species.



Red-cheeked gibbon *Nomascus gabriellae*
© Derek Keats / Creative Commons

Genus *Hylobates*

The natural distribution in the Greater Mekong region of gibbons in this genus is limited to the west of the Mekong River.

In the Greater Mekong, found only in Thailand. Because this species inhabits closed-canopy forests, it is primarily threatened by deforestation for agricultural expansion, land clearance for slash and burn cultivation, and road building. Roads fragment their habitat and isolate gibbon groups from each other. Agile gibbons are also traded illegally as pets.



Agile gibbon (*Hylobates agilis*) EN



Lar gibbon (*Hylobates lar*) EN



In the Greater Mekong, found in Laos, Myanmar and Thailand. This species is found in two WWF priority landscapes: the Dawna Tenasserim landscape in Thailand, and the Nam Poui National Protected Area in Laos. In the latter area, WWF is conducting surveys and planning conservation actions for the species. This species is hunted for meat and the pet trade, with some of the hunting being carried out opportunistically by people who are principally exploiting aromatic agarwood trees and other forest products.

Pileated gibbon (*Hylobates pileatus*) EN



Native to eastern Thailand and western Cambodia. A few scattered groups existed in southern Laos, to the west of the Mekong River, up until 10 years ago, but given the severe threats it faces and a lack of targeted protection, the species is probably now extinct in Laos. Hunting for wild meat, the trade in young gibbons as pets, logging, and deforestation for agriculture and hydropower development are major threats to this species. A study conducted in 2011 found that gibbon density correlates with habitat quality, which is unsurprising given that gibbons are almost entirely arboreal.⁴⁰ More importantly, however, the study highlighted that gibbon recovery in disturbed landscapes might take decades due to the slow pace of forest regeneration and low recovery potential of gibbons.





Primates at risk of COVID-19 and other human diseases

Humans are not the only species at risk of contracting SARS-CoV-2, the novel virus that causes the COVID-19 disease. Recent research comparing the main cellular receptor for the virus across 410 different vertebrate species⁴¹ and the protein sequences of these receptors specifically among primates predicted that all apes and all Asian and African monkeys are at high risk of being infected with SARS-CoV-2.⁴² Rhesus macaques and long-tailed macaques, both Asian species, became infected with the virus under laboratory conditions and developed COVID-19 symptoms similar to humans.

Most primate species found in the Greater Mekong region are currently assessed as threatened and declining in the IUCN Red List. These species, many of which are found only in a few isolated locations, face habitat loss from logging and agricultural expansion and habitat fragmentation by roads, which also bring humans closer to primates. The consequences of these species contracting SARS-CoV-2 from humans is not yet known, but if they develop a serious infectious disease in a similar way to humans, it could be devastating for many primates already on the verge of extinction. It is therefore critically important to protect these species not only from direct threats like hunting and habitat loss, but also from possible disease transmission from humans.

Southern yellow-cheeked gibbon *Nomascus gabriellae*
© Yann Francois / Jahoo, Cambodia (www.gibbon.life)

WWF's primate conservation efforts in the Greater Mekong

Pileated gibbon surveys in Thailand's Eastern Forest Complex

In partnership with Thailand's Department of National Parks, Wildlife and Plant Conservation and Kasetsart University's Faculty of Forestry, WWF has recently conducted a follow-up survey in the Khao Ang Rue Nai Wildlife Sanctuary in the Eastern Forest Complex of southeastern Thailand. The aim is to know how the population of pileated gibbon has changed since the baseline estimates made in 2008.⁴⁰ Data analysis from the survey is in progress.

Lar gibbon surveys in the Nam Poui Protected Area, Laos

The Nam Poui National Protected Area is home to the only formally protected population of the lar gibbon in Laos. Lar gibbons have been sighted on rare occasions in Nam Poui and other scattered locations in Laos' Xayaboury province, west of the Mekong River. Through a survey conducted in 2021 and supported by the Arcus Foundation, WWF and the National University of Laos have confirmed the persistence of gibbons in these locations. The survey also documented the continued threats of illegal hunting and habitat destruction. Efforts to work with local authorities and communities to improve the protection of the gibbons and their habitat are ongoing.

Long-term monitoring of gibbon populations, Viet Nam

WWF has recently conducted a population survey of the northern yellow-cheeked crested gibbon (*N. annamensis*) as part of a long-term wildlife monitoring programme in the Central Annamite Landscape. The study used a more robust model than what is commonly used to predict gibbon occupancy patterns, and it estimated extinction and colonisation probabilities. It found that although local site extinctions have occurred, some sites have been recolonised, keeping the overall occurrence probability stable.⁴³

Southern yellow-cheeked crested gibbons in Phnom Prich Wildlife Sanctuary, Cambodia

In 2019, gibbon call surveys conducted by WWF in Cambodia's Phnom Prich Wildlife Sanctuary estimated the presence of 86 groups (102 groups using a different estimation method) of yellow-cheeked crested gibbons. The survey confirmed Phnom Prich as the second-largest protected habitat for this species in Cambodia, after the adjacent Keo Seima Wildlife Sanctuary, which harbours 669 groups.⁴⁴

The survey findings suggested that further conservation efforts should be focused on gibbons in this last remaining area of dry-forest wilderness in the country.

Ha Tinh langur protection in Thach Hoa district, Quang Binh province, Viet Nam

Starting in 2019, WWF supported the protection of the endemic Ha Tinh langur in this location by signing an agreement with the Quang Binh provincial Forest Protection Department (FPD) and working with local communities. WWF provided field equipment, such as leech-proof socks and backpacks, to the FPD and supported local community volunteers recruited to monitor the langurs regularly and report any illegal hunting to the FPD.



Gibbon friendly electricity, Myanmar

In some villages in southern Myanmar, lar gibbons were seen using newly constructed uninsulated power lines to move between forest patches, exposing them to the risk of electrocution. To help protect the gibbons while ensuring communities receive electricity, WWF and its partner organizations, the Karen Wildlife Conservation Initiative and Wildlife Asia, worked together to insulate the power lines. Nearly a mile of cable has been insulated, and the work will continue until all power lines in the locality are insulated. In addition, WWF is advocating that only insulated electric lines be used in future, so that Myanmar can continue electrifying the country without endangering its wildlife.⁴⁵

Camera-trap records of Popa langur, North Zameri Wildlife Sanctuary, Myanmar

WWF conducted camera-trap surveys in the North Zarmari Wildlife Sanctuary in 2020, in collaboration with Myanmar's Forest Department, during which Phayre's langurs were found in five locations. At the time of the survey, the Popa langur was still classified as Phayre's langur, but the camera-trap photos later helped FFI and collaborators to describe the species and estimate its distribution range and population status.⁴



© Thomas Cristofolletti / Ruom for WWF

Online wildlife trade monitoring, Myanmar

Between January and December 2020, WWF monitored the social media platform Facebook for the illegal trade in wildlife and their parts and products. In total, 6,336 items from 143 wildlife species were recorded for sale on Facebook, with live animals accounting for 96 per cent (1,540) of the posts.⁴⁶ Of the posts selling mammals, the largest group, at 33 per cent, was for species from the *Cercopithecidae* family, including the dusky langur, Shortridge's langur and some macaque species, while over 4 per cent of the posts were for gibbons. Young primates made up 68 per cent of the *Cercopithecidae* posts.

Primate conservation efforts of other organizations

Association Anoulak, Laos

Association Anoulak is currently researching the two species of white-cheeked gibbon (*N. siki* and *N. leucogenys*) in the Annamite mountains of Laos. Nakai Nam Theun National Park, where Association Anoulak works, may contain both the northern and southern white-cheeked gibbon and possibly a hybrid population. To better plan conservation actions for these species, Association Anoulak is recording gibbon calls in several sites to understand their distribution across the national park and is partnering with other organizations to collect additional gibbon call recordings from several other sites in the Annamites.⁴⁷

Endangered Primate Rescue Center (EPRC), Vietnam

Located in Cuc Phuong National Park, the EPRC has been dedicated to the rescue, rehabilitation, breeding, research and conservation of endangered primate species in Viet Nam for the past 25 years. The primary goal of the EPRC is to reintroduce animals that have been confiscated from the illegal wildlife trade back to the wild. At the centre, captive populations of various species are established so they can eventually be released as stable family groups into protected areas. On average, the EPRC rescues 20 primates a year, and since their inception, the organization has rescued more than 300 primates. Their success stems from their collaborations with national and provincial Forest Protection Departments, local NGOs, and local communities. The EPRC disseminates critical information to the public about primate species and their conservation status in Southeast Asia through tours, volunteer programmes and the online platforms Facebook, Instagram and YouTube. One of its key partners is Education for Nature Vietnam, which helps fulfil the need for “sustainable, long-term, locally-led environmental education across the country.” eprc.asia

The Gibbon Experience, Laos

Since 1997, the Gibbon Experience has worked towards a better future for western black crested gibbons living in the Nam Kan National Protected Area of Laos’ Bokeo province. The company focuses on tourism-based conservation and is known for its tree houses and zip lines, where visitors can get glimpses of the gibbons. The protected area covers 136,000ha of mixed deciduous forest. The Gibbon Experience has put together a team of forest guards to protect the gibbons and their habitat, and the team is now jointly run with the Laos government. Since 2006, the Gibbon Experience has offered free or low-cost land preparation and irrigation services to farmers willing to switch from slash-and-burn agriculture to more confined paddy rice cultivation, believing that locals can positively impact primate conservation because they are culturally attached to it. Before the COVID-19 pandemic, the Gibbon Experience had provided jobs to over 120 people, who were supported by foreign volunteers. However, the pandemic-induced tourism decline has hit its revenues massively, in turn impacting gibbon conservation work in Nam Kan National Protected Area. gibbonexperience.org

Gibbon Rehabilitation Project (GRP), Thailand

Gibbons were poached to extinction in Phuket some 40 years ago. Since 1992, the GRP has worked to rescue, rehabilitate and reintroduce gibbons to the last remaining forests of Phuket, within the Phuket-Khao Pra Theaw Non-Hunting Area. The project has tested different methods of reintroduction, which have been peer-reviewed in academic journals, aiding the improvement of primate reintroduction activities globally. Since its inception, the GRP has expanded its reintroduction efforts to Pang Champee in northern Thailand. It is also working to end the demand for illegally traded gibbons in the tourism sector and pet trade by increasing awareness of the plight of captive gibbons and the role tourism plays in the demand for baby gibbons. gibbonproject.org



Silvered langur mother and infant saved from snare and released in Phnom Prich Wildlife Sanctuary
© PDoE / WWF-Cambodia

GreenViet, Viet Nam

GreenViet is working to conserve douc langur populations in Viet Nam. In the Son Tra peninsula near Da Nang, it is researching the most effective conservation interventions for the red-shanked douc, while more broadly raising awareness and promoting community participation in the conservation of this species. Its “I love Son Tra” journey provides a free nature experience for the people of Da Nang that allows them to discover the unique beauty of the red-shanked douc. GreenViet is also working to conserve grey-shanked doucs by developing conservation projects for the approximately 50 individuals in Quang Nam province’s Nui Thanh district and 600 individuals in Kon Tum province’s Kong Plong district. In Khanh Hoa province, GreenViet is partnering with Six Senses Ninh Van Bay, a luxury resort, to monitor the behaviour of over 100 black-shanked doucs present around the resort and to plant trees that the langurs eat. A full-time

resident biologist from GreenViet is working at the resort to create an ecotourism experience for guests. greenviet.org

Jahoo Gibbon Camp, Cambodia

This sustainable ecotourism venture is working to increase community efforts to conserve endangered primates, including the yellow-cheeked crested gibbon and the black-shanked douc langur, in the Keo Seima Wildlife Sanctuary in Cambodia’s Mondulkiri province. Jahoo works with the Bunong ethnic minority, whose livelihoods and culture depend on the forest and its natural resources, leveraging their traditional knowledge into conservation jobs. Jahoo also motivates community conservation actions and funds community development by linking ecotourism revenue to the continued conservation of endangered primates. Bunong forest guides lead visitors through the forest to observe the unique primates and other wildlife in their natural habitat. gibbon.life



The Little Fireface Project, Thailand and Cambodia

Headed by Professor Anna Nekaris, the Little Fireface Project researches the ecology and contributes to the conservation of slow and slender loris species throughout their range. Since its establishment in 1994, the project has named seven new species of lorises and contributed new data on six species studied in the wild for a year or more. In Cambodia, the project supported the government's proposal to transfer slow lorises to CITES Appendix I, which lists species immediately threatened with extinction. The project also spent two years researching the behavioural ecology of pygmy slow lorises in eastern Cambodia's Keo Seima Wildlife Sanctuary and conducting country-wide surveys for both the Bengal and pygmy slow lorises. In Thailand, the project tackles the illegal trade in lorises as pets as well as harmful "selfie tourism", where lorises and other animals are used as photo props for tourists. This

work has included a subproject with the Bang Phra Wildlife Domestic Research Station, which takes in lorises rescued from the wildlife trade and entertainment industry. The goal was to improve the husbandry of these animals and restore their health and natural behaviours to the point where they can eventually be reintroduced to the wild. nocturama.org/



Fauna & Flora International's work on threatened primates

Viet Nam

Viet Nam has an incredible diversity of primates. Five of its 25 species are endemic and 10 are listed as Critically Endangered in the IUCN Red List. FFI's conservation efforts in Viet Nam prioritise these highly threatened primates, which persist in isolated pockets within the northern limestone mountains, Annamite mountains and Central Highlands. FFI works closely in these efforts with the Forest Protection Department and Department of Special-Use and Protection Forest Management, both under the Ministry of Agriculture and Rural Development.

Cao-vit gibbon in the CVG Conservation Area, Trung Khanh, Cao Bang province

Probably the most endangered small ape in the world, the Cao-Vit gibbon was rediscovered by FFI in 2002 in a small fragmented forest in Cao Bang province. With local partners, FFI established a protected area for the gibbon in 2007, setting up community-based patrol groups to stop hunting and habitat destruction and pioneering a gibbon monitoring programme with semi-habituated groups. Since 2007, the gibbon population has more than doubled to approximately 135 individuals as of 2021.

Tonkin snub-nosed monkey in Quan Ba and Khau Ca Conservation Area, Ha Giang province

Endemic to Viet Nam, the Tonkin snub-nosed monkey is the country's largest and most unique primate. FFI has helped to protect the species from logging, hunting and destructive farming by establishing Khau Ca as a protected area in 2007 and is now working with local counterparts to establish a new protected area in Quang Ba.

Tonkin (Western) black-crested gibbon in the Mu Cang Chai Conservation Area, Yen Bai province, and the Muong La Nature Reserve, Son La province

It is estimated that only 60 to 80 Tonkin black-crested gibbon remain in Viet Nam. FFI focuses on implementing community-based patrolling, monitoring and local education in two sites where the species occurs.

Delacour's langur in the Kim Bang forest, a proposed protected area in Ha Nam province

With a global population of around 250 individuals, the Delacour's langur is mainly threatened by habitat loss driven by the destruction of its limestone habitat for cement production. In 2018, FFI discovered a "new" population of around 100 langurs, the second largest found in the world, in the Kim Bang watershed protection forest and is now working with partners to establish a new nature reserve.

Northern and southern white-cheeked gibbons in Pu Mat National Park, Nghe An province and Phong Nha-Ke Bang National Park, Quang Binh province

The largest population of the northern white-cheeked gibbons is in Pu Mat National Park, with around 430 family groups, while the largest population of southern white-cheeked gibbons is in Phong Nha-Ke Bang National Park. These two protected areas are home to eight and nine primate species, respectively. These national parks are of the highest priority for the conservation for primates, and FFI supports improved protected area management, institutional coordination and cooperation, law enforcement and community engagement.

**Grey-shanked douc langur in Kon Plong forest,
a proposed protected area in Kon Tum province**

In 2016, an FFI-led team of experts discovered about 500 grey-shanked douc langurs in Kon Tum province, one of the largest populations of this Critically Endangered primate. FFI is now supporting the establishment of a nature reserve in Kon Plong in the eastern Annamite mountains to ensure the long-term survival of this species and myriad others, including pangolins, otters and some endemic birds and plants.

**FFI also provided technical
support for translocating,
researching and monitoring the
Cat Ba langur population up
until 2021**

More broadly, FFI provides technical support for patrols using the Spatial Monitoring and Reporting Tool (SMART) platform in eight protected areas in Viet Nam. Community teams and rangers have been trained to collect systematic data during patrols that is then analysed to provide up-to-date information on threats and support adaptive protected area management.

Most significantly, FFI has supported the establishment of six new protected areas during its 24-year history in Viet Nam and is currently in the process of establishing a further four, in Cao Bang, Ha Giang, Ha Nam and Kon Tum provinces. These sites are among the most important forests in Viet Nam and are of the highest global significance for primate conservation.

Myanmar

Myanmar snub-nosed Monkey

FFI helped create the Imawbum National Park for the Myanmar snub-nosed monkey in Kachin state in northern Myanmar, building on local community conservation initiatives. The Myanmar snub-nosed monkey was discovered only in 2010 and soon after was listed as Critically Endangered in the IUCN Red List. The newly created national park covers 156,280ha in the eastern Himalayas along the border with China. FFI offers continuous support to local communities to protect this unique species.

Western hoolock gibbon

The range of this endangered species straddles India, Bangladesh and Myanmar. Since most of the remaining habitat in India and Bangladesh is either lost or highly fragmented, the main hope for the survival of this species rests in Myanmar. FFI has been protecting Myanmar's largest remaining Western hoolock gibbon population in the Rakhine mountains in Magwe region since 2012, taking a community-based approach. Because the species' remaining habitat is threatened by shifting cultivation, FFI has assisted local Chin communities in adopting organic coffee agroforestry, which has increased local income, reduced shifting cultivation and protected the remaining primary forest habitat.

Eastern hoolock gibbon and Shortridge's langur conservation in the Indawgyi Wildlife Sanctuary

Since 2012, FFI has conducted primate research and conservation in the Indawgyi Wildlife Sanctuary in Myanmar's Kachin state. During that period, FFI facilitated the gazettelement of the Indawgyi Lake Biosphere Reserve, which protects two of the most important populations of the eastern hoolock gibbon and the Shortridge's langur and empowers local communities to participate in protected area management and the development of sustainable livelihoods. fauna-flora.org/



In Summary

Many primate species of the Greater Mekong remain seriously threatened, some with a high likelihood of extinction in the near future, despite laudable efforts by various organizations and government agencies. The threats to primate survival in this region are severe. Loss and fragmentation of habitats, poaching and trade for meat, traditional medicine, and pets are threats common to almost all species. The high endemism and small and isolated populations of many species make natural population recovery a challenge. On the other hand, these small and localised populations present opportunities for targeted, effective and swift conservation actions in the short term. Securing existing populations for recovery will enable population restoration to additional locations within their native ranges. We hope this report will provide the impetus for all concerned - governments, NGOs, private sector, and local and global communities - to step up effective and immediate conservation efforts. We must make all necessary efforts for the long-term survival of these fascinating, diverse and iconic primates of the Greater Mekong.



References

1. Estrada, A., Garber, P. A., Rylands, A. B., & Roos, C. (2017). Impending extinction crisis of the world's primates: Why primates matter? *Science Advances*, 3:1–16.
2. Roos, C., Boonratana, R., Supriatna, J., Fellowes, J. R., Groves, C. P., Nash, S. D., Rylands, A., Mittermeier, R. A. (2014). An updated taxonomy and conservation status review of Asian primates. *Asian Primates Journal*, 4(1):2–38.
3. Fan, P.F., He, K., Chen, X., Ortiz, A., Bin, Z., Zhao, C., Li, Y.Q., Zhang, H.B., Kimock, C., Wang, W.Z., Groves, C., Turvey, S., Roos, C., Helgen, K., Jiang, X.L. (2017). Description of a new species of Hoolock gibbon (Primates: Hylobatidae) based on integrative taxonomy. *American journal of primatology*. 79(5), e22631.
4. Roos, C., Helgen, K. M., Miguez, R. P., Thant, N. M. L., Lwin, N., Lin, A. K., Lin A., Yi K.M., Soe P., Hein Z.M., Myint M.N.N., Ahmed T., Chetry D., Urh M., Veatch E.G., Duncan N., Kamminga P., Chua M.A.H., Yao L., Matauschek C., Meyer D., Liu Z.J., Li M., Nadler T., Fan P.F., Quyet L.K., Hofreiter M., Zinner D., Momberg, F. (2020). Mitogenomic phylogeny of the asian colobine genus *trachypithecus* with special focus on *Trachypithecus phayrei* (Blyth, 1847) and description of a new species. *Zoological Research*, 41(6), 656–669.
5. WWF Greater Mekong (2016). Stranger Species: New Species Discoveries in 2016. https://greatermekong.panda.org/discovering_the_greater_mekong/species/new_species/stranger_species/
6. Hughes, A. C. (2017). Understanding the drivers of South-east Asian biodiversity loss. *Ecosphere*, 8(1), e01624.
7. Schipper, J., Chanson, J. S., Chiozza, F., Cox, N. A., Hoffmann, M., Katariya, V., ... & Young, B. E. (2008). The status of the world's land and marine mammals: diversity, threat, and knowledge. *Science*, 322(5899), 225–230.
8. Duckworth, J. W., Batters, G., Belant, J. L., Bennett, E. L., Brunner, J., Burton, J., ... & Wirth, R. (2012). Why South-East Asia should be the world's priority for averting imminent species extinctions, and a call to join a developing cross-institutional programme to tackle this urgent issue. *SAPIENS*, (5.2).
9. Hoffmann, M., Hilton-Taylor, C., Angulo, A., Böhm, M., Brooks, T. M., Butchart, S. H., ... & Veloso, A. (2010). The impact of conservation on the status of the world's vertebrates. *science*, 330(6010), 1503–1509.
10. Gazagne, E., Pitance, J.L., Savini, T., Huynen, M.C., Poncin, P., Brotcorne, F., Hambuckers, A. (2020). Seed Shadows of Northern Pigtailed Macaques within a Degraded Forest Fragment, Thailand. *Forests* 11(11):1184.
11. Terakawa, M., Matsui, K., Hamada, T., Noma, N., & Yumoto, T.. (2008). Reduced dispersal effectiveness in the large-seeded tree *Myrica rubra* in the absence of the Japanese macaque on Tanegashima Island, Japan. *Japanese Journal of Conservation Ecology*, 13:161–167.
12. Nekaris, K.A., Bergin, D. (2017). *Primate Trade (Asia)*. The International Encyclopedia of Primatology, 1–8.
13. Nijman, V., Nekaris, K.A., Donati, G., Bruford, M., Fa, J. E.. (2011). Primate conservation: Measuring and mitigating trade in primates. *Endangered Species Research*, 13(2): 159–161.
14. CITES Trade Database, accessed October 2021.
15. Norconk M.A., Atsalis S., Tully G., Santillán, A., Waters, S., Knott, C., Ross, S., Shantee, S., Stiles, D. (2020) Reducing the primate pet trade: Actions for primatologists. *American J. Primatol*, 82(1):e23079.
16. Pacheco, V., Mittermeier R.A., Wallis J., Rylands A.B., Ganzhorn J.U., Oates, J., Williamson, L., Palacios, E., Heymann, E., Kierulff, M., Long, Y., Supriatna, J., Roos, C., Walker, S., Cortés-Ortiz, L., Schwitzer, C. (2009) Primates in peril: the world's 25 most endangered primates 2008–2010. IUCN/Species Survival Commission (SSC) Primate Specialist Group (PSG), International Primatological Society (IPS), and Conservation International (CI), Arlington, VA.
17. Carvalho, C., Gaspar, A., Knight, A., Vicente, L. (2018). Ethical and Scientific Pitfalls Concerning Laboratory Research with Non-Human Primates, and Possible Solutions. *Animals*, 9:1–17.
18. Alves R.R., Souto W.M.S., Barboza R.R.D. (2010). Primates in traditional folk medicine: a world overview. *Mammal Rev.*, 40: 155–180.
19. Alves R.R., Rosa I.L. (2005). Why study the use of animal products in traditional medicines? *Journal of ethnobiology and ethnomedicine*, 1(1):1–5. 10.1186/1746-4269-1-5.
20. Starr C., Nekaris K.A.I., Streicher U., Leung L. (2010) Traditional use of slow lorises *Nycticebus bengalensis* and *N. pygmaeus* in Cambodia: an impediment to their conservation. *Endang Species Res.*, 12:17–23.
21. Erickson-Davis, M. (25 February 2016). The dangers of China's 'thumb monkey' trend. *Mongabay*. <https://news.mongabay.com/2016/02/the-dangers-of-chinas-thumb-monkey-trend/>
22. Nekaris, K. A. I., Shepherd, C. R., Starr, C. R., & Nijman, V. (2010). Exploring cultural drivers for wildlife trade via an ethnoprimate approach: A case study of slender and slow lorises (*Loris* and *Nycticebus*) in South and Southeast Asia. *American Journal of Primatology*, 72(10):877–886.
23. Tshen, L. T. (2016). Biogeographic distribution and metric dental variation of fossil and living orangutans (*Pongo* spp.). *Primates*, 57(1):39–50.
24. (17 December 2020) Two smuggled Sumatran orangutans flown home from Thailand. *Reuters*. <https://www.reuters.com/article/us-thailand-indonesia-orangutans/two-smuggled-suma->

tran-orangutans-flown-home-from-thailand-idUSKBN28RoPW

25. TRAFFIC. Thailand repatriates smuggled orangutans to Indonesia. (12 November 2015). <https://www.traffic.org/news/thailand-repatriates-smuggled-orangutans-to-indonesia/>

26. Smiley Evans, T., Myat, T. W., Aung, P., Oo, Z. M., Maw, M. T., Toe, A. T., ... Johnson, C. K. (2020). Bushmeat hunting and trade in Myanmar's central teak forests: Threats to biodiversity and human livelihoods. *Global Ecology and Conservation*, 22:e00889. <https://doi.org/10.1016/j.gecco.2019.e00889>

27. Peña, P. (2013). "Nycticebus coucang" (On-line), Animal Diversity Web. Accessed June 23, 2021 at https://animaldiversity.org/accounts/Nycticebus_coucang

28. Cawthon Lang K.A. (2005 September 12). Primate Factsheets: Pigtail macaque (*Macaca nemestrina*) Taxonomy, Morphology, & Ecology. http://pin.primate.wisc.edu/factsheets/entry/pigtail_macaque. Accessed July 15, 2020.

29. Hara, C. (2003). "Pygathrix nemaeus" (On-line), Animal Diversity Web. Accessed June 23, 2021 at https://animaldiversity.org/accounts/Pygathrix_nemaeus/

30. WWF. Douc Langur profile. https://wwf.panda.org/discover/our_focus/wildlife_practice/profiles/mammals/douc_langur/

31. Endangered Primate Rescue Center. Grey shanked douc langur profile. <https://www.eprc.asia/grey-shanked-douc-langur/>

32. Downey, K. (2017). New England Primate Conservancy. Grey shanked douc langur profile. <https://www.neprimateconservancy.org/gray-shanked-douc-langur.html>

33. Nadler, T., Momberg, F., Nguyen, X., Dang and Lormee, N. (2003). Leaf monkeys: Vietnam Primate Conservation Status Review 2002 part 2. Fauna & Flora International Asia Pacific Programme Office, Hanoi, Vietnam.

34. Ang, A., Roesma, D.I., Nijman, V. et al. (2020). Faecal DNA to the rescue: Shotgun sequencing of non-invasive samples reveals two subspecies of Southeast Asian primates to be Critically Endangered species. *Sci Rep.*, 10:9396.

35. Roos C (2004): Molecular evolution and systematics of Vietnamese primates. In: Nadler, Streicher & Ha Thang Long (eds.): Conservation of Primates in Vietnam; pp. 23-28. Frankfurt Zoological Society. Hanoi.

36. Roos C, Thanh V N, Walter L & Nadler T (2007): Molecular Systematics of Indochinese Primates. *Vietnamese J. Primatol.*, 1:41-53.

37. Agence France Presse. 11 Nov 2020. New species of primate identified in Myanmar – and is already endangered. *The Guardian*, World News. <https://www.theguardian.com/world/2020/nov/11/popa-scoop-100-year-old-monkey-faeces-reveals-new-species-in-myanmar>

38. Endangered Primate Rescue Center. Indochinese grey langur profile. <https://www.eprc.asia/indochinese-grey-langur/>

39. Trivedi, M., Manu, S., Balakrishnan, S. et al. (2021) Understanding the Phylogenetics of Indian Hoolock Gibbons: *Hoolock hoolock* and *H. leuconedys*. *Int J Primatol* 42, 463–477. <https://doi.org/10.1007/s10764-021-00212-8>

40. Phoonjampa, R., Koenig, A., Brockelman, W.Y., Borries, C., Gale, G.A., Carroll, J.P. and Savini, T. (2011). Pileated Gibbon Density in Relation to Habitat Characteristics and Post-logging Forest Recovery. *Biotropica*, 43:619-627.

41. Damas, J., Hughes, G.M., Keough, K.C., Painter, C.A., Per-sky, N.S., Corbo, M., Hiller, M., Koepfli, K.P., Pfenning, A.R., Zhao, H., Genereux, D.P., Swofford, R., Pollard, K.S., Ryder, O.A., Nweeia, M.T., Lindblad-Toh, K., Teeling, E.C., Karlsson, E.K., Lewin, H.A. (2020). Broad host range of SARS-CoV-2 predicted by comparative and structural analysis of ACE2 in vertebrates. *Proceedings of the National Academy of Sciences*, 117(36):22311-22322.

42. Melin, A. D., Janiak, M. C., Marrone, F., Arora, P. S., & Higham, J. P. (2020). Comparative ACE2 variation and primate COVID-19 risk. *Communications Biology*, 3(641):1–9.

43. Vu, TT, Hoa Anh, NQ, Rawson, BM, Tran, DV, Nguyen, HT, Van, TN. (2020). Monitoring occurrence, extinction, and colonization probabilities for gibbon populations. *Am J Primatol.*, 82:e23171.

44. Griffin, O. & Nuttall, M. (2020). Status of Key Species in Keo Seima Wildlife Sanctuary 2010-2020. Wildlife Conservation Society, Phnom Penh, Cambodia. <https://doi.org/10.19121/2020.Report.38511>

45. WWF Asia Pacific. 17 May 2019. "DON'T TOUCH THAT!" Making electricity gibbon-friendly. <https://wwfasiapacific.exposure.co/dont-touch-that>

46. Yamin, S. (2021) In Plain Sight: The Online Trade in Myanmar's Wildlife 2020. WWF-Myanmar. <https://www.wwf.org.mm/en/reports/?uNewsID=369038>

47. Association Anoulak. "The beautiful and informative gibbon songs: Progress on our gibbon call recordings to study species distribution in Nakai – Nam Theun National Park." <https://www.conservationlaos.com/the-beautiful-and-informative-gibbon-songs-progress-on-our-gibbon-call-recordings-to-study-species-distribution-in-nakai-nam-theun-national-park/>

Citations of IUCN Red List assessments and species range maps

Pygmy slow loris (*Nycticebus pygmaeus*)

Blair, M., Nadler, T., Ni, O., Samun, E., Streicher, U. & Nekaris, K.A.I. 2021. *Nycticebus pygmaeus* (amended version of 2020 assessment). The IUCN Red List of Threatened Species 2021: e.T14941A198267330. <https://dx.doi.org/10.2305/IUCN.UK.2021-2.RLTS.T14941A198267330>. en. Accessed on 27 December 2021.

Bengal slow loris (*Nycticebus bengalensis*)

Nekaris, K.A.I., Al-Razi, H., Blair, M., Das, N., Ni, Q., Samun, E., Streicher, U., Xue-long, J. & Yongcheng, L. 2020. *Nycticebus bengalensis* (errata version published in 2020). The IUCN Red List of Threatened Species 2020: e.T39758A179045340. <https://dx.doi.org/10.2305/IUCN.UK.2020-2.RLTS.T39758A179045340>. en. Accessed on 27 December 2021.

Sunda/greater slow loris (*Nycticebus coucang*)

Nekaris, K.A.I., Poindexter, S. & Streicher, U. 2020. *Nycticebus coucang*. The IUCN Red List of Threatened Species 2020: e.T163017685A17970966. <https://dx.doi.org/10.2305/IUCN.UK.2020-2.RLTS.T163017685A17970966>. en. Accessed on 27 December 2021.

Stump-tailed macaque (*Macaca arctoides*)

Chetry, D., Boonratana, R., Das, J., Long, Y., Htun, S. & Timmins, R.J. 2020. *Macaca arctoides*. The IUCN Red List of Threatened Species 2020: e.T12548A185202632. <https://dx.doi.org/10.2305/IUCN.UK.2020-3.RLTS.T12548A185202632>. en. Accessed on 27 December 2021.

Assamese macaque (*Macaca assamensis*)

Boonratana, R., Chalise, M., Htun, S. & Timmins, R.J. 2020. *Macaca assamensis*. The IUCN Red List of Threatened Species 2020: e.T12549A17950189. <https://dx.doi.org/10.2305/IUCN.UK.2020-2.RLTS.T12549A17950189>. en. Accessed on 27 December 2021.

Long tailed/crab-eating macaque (*Macaca fascicularis*)

Eudey, A., Kumar, A., Singh, M. & Boonratana, R. 2021. *Macaca fascicularis* (amended version of 2020 assessment). The IUCN Red List of Threatened Species 2021: e.T12551A204494260. <https://dx.doi.org/10.2305/IUCN.UK.2021-2.RLTS.T12551A204494260>. en. Accessed on 27 December 2021.

Rhesus macaque (*Macaca mulatta*)

Singh, M., Kumar, A. & Kumara, H.N. 2020. *Macaca mulatta*. The IUCN Red List of Threatened Species 2020: e.T12554A17950825. <https://dx.doi.org/10.2305/IUCN.UK.2020-2.RLTS.T12554A17950825>. en. Accessed on 27 December 2021.

Northern Pig-tailed Macaque (*Macaca leonina*)

Boonratana, R., Chetry, D., Long, Y., Jiang, X.-L., Htun, S. & Timmins, R.J. 2020. *Macaca leonina* (errata version published in 2020). The IUCN Red List of Threatened Species 2020: e.T39792A186071807. <https://dx.doi.org/10.2305/IUCN.UK.2020-2.RLTS.T39792A186071807>. en. Accessed on 27 December 2021.

Southern pig-tailed macaque (*Macaca nemestrina*)

Ang, A., Boonratana, R., Choudhury, A. & Supriatna, J. 2020. *Macaca nemestrina*. The IUCN Red List of Threatened Species 2020: e.T12555A181324867. <https://dx.doi.org/10.2305/IUCN.UK.2020-3.RLTS.T12555A181324867>. en. Accessed on 27 December 2021.

Grey-shanked douc langur (*Pygathrix cinerea*)

Long, H.T., Duc, H., Quyet, L.K., Rawson, B.M., Nadler, T. & Covert, H. 2020. *Pygathrix cinerea*. The IUCN Red List of Threatened Species 2020: e.T39827A17941672. <https://dx.doi.org/10.2305/IUCN.UK.2020-2.RLTS.T39827A17941672>. en. Accessed on 27 December 2021.

Black-shanked douc langur (*Pygathrix nigripes*)

Duc, H., Quyet, L.K., Rawson, B.M., O'Brien, J. & Covert, H. 2021. *Pygathrix nigripes* (amended version of 2020 assessment). The IUCN Red List of Threatened Species 2021: e.T39828A196138291. <https://dx.doi.org/10.2305/IUCN.UK.2021-1.RLTS.T39828A196138291>. en. Accessed on 27 December 2021.

Red-shanked douc langur (*Pygathrix nemaeus*)

Coudrat, C.N.Z., Quyet, L.K., Duc, H., Phiaphalath, P., Rawson, B.M., Nadler, T., Ulibarri, L. & Duckworth, J.W. 2020. *Pygathrix nemaeus*. The IUCN Red List of Threatened Species 2020: e.T39826A17941247. <https://dx.doi.org/10.2305/IUCN.UK.2020-2.RLTS.T39826A17941247>. en. Accessed on 27 December 2021.

Banded langur (*Presbytis femoralis*) - older version for Robinson's banded langur (*Presbytis robinsoni*)

Ang, A. & Boonratana, R. 2020. *Presbytis femoralis*. The IUCN Red List of Threatened Species 2020: e.T18126A17955020. <https://dx.doi.org/10.2305/IUCN.UK.2020-2.RLTS.T18126A17955020>. en. Accessed on 30 September 2021.

White-thighed surili (*Presbytis siamensis*)

Ang, A. & Traeholt, C. 2020. *Presbytis siamensis*. The IUCN Red List of Threatened Species 2020: e.T18134A17953755. <https://dx.doi.org/10.2305/IUCN.UK.2020-2.RLTS.T18134A17953755>. en. Accessed on 27 December 2021.

Tonkin snub-nosed monkey (*Rhinopithecus avunculus*)

Quyet, L.K., Rawson, B.M., Duc, H., Nadler, T., Covert, H. & Ang, A. 2020. *Rhinopithecus avunculus*. The IUCN Red List of Threatened Species 2020: e.T19594A17944213. <https://dx.doi.org/10.2305/IUCN.UK.2020-2.RLTS.T19594A17944213>. en. Accessed on 27 December 2021.

Myanmar snub-nosed monkey (*Rhinopithecus strykeri*)

Geissmann, T., Momberg, F. & Whitten, T. 2020. *Rhinopithecus strykeri*. The IUCN Red List of Threatened Species 2020: e.T13508501A17943490. <https://dx.doi.org/10.2305/IUCN.UK.2020-2.RLTS.T13508501A17943490.en>. Accessed on 27 December 2021.

François' langur (*Trachypithecus francoisi*)

Nadler, T., Quyet, L.K., Covert, H. & Long, Y. 2020. *Trachypithecus francoisi*. The IUCN Red List of Threatened Species 2020: e.T39853A17958817. <https://dx.doi.org/10.2305/IUCN.UK.2020-3.RLTS.T39853A17958817.en>. Accessed on 27 December 2021.

Annamese (or Elliot's) silvered langur (*Trachypithecus margarita*)

Eudey, A. & Ang, A. 2021. *Trachypithecus margarita*. The IUCN Red List of Threatened Species 2021: e.T39875A17988048. <https://dx.doi.org/10.2305/IUCN.UK.2021-1.RLTS.T39875A17988048.en>. Accessed on 27 December 2021.

Indochinese silvered langur (*Trachypithecus germaini*)

Duc, H., Covert, H., Ang, A. & Moody, J. 2021. *Trachypithecus germaini* (amended version of 2020 assessment). The IUCN Red List of Threatened Species 2021: e.T39874A195374767. <https://dx.doi.org/10.2305/IUCN.UK.2021-1.RLTS.T39874A195374767.en>. Accessed on 27 December 2021.

Phayre's langur (*Trachypithecus phayrei*)

Chetry, D. & Ahmed, T. 2021. *Trachypithecus phayrei*. The IUCN Red List of Threatened Species 2021: e.T175862145A175862149. <https://dx.doi.org/10.2305/IUCN.UK.2021-2.RLTS.T175862145A175862149.en>. Accessed on 27 December 2021.

Hatinh langur (*Trachypithecus hatinhensis*)

Quyet, L.K., Coudrat, C.N.Z., Phiaphalath, P., Nadler, T. & Covert, H. 2021. *Trachypithecus hatinhensis* (amended version of 2020 assessment). The IUCN Red List of Threatened Species 2021: e.T40789A196139355. <https://dx.doi.org/10.2305/IUCN.UK.2021-1.RLTS.T40789A196139355.en>. Accessed on 27 December 2021.

Indochinese grey langur (*Trachypithecus crepusculus*)

Yongcheng, L., Nadler, T. & Quyet, L.K. 2021. *Trachypithecus crepusculus* (amended version of 2020 assessment). The IUCN Red List of Threatened Species 2021: e.T136920A204397334. <https://dx.doi.org/10.2305/IUCN.UK.2021-2.RLTS.T136920A204397334.en>. Accessed on 27 December 2021.

Lao langur (*Trachypithecus laotum*)

Coudrat, C.N.Z., Nadler, T., Phiaphalath, P. & Duckworth, J.W. 2020. *Trachypithecus laotum*. The IUCN Red List of Threatened Species 2020: e.T22044A17959133. <https://dx.doi.org/10.2305/IUCN.UK.2020-3.RLTS.T22044A17959133.en>. Accessed on 27 December 2021.

Delacour's langur (*Trachypithecus delacouri*)

Nadler, T., Quyet, L.K., Rawson, B.M. & Coudrat, C.N.Z. 2020. *Trachypithecus delacouri*. The IUCN Red List of Threatened Species 2020: e.T22043A17958988. <https://dx.doi.org/10.2305/IUCN.UK.2020-2.RLTS.T22043A17958988.en>. Accessed on 27 December 2021

Capped langur (*Trachypithecus pileatus*)

Das, J., Chetry, D., Choudhury, A. & Bleisch, W. 2020. *Trachypithecus pileatus* (errata version published in 2021). The IUCN Red List of Threatened Species 2020: e.T22041A196580469. <https://dx.doi.org/10.2305/IUCN.UK.2020-3.RLTS.T22041A196580469.en>. Accessed on 27 December 2021.

Shortridge's langur (*Trachypithecus shortridgei*)

Long, Y. & Htun, S. 2020. *Trachypithecus shortridgei*. The IUCN Red List of Threatened Species 2020: e.T39869A17961202. <https://dx.doi.org/10.2305/IUCN.UK.2020-2.RLTS.T39869A17961202.en>. Accessed on 27 December 2021.

Popa langur (*Trachypithecus popa*), not yet Red List assessed.

Cat Ba langur (*Trachypithecus poliocephalus*)

Rawson, B.M., Leonard, N., Covert, H. & Nadler, T. 2020. *Trachypithecus poliocephalus*. The IUCN Red List of Threatened Species 2020: e.T39871A17959804. <https://dx.doi.org/10.2305/IUCN.UK.2020-2.RLTS.T39871A17959804.en>. Accessed on 27 December 2021.

Dusky langur or spectacled leaf monkey (*Trachypithecus obscurus*)

Boonratana, R., Ang, A., Traeholt, C. & Thant, N.M.L. 2020. *Trachypithecus obscurus*. The IUCN Red List of Threatened Species 2020: e.T22039A17960562. <https://dx.doi.org/10.2305/IUCN.UK.2020-2.RLTS.T22039A17960562.en>. Accessed on 27 December 2021.

Shan states langur (*Trachypithecus melamera*),

assessed under *T. phayrei shanicus*.

Tenasserim lutung (*Trachypithecus barbei*)

Nadler, T. 2021. *Trachypithecus barbei*. The IUCN Red List of Threatened Species 2021: e.T41554A17960144. <https://dx.doi.org/10.2305/IUCN.UK.2021-1.RLTS.T41554A17960144.en>. Accessed on 27 December 2021.

Western hoolock gibbon (*Hoolock hoolock*)

Brockelman, W., Molur, S. & Geissmann, T. 2019. *Hoolock hoolock*. The IUCN Red List of Threatened Species 2019: e.T39876A17968083. <https://dx.doi.org/10.2305/IUCN.UK.2019-3.RLTS.T39876A17968083.en>. Accessed on 27 December 2021.

Eastern hoolock gibbon (*Hoolock leuconedys*)

Brockelman, W. & Geissmann, T. 2019. *Hoolock leuconedys*. The IUCN Red List of Threatened Species 2019: e.T118355453A17968300. <https://dx.doi.org/10.2305/IUCN.UK.2019-1.RLTS.T118355453A17968300.en>. Accessed on 27 December 2021.

Skywalker/Gaoligong hoolock gibbon (*Hoolock tianxing*)

Fan, P.F., Turvey, S.T. & Bryant, J.V. 2020. *Hoolock tianxing* (amended version of 2019 assessment). The IUCN Red List of Threatened Species 2020: e.T118355648A166597159. <https://dx.doi.org/10.2305/IUCN.UK.2020-1.RLTS.T118355648A166597159.en>. Accessed on 27 December 2021.

Siamang (*Symphalangus syndactylus*)

Nijman, V., Geissmann, T., Traeholt, C., Roos, C. & Nowak, M.G. 2020. *Symphalangus syndactylus*. The IUCN Red List of Threatened Species 2020: e.T39779A17967873. <https://dx.doi.org/10.2305/IUCN.UK.2020-2.RLTS.T39779A17967873.en>. Accessed on 27 December 2021.

Black crested gibbon (*Nomascus concolor*)

Pengfei, F., Nguyen, M.H., Phiaphalath, P., Roos, C., Coudrat, C.N.Z. & Rawson, B.M. 2020. *Nomascus concolor*. The IUCN Red List of Threatened Species 2020: e.T39775A17968556. <https://dx.doi.org/10.2305/IUCN.UK.2020-2.RLTS.T39775A17968556.en>. Accessed on 27 December 2021.

Laotian black crested gibbon (*N. c. lu*)

Phiaphalath, P., Coudrat, C.N.Z., Roos, C. & Rawson, B.M. 2020. *Nomascus concolor* ssp. *lu*. The IUCN Red List of Threatened Species 2020: e.T39894A17991433. <https://dx.doi.org/10.2305/IUCN.UK.2020-2.RLTS.T39894A17991433.en>. Accessed on 27 December 2021.

Tonkin (western) black-crested gibbon (*N. c. concolor*)

Pengfei, F., Nguyen, M.H., Roos, C. & Rawson, B.M. 2020. *Nomascus concolor* ssp. *concolor*. The IUCN Red List of Threatened Species 2020: e.T160304839A17991381. <https://dx.doi.org/10.2305/IUCN.UK.2020-2.RLTS.T160304839A17991381.en>. Accessed on 27 December 2021.

Cao-Vit (eastern) black-crested gibbon (*Nomascus nasutus*)

Rawson, B.M., Roos, C., Nguyen, M.H., Bleisch, W., Geissmann, T. & Fan, P.F. 2020. *Nomascus nasutus*. The IUCN Red List of Threatened Species 2020: e.T41642A17969578. <https://dx.doi.org/10.2305/IUCN.UK.2020-2.RLTS.T41642A17969578.en>. Accessed on 27 December 2021.

Northern yellow-cheeked crested gibbon (*Nomascus annamensis*)

Thinh Van Ngoc, Roos, C., Rawson, B.M., Nguyen, M.H., Duckworth, J.W., Hoang Minh Duc, Nijman, V. & Thien Nguyen Van. 2020. *Nomascus annamensis*. The IUCN Red List of Threatened Species 2020: e.T120659170A120659179. <https://dx.doi.org/10.2305/IUCN.UK.2020-2.RLTS.T120659170A120659179.en>. Accessed on 27 December 2021.

Northern white-cheeked gibbon (*Nomascus leucogenys*)

Rawson, B.M., Nguyen, M.H., Coudrat, C.N.Z., Roos, C., Jiang, X. & Duckworth, J.W. 2020. *Nomascus leucogenys* (errata version published in 2020). The IUCN Red List of Threatened Species 2020: e.T39895A180816530. <https://dx.doi.org/10.2305/IUCN.UK.2020-2.RLTS.T39895A180816530.en>. Accessed on 27 December 2021.

Southern white-cheeked gibbon (*Nomascus siki*)

Nguyen, M.H., Coudrat, C.N.Z., Roos, C., Rawson, B.M. & Duckworth, J.W. 2020. *Nomascus siki*. The IUCN Red List of Threatened Species 2020: e.T39896A17968765. <https://dx.doi.org/10.2305/IUCN.UK.2020-2.RLTS.T39896A17968765.en>. Accessed on 27 December 2021.

Red-cheeked (southern yellow-cheeked) gibbon (*Nomascus gabriellae*)

Rawson, B.M., Hoang, M.D., Roos, C., Van, N.T. & Nguyen, M.H. 2020. *Nomascus gabriellae*. The IUCN Red List of Threatened Species 2020: e.T128073282A17968950. <https://dx.doi.org/10.2305/IUCN.UK.2020-2.RLTS.T128073282A17968950.en>. Accessed on 27 December 2021.

Agile gibbon (*Hylobates agilis*)

Geissmann, T., Nijman, V., Boonratana, R., Brockelman, W., Roos, C. & Nowak, M.G. 2020. *Hylobates agilis*. The IUCN Red List of Threatened Species 2020: e.T10543A17967655. <https://dx.doi.org/10.2305/IUCN.UK.2020-2.RLTS.T10543A17967655.en>. Accessed on 27 December 2021.

Lar gibbon (*Hylobates lar*)

Brockelman, W. & Geissmann, T. 2020. *Hylobates lar*. The IUCN Red List of Threatened Species 2020: e.T10548A17967253. <https://dx.doi.org/10.2305/IUCN.UK.2020-2.RLTS.T10548A17967253.en>. Accessed on 27 December 2021.

Pileated gibbon (*Hylobates pileatus*)

Brockelman, W., Geissmann, T., Timmins, T. & Traeholt, C. 2020. *Hylobates pileatus*. The IUCN Red List of Threatened Species 2020: e.T10552A17966665. <https://dx.doi.org/10.2305/IUCN.UK.2020-2.RLTS.T10552A17966665.en>. Accessed on 27 December 2021.



Northern pig-tailed macaque *Macaca leonina*
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Species range maps that use data from sources other than the IUCN Red List

Eastern hoolock (*Hoolock leuconedys*)

The Eastern hoolock's range has been revised based on:

Lwin, N., Sukumal, N., & Savini, T. (2021). Modeling the conservation status of the threatened hoolock gibbon (genus *Hoolock*) over its range. *Global Ecology and Conservation*, 29, e01726.

Gaoligong hoolock (*Hoolock tianxing*)

The Gaoligong hoolock's range has been revised based on:

Lwin, N., Sukumal, N., & Savini, T. (2021). Modeling the conservation status of the threatened hoolock gibbon (genus *Hoolock*) over its range. *Global Ecology and Conservation*, 29, e01726.

Germain's/Indochinese silvered langur (*Trachypithecus germaini*)

The species range provided is an edited version of the map in the IUCN Red List assessment, and excludes the areas east of the Mekong river.

Annamese langur (*Trachypithecus margarita*)

The range provided includes the portion of *T. germaini* range to the east of the Mekong river, combined with the range of *T. margarita* as given in the Red List.

Robinson's banded langur (*Presbytis robinsoni*)

The range provided is an edited version of the *P. femoralis* range from the IUCN Red List, excluding the polygons overlapping Johor, Malaysia; Singapore; and Sumatra, Indonesia.

Shan states langur (*Trachypithecus melamera*)

The range has been digitized based on the figure from Roos et al. 2020.

Phayre's leaf monkey (*Trachypithecus phayrei*)

The range has been digitized based on the figure from Roos et al. 2020.

Popa langur (*Trachypithecus popa*)

The range has been digitized based on the figure from Roos et al. 2020.





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