



for a living planet

THE EASTERN HIMALAYAS

WHERE WORLDS COLLIDE

Living Himalayas Network Initiative

NEW SPECIES DISCOVERIES



At least 353 new species have been discovered in the Eastern Himalayas between 1998 and 2008, equating to an average of 35 new species finds every year for the last 10 years. The discoveries include 242 plants, 16 amphibians, 16 reptiles, 14 fish, 2 birds and 2 mammals, and at least 61 new invertebrates.



Above: The Arunachal macaque, a new primate species, one of the extraordinary new finds from the Eastern Himalayas. New mammals, particularly primates, are very rare among global scientific discoveries.

Main photo: The awe-inspiring Eastern Himalayas.

The Eastern Himalayas is at the crossroads of two continental plates represented by the lowland Indo-Malayan Realm and to the north, the elevated Palearctic Realm. The meeting of these worlds has created one of the biologically richest areas on Earth.

Spanning Bhutan, the north-eastern Indian states of Arunachal Pradesh, Assam, North Bengal and Sikkim, the far north of Myanmar (Burma), Nepal and Tibet, the region includes four of the Global 200 ecoregions, critical landscapes of international biological importance. The Himalayas are home to an estimated 10,000 plant species, 300 mammal species, 977 bird species, 176 reptiles, 105 amphibians and 269 freshwater fish. The region also has the highest density of the Bengal tiger and is the last bastion for the charismatic greater one-horned rhino.

Even today the rugged, and largely inaccessible landscape of the Eastern Himalayas, hides the real extent of the region's biodiversity, with extraordinary new species continuing to be discovered year-on-year. Between 1998 and 2008, at least 353 new species have been discovered in the Eastern Himalayas, 35 new species finds on average every year for the last 10 years (see Appendix).

The extent of the new species finds place the Eastern Himalayas on a par with more well-known biological hotspots such as Borneo.

This report celebrates these unique and fascinating species discoveries. It also highlights the many vital habitats that face growing pressures as a consequence of unsustainable development in the region. Despite protection efforts, in the last half-century, this area of South Asia has faced a wave of pressures as a result of population growth and the increasing demand for commodities by global and regional markets. The host of threats include forest destruction as a result of unsustainable and illegal logging, agriculture, unsustainable fuel wood collection, overgrazing by domestic livestock, illegal poaching and wildlife trade, mining, pollution, hydropower development, and poorly planned infrastructure. The region is also among the most vulnerable to global climate change, which will amplify the impacts of these threats.

Only 25% of the original habitats in the region remain intact. For the unique species of the Eastern Himalayas, this means that today 163 are considered globally threatened.

Many of WWF's established priority conservation landscapes are being impacted by the current unsustainable development in the Eastern Himalayas, and so we consider that a new layer of strategic action is needed to augment our longstanding field projects. This includes asking the governments of Bhutan, India and Nepal to commit to a shared tripartite vision that recognises the global significance of the region and supports the implementation of a unified conservation and sustainable development plan that ensures the landscapes within the Eastern Himalayas are connected.

By promoting a shared sustainable development vision, WWF believes that real progress can be made in tackling huge poverty-impacting issues in the Eastern Himalayas such as climate change, deforestation, the illegal wildlife and timber trade, poor infrastructure development, and thereby secure the livelihoods, subsistence and fresh water essential to millions of people throughout the region.

Only a concerted focus and a shared vision can maintain a living Himalayas, for people and nature, whether discovered or yet to be discovered.



Above: Where worlds collide. The Eastern Himalayas is at the crossroads of two continental plates, creating one of the biologically richest areas on Earth.

Asia's Land of Contrast, Life and Wonder



Above: Asian elephant (**top**) and greater one-horned rhino (**bottom**).
Main photo: The Eastern Himalayas comprise 17 critical tiger landscapes and the densest population of Bengal tigers in the world.

No mountain range on Earth can match the awe-inspiring Himalayas. Home to all of the world's highest peaks, many standing above 8,000m, they include the tallest, the formidable Sagarmatha (Mount Everest) at 8,848m. Their story is one of fascination and intrigue, which continues to captivate the world.

The 3,000km-long Himalayan mountain range, “abode of snow” in Sanskrit, was born from a massive tectonic collision 40-50 million years ago. The energy dissipated by the monumental meeting of India and Eurasia was far-reaching and shaped many of Asia's most distinctive geographical features, including the formation of the Tibetan Plateau; the highest on Earth. Even today, the relentless movement of the plates continues to push the Himalayas further skyward.

The Eastern Himalayas spanning Bhutan, the north-eastern Indian states of Arunachal Pradesh, Assam, North Bengal and Sikkim, the far north of Myanmar (Burma), Nepal and Tibet forms a wall that separates the lowlands of the Indian subcontinent from the high, dry Tibetan Plateau. Climatic variability and altitudinal gradation have forged the region into Asia's land of contrasts, encompassing some of nature's most magnificent spaces, from the world's highest mountains and several of the world's deepest gorges, to subtropical jungles, temperate forests, tall grasslands, savannas and rich alpine meadows.

A myriad of cultures and faiths including Buddhists, Hindus, Christians and animists, have lived closely with the natural environments of the Eastern Himalayas for millennia. Many of these communities live in isolation; their customs, lifestyles and livelihoods have been shaped by their environment, and they remain deeply dependent on the resources nature provides.



Right: The beautifully-marked snow leopard is endemic to the Eastern Himalayas.



Where worlds collide

A global biodiversity hotspot¹, the Eastern Himalayas is one of the biologically richest areas on Earth. Because the region sits at the biogeographical crossroads of two continental plates, it contains an incredible wealth of biodiversity from both worlds. The Indo-Malayan Realm in the lowlands of the Eastern Himalayas is home to Asian elephants, clouded leopards, wild water buffalo, gaur, hornbills, cobras and geckos. The elevated Palearctic Realm to the north includes the snow leopard, red pandas, black bears, wolf, golden langurs and a diverse assemblage of alpine ungulates, like takins.

The Eastern Himalayas hotspot² includes four Global 200 ecoregions³, critical landscapes of international biological importance, four World Heritage sites, two Endemic Bird Areas⁴, and several global centres for plant diversity⁵. The Himalayas harbour a staggering 10,000 plant species, from tropical to temperate, from alpine to tundra; 300 mammal species, 977 bird species, 176 reptiles, 105 amphibians and 269 types of freshwater fish⁶. A third of all plants and reptiles are endemic¹, as are 40% of all amphibians⁷.

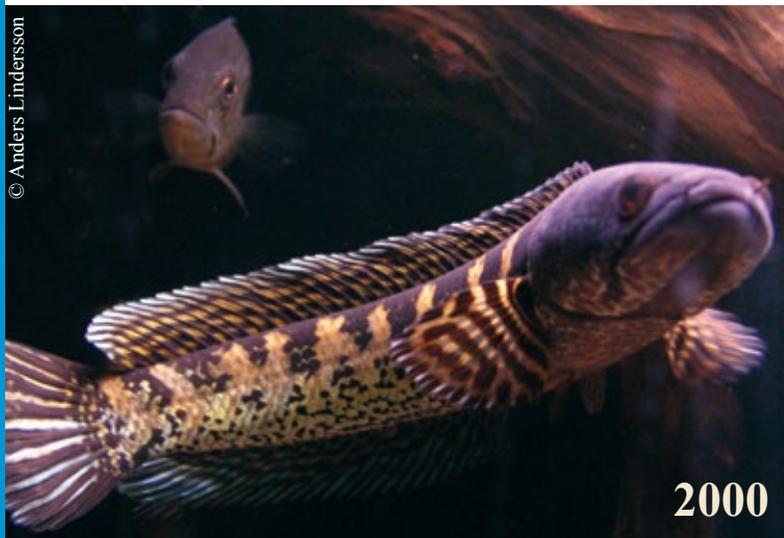
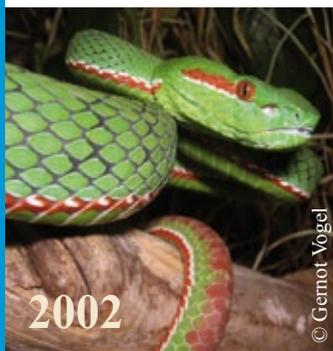
The world's northernmost tropical rainforests can be found in the Eastern Himalayas⁸ and nearly half of the flowering plants⁹ and bird species known from India¹⁰. The plant life of Arunachal Pradesh is considered among the most diverse in the world, ranking second only to Sumatra in Indonesia and greater than Borneo, Brazil and Papua New Guinea¹¹.

Importantly, the region comprises 17 landscapes for the Bengal tiger¹², Asia's largest carnivore, with the densest population of Bengal tigers in the world. The Eastern Himalayas are also the last bastion for the charismatic greater one-horned rhino, which once enjoyed a range spanning the entire length of the Himalaya foothills, from Pakistan to Myanmar¹³ but are now restricted to a few corners of India, Bhutan and Nepal.

People and wildlife form a rich mosaic of life stretching across a remarkable and unparalleled landscape.

¹ Endemic refers to a species that is exclusively native to a specific place and found nowhere else.

a decade of new life revealed...



New life in colour, clockwise:
 Male Gumprecht's green pitviper (*Trimeresurus gumprechtii*); Smith's litter frog (*Leptobranchium smithi*); Orange-spotted snakehead (*Channa aurantimaculata*); blue diamond impatiens (*Impatiens namcharwensis*).

Historically, the rugged and largely inaccessible landscape of the Eastern Himalayas has made biological surveys in the region extremely difficult. As a result, wildlife has remained poorly surveyed and there are large areas that are still biologically unexplored.

The topographic complexity, including steep mountains and valleys, has also forged isolated islands of habitat. According to scientists, large areas of intact forests, rivers and thousands of isolated streams, separated by mountain massifs, high ridges and valleys, could support populations of species cut off from one another, giving rise to genetic differences among populations, a step toward the evolution of endemic species. Scientists believe that these pockets could harbour globally threatened species and many undiscovered species, including mammals, reptiles and amphibians, some of which could qualify for globally threatened status but have been missed in surveys to date¹⁴.

Many species groups have been inadequately studied and the real extent of the biodiversity of the Eastern Himalayas is undoubtedly underestimated. This is reflected in the remarkable level of new life discovered in the region over the past 10 years by dedicated scientists. Some of these species have evolved and survived for centuries, and their full glory is only just being unearthed.

It is largely in the last decade that wildlife research and exploration has begun to gather momentum in the Eastern Himalayas, led by researchers of non-governmental and governmental research institutions. Surveys have yielded extraordinary results, and the discovery of large mammals such as the leaf deer (*Muntiacus putaoensis*), the primate Arunachal macaque (*Macaca munzala*), and new birds such as the Bugun Liocichla (*Liocichla bugunorum*), has drawn renewed attention to this globally important region for biodiversity.

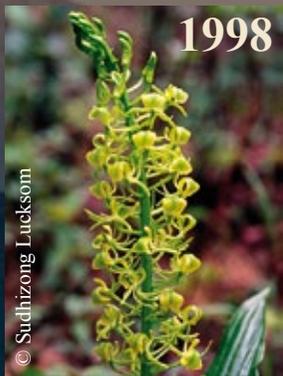
Remarkably, at least 353 new species have been discovered in the Eastern Himalayas between 1998 and 2008, equating to an average of 35 new species finds every year for the last 10 years. The discoveries include 242 plants, 16 amphibians, 16 reptiles, 14 fish, 2 birds and 2 mammals, and at least 61 new invertebrate discoveries (see **Appendix**).

The extent of the new species finds place the Eastern Himalayas on a par with Borneo¹¹.

Today, further species continue to be unearthed, and many more species of amphibians, reptiles and fish are currently in the process of being officially named by scientists. The Eastern Himalayas is certainly one of the last biological frontiers of Asia and, without doubt, there are still many new discoveries waiting to be made.

¹¹ The WWF report, *Borneo's Lost World* (2005), showed that between 1994 and 2004, 361 new species were identified on Borneo.

The rugged and largely inaccessible landscape of the Eastern Himalayas has made biological surveys in the region extremely difficult. As a result, wildlife has remained poorly surveyed and there are large areas that are still biologically unexplored.



Above: The orchids *Liparis dongchenii* (**top**) and *Calanthe yuksomnensis* (**bottom**) are just two of more than 200 new species of plants discovered in the Eastern Himalayas in the last decade.

amphibians



There have been 16 new amphibian discoveries in the Eastern Himalayas over the past 10 years. A caecilian and a diverse chorus of 14 frogs and a toad have revealed themselves for the first time in the last decade.

The eclectic mix of amphibians from Bhutan, India, Myanmar, Nepal and Tibet includes a number of high-altitude dwellers, with many found more than 1,000m above sea level. The toad, *Pseudepidalea zamdaensis*, belonging to the 'true toad' family Bufonidae, was discovered at the extraordinary altitude of 2,900m¹⁵.

Lowland discoveries include *Hylarana chitwanensis* or Chitwan frog of Nepal¹⁶. Named after the Chitwan National Park, this frog inhabits the terai grasslands, bushes and tropical *Shorea* forest. Because of the closer proximity of the species to human populations than its cloud-dwelling cousins, populations of the Chitwan frog in the Eastern Himalayas are decreasing and are already considered at risk by the IUCN, as a result of habitat destruction. The status of the Chitwan frog is close to being elevated to 'Vulnerable' from 'Near Threatened' according to the IUCN Red List of Threatened Species, on account of the declining quality and extent of habitat in its only know range, which is limited to 20,000 sq km¹⁷.

Most of the new amphibians are endemic or highly endemic, found only in a specific area. The bright green, red-footed tree frog *Rhacophorus suffry* [1a], a so-called 'flying frog' because long webbed feet allow the species to glide when falling, was described in 2007¹⁸. The species is mainly found in swampy areas and is known only from five specific sites, including the Suffry tea estate in Assam, where it was originally found¹⁹, and in neighbouring areas. Other new species from Assam include *Amolops assamensis* [1b], a green and brown species also called the Assamese cascade frog. Cascade frogs or torrent frogs as they are also known as, have adapted to life amongst the torrents, waterfalls and wet boulders that cascade out of Asia's rainforests.

The species *Philautus sahai* is perhaps the lead contender for the crown of 'most endemic frog' in the Eastern Himalayas. This frog was described in 2006 from specimens found in 1988 in a single tree hollow about 3m above ground, in a dense forest on the bank of the Noa Dihing River, in Arunachal Pradesh²⁰. Very little is known about the species and there has been no more information about it since 1988²¹, indicating this elusive frog may be extremely rare.

Also among the new amphibian species discovered was a caecilian, *Ichthyophis garoensis*²². These are interesting creatures; although classed as amphibians, they are completely limbless and look more like giant earthworms. As caecilians are subterranean, they are among the least studied of the amphibian species, making the latest species discovery from Assam particularly significant.



A golden-eyed frog

Smith's litter frog (*Leptobrachium smithi*) [1c, 1d] identified in 1999²⁴, one of five new frog discoveries in the Indian state of Assam, must certainly rank among the most extraordinary-looking frogs in the world. Measuring only a few centimetres, this small frog has a giant pair of piercing, bulging and vivid golden eyes. Smith's litter frog was reportedly discovered in the Mayeng Hill Reserve Forest and Garbhanga Reserve Forest, Kamru District, Assam²⁵, and today populations of the frog are declining due to pressures from forest clearance and other impacts such as stream pollution²⁶.

1d *Leptobrachium smithi*

birds



2a *Liocichla bugunorum*

It seems fitting that a region closely associated with the sky should be blessed with so many bird species. In the Eastern Himalayas, 977 species have been recorded, which roughly equates to a staggering one tenth of all known bird species of the world. Among this number have been two recent new discoveries.

The discovery of Bugun Liocichla (*Liocichla bugunorum*), a striking, colourful Asian babbler was unconventional in every sense and highly significant, given that prior to this the most recent new bird species reported from India was described more than half a century earlier, in 1948. Astrophysicist Ramana Athreya described the new species in 2006²⁷. The species predominantly inhabits open-canopied, degraded hill forests with dense shrubs and small trees which remain after logging, and so far is known to be restricted to 2 sq km at an altitude of between 2,000m and 2,350m. Ramana had first glimpsed two of the birds in 1995 near Eaglenest Wildlife Sanctuary, Arunachal Pradesh, during a birdwatching trip. Ten years passed before he saw the birds again and was able to take a closer look.

It was initially believed to be a similar species, *Liocichla omeiensis* (the bird's closest relative), but the many differences in size, plumage and calls, especially its distinctive fluty song, indicated a new species. The bird is spectacularly colourful, with wings of yellow, red and white and tail of black with red tips [2a]. Since the species had been overlooked during several years of surveys at Eaglenest, the astrophysicist felt the population might be too small to withstand the loss of an adult bird. The International Code of Zoological Nomenclature does not allow for new species to be described without the collection of type specimens, but somewhat luckily for the bird, the Code does allow for “any part of an animal” and the species was eventually described as a new species based on feathers, photographs, sound recordings and field notes.

Given that it is unlikely that the species could have escaped detection for so long if it were relatively common and widespread, the known population of between 50 and 250 individuals²⁸ is today listed as ‘Vulnerable’ according to the IUCN Red List of Threatened Species²⁹.

A second new bird species was identified near the remote Naung Mung township of northern Kachin state, Myanmar, in a temperate rainforest or hill jungle at the base of the Himalayas, 540m above sea level. A team of scientists ventured into the area, 118km south of the Tibetan border, to inventory the poorly-known bird fauna, and subsequently discovered the Naung Mung scimitar-babbler (*Jabouilleia naungmungensis*)³⁰. The medium-sized jungle bird reminiscent of a wren is dark brown, with a short tail, long legs, relatively large feet and a long curved bill [2b]. This long bill is used to forage and probe for food on the ground. The species was officially described as a new species in 2005.



© Christopher Milensky

2b *Jabouilleia naungmungensis*

fish



Main photo: The Kosi river, Nepal's largest river and the location for a number of new species discoveries.



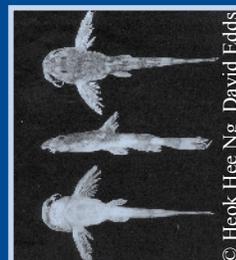
3d *Psilorhynchus nepalensis*

© Kevin Conway



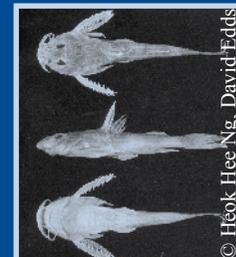
3c *Psilorhynchus nepalensis*

© R. L. Mayden



3a *E. ascita*

© Heok Hee Ng, David Edds



3b *E. cavatura*

© Heok Hee Ng, David Edds

In the past 10 years, 14 new fish species have surfaced in the Eastern Himalayas.

Half the new fish species are from the rivers and streams of Nepal. Until recently, the fish diversity of this country had been poorly studied or understood, relative to other fauna. A single scientist, Dr David Edds, undertook an ambitious exploration of Nepal's fish diversity in the late 1990s. The aim of the research was to better understand the biodiversity and conservation value of the protected areas. As a result of 35 different collections from seven protected areas, ranging from Himalayan mountains to subtropical lowlands and from east to west throughout the country, the scientist collected 91 different species of fish³¹. These were the first fish surveys in two of the reserves and the most comprehensive assessments to date in three others, adding to our knowledge of the distribution and ecology of fishes in Nepal and South Asia.

As a result of the increase in ichthyological activity in Nepal by scientists, new species to science have been reported. These include a small bagrid catfish, *Batasio macronotus*, discovered in the Kosi river, Nepal's largest river and part of the Ganges river drainage. The species has a dark yellow body and head, with two dark horizontal stripes, and was officially recorded as a new species in 2004³².

Perhaps among the more bizarre new fish discoveries are the two light chocolate-brown catfish, *Erethistoides ascita* [3a] and *E. cavatura* [3b] described in 2005 from the Ganges river drainage in the terai of Nepal³³. Both species display a battery of serrations along the length of their blade-like fins, in the case of *E. ascita*, as many as 24 sharp points. It is perhaps easy to see why the Latin name given to the fish means 'strange'.

Two further catfish species *Pseudecheneis crassicauda* and *P. serracula*, were discovered from tributaries of the Ganges river drainage in Nepal in 2005³⁴. Both are catfish that live in fast-flowing streams, which have evolved unique adhesive undersides, made of a series of transverse ridges (12-15 on *P. crassicauda*, 13-18 on *P. serracula*) that allow the fish to stick to rocks. The chestnut brown species were collected from broad and shallow stretches of river with swift water over rocks. Local fishers report that *P. serracula*, or 'kabre' as the fish is known locally, is something of a mountain climber, ascending from the base of the Himalayas in the terai to 1000m above sea level during the monsoon, suggesting these fish may breed in the upper reaches of the river, then migrate downstream following the spawning season.

The fish *Psilorhynchus nepalensis* [3c, 3d], named after its country of origin, was officially described in 2008 from the Budi Rapti river, just outside Chitwan National Park³⁵. The body of this slender species is marked with dark pigment blotches, with highlights of silver and gold, and with a remarkable iridescent underbelly.

Field work in Nepal suggests that there are already several other new fish species awaiting formal description, not only in the species-rich lowlands but also rather surprisingly also in the high altitude rivers³⁶. Although the high altitude rivers of the Himalayas have unique fauna, the level of species diversity is usually less compared to that of the terai lowlands.

Orange-spotted snakehead fish

The fairly large species, *Channa aurantimaculata* [3e], is endemic to the forest streams, ponds, and swamps adjacent to the Brahmaputra river in the subtropical rainforest of northern Assam³⁷. The species is remarkably striking, with a vibrant pattern of purple and orange adorning the length of its body. Discovered in 2000, and measuring up to 40cm in length, the fish is also known as the 'orange-spotted snakehead', as its head looks like that of a snake. It is carnivorous and predatory, enjoying a diet of smaller fish and invertebrates.



3e *Channa aurantimaculata*

© Anders Lindersson

There have been at least 61 new invertebrate discoveries from the Eastern Himalayas region in the last 10 years.

Invertebrate species can sometimes add an additional element of danger in already formidable territory. The Eastern Himalayas is no exception. The region is home to world's largest hornet, *Vespa mandarina*, or the Asian hornet known colloquially as the 'yak-killer' on account of its potent venom. Perhaps none of the new finds are as potentially nasty as this but some definitely deserve to be handled with care.

Asian huntsman spiders have been poorly investigated, with very little taxonomic research being published on these medium to large species of spider since the late 1800s³⁸. In 2001, Dr Peter Jäger published a paper describing an extraordinary 42 new species of huntsman spider from the Eastern Himalayas, as a result of an expedition through East Nepal, Sikkim, Darjeeling and West Bhutan³⁹. This plethora of spiders were formally organised into two new genera, Pseudopoda and Bhutaniella, both found in habitats more than 1,000m above sea level. *Bhutaniella hillyardi* was discovered at over 2,000m in the Arun Valley of East Nepal⁴⁰. Although not poisonous, some species of huntsman spiders can deliver a nasty bite.

Further amazing invertebrates include at least nine beetles being reported. The discovery of *Agabus joachimschmidti* in Tibet shattered the world altitude record for the genus Dytiscidae (from 'to dive' in Latin)⁴¹. Found at the dizzying height of 5,100m above sea level, this small and predatory diving beetle is able to move underwater where it feeds on tadpoles and smaller water-dwelling creatures. Adding further to the beetle-mania in Tibet were two black robust-bodied beetles *Itagonia cordiformis* [4a, 4b] and *Itagonia zayica*⁴² [4c, 4d] and three new stag beetles described in 2006⁴³, including *Prismognathus prossi* [4e].

A recent shipment of freshwater prawns imported into Europe from Cooch Behar, Bengal, had among their number a surprise stowaway; a previously unknown species to science. Freshwater prawns do not only have economic importance in hydroponics and fisheries for food purposes, but are also increasingly in demand by the global aquarium trade. With its tinted reddish-brown colour, the medium sized new species *Macrobrachium agwi*, described in 2008⁴⁴, is now categorised as an 'ornamental shrimp' in the aquarium trade [4f, 4g].



4c *I. zayica* (female)



4d *I. zayica* (male)



4a *I. cordiformis* (female)



4b *I. cordiformis* (male)



4e *P. prossi*

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Nepal's first scorpion

Among the new finds are three species of scorpion, one of which was described from the Chitwan National Park in Nepal in 2004. This discovery was particularly significant as it was the first species of scorpion ever to be discovered in the country, and was subsequently named *Heterometrus nepalensis*⁴⁵ to honour the occasion [4h]. The 8cm long, reddish-black, species has a smooth carapace, and a reddish-brown tail tip or telson that contains the venom. All scorpions should be considered dangerous, as the venom that they release is generally neurotoxic, and is of variable potency. The new discovery is a member of the *Heterometrus* genus of large black scorpions, which inhabit tropical rainforests and have a diet of large insects and the occasional mouse, but will generally eat any small animal it can subdue. The genus includes *Heterometrus swammerdami* that lives in India, one of the world's largest scorpions, capable of growing to more than 20cm in length.



4h *Heterometrus nepalensis*

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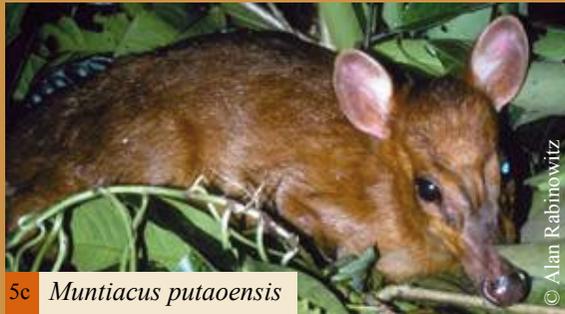
© Werner Klotz

4f *Macrobrachium agwi*



© Werner Klotz

4g *Macrobrachium agwi*



5c *Muntiacus putaoensis*

© Alan Rabinowitz



5a *Macaca munzala*

© Anindya Sinha



5b *Macaca munzala*

© M. D. Madhusudan

The remote Eastern Himalayan state of Arunachal Pradesh, with its rugged mountains and extensive forest cover, is one of India's last truly wild places, and the location of two highly significant and exciting large mammals finds.

Biological expeditions in this biodiversity hotspot resulted in the discovery of the Arunachal macaque *Macaca munzala* [5a, 5b], a primate new to science⁴⁶, in the high altitudes of western Arunachal Pradesh. Described as a new species in 2005, the relatively large brown primate with a short tail was a significant discovery as, at the time, it represented the first new monkey species identified anywhere in the world in over a century. The newly described macaque species is stocky in build and has a darker face than other closely related species. The new species is also one of the highest-dwelling primates in the world, and certainly of all macaques, occurring between 1,600m and 3,500m about sea level.

The status of the monkey is not yet fully known. Subsequent field studies to learn more about the species have revealed a total of 569 individuals in the Tawang and West Kameng districts of the state⁴⁷. Although new to science, locals have been familiar with the species for some time, which they blame for widespread crop damage⁴⁸. As a result, the species, known locally as mun zala or 'deep-forest monkey' by the Dirang Monpa people, is vulnerable to extensive hunting in the only two places it is known to occur⁴⁹.

The world's largest mountain range was the location for a surprisingly small species discovery in 1999. The world's smallest deer species, a miniature muntjac [5c], standing 60-80cm tall and weighing just about 11kg, was first seen by a team of scientists undertaking field surveys in the Himalayan region of northern Myanmar. Examining the small carcass of a deer initially believed to be the juvenile of another species, scientists were astounded to learn that the carcass was of an adult female of a mystery species⁵⁰. After obtaining specimens of the accidental discovery from local hunters, scientists conducted further DNA analysis in a New York laboratory, with the results of the genetic work confirming the so-called 'leaf deer' (*Muntiacus putaoensis*) as a unique species⁵¹.

The muntjac group, with its eleven known living species, is the oldest known deer group, first appearing in the fossil record 15-35 million years ago.

At the time of its official scientific recording, scientists believed *Muntiacus putaoensis* to be highly endemic to the region in Myanmar; the species was named after the town of Putao in Myanmar, a recognisable reference point in the region where it was first discovered. Then in 2003, a team of Indian scientists sprang a surprise, reporting conclusive evidence that the leaf deer also inhabits the lush rainforests close to Namdapha Tiger Reserve in Arunachal Pradesh⁵². Before examining skulls of *Muntiacus putaoensis*, displayed as trophies by hunters in local villages, it was not known that the species existed in India. The new find was particularly significant as it represented the only addition to the ungulate fauna of the Indian subcontinent in the last century. While the existence of the species had eluded scientists, local villagers were well aware of the leaf deer.

The species *Muntiacus putaoensis* remains elusive, with sightings of the animal so rare that scientists have not been able to assess its full distribution and status. Locating such a small deer in such a large landscape plays a large role in the ongoing difficulties of better understanding it⁵³.



© Keshow Chandra Pradhan and Dr. Michael Lorek

6e *Trachycarpus ukhrulensis*



© Elayne Takemoto

6b *Impatiens namchabarwensis*



© Elayne Takemoto

6a *Impatiens namchabarwensis*



© Margaret Thorne

6c *Meconopsis tibetica*



© Sudhizong Luksom

6d *Coelogyne pantlingii*

An astonishing 242 new plant species have been recorded in the Eastern Himalayas in the last 10 years.

A vast garden stretches across the Eastern Himalayas, a mysterious and alluring landscape that has yielded on average 24 new plant discoveries every year for the last 10 years. These remarkable floral finds, in a place still much to be explored, include *Impatiens namchabarwensis*, or the blue diamond impatiens described in 2005 from Medog, Tibet - an entirely road-less county, 930m above sea level⁵⁴. The highly endemic ultramarine-blue flower was discovered as a result of an intrepid expedition undertaken by a dedicated pair of Chinese botanists, Yuan Yong-Ming and Ge Xue-Jun. The duo ventured 100km from the nearest road, then descended into the remote reaches of the Namcha Barwa canyon, a gorge measuring almost 250km long and, in places, twice as deep as the Grand Canyon.

Named after the canyon in which it was found, an area of Tibet which really only started to be explored as recently as the mid-1990s, the rare plant can grow as tall as 60cm and flowers all year round. The many flowers are dramatic in both colour and form and, extraordinarily, the colour seems to change with temperature and exposure. They sometimes appear truly blue when in a cool climate [6a] and change to purple when temperatures rise [6b]; a characteristic unique for this species among impatiens. The shape of the flower is also far different from the traditional flat-disk shape of most impatiens, with some saying that when viewed from the side, the flowers resemble an elegant crane in flight.

Also from Tibet, *Meconopsis tibetica* (described in 2006⁵⁵) is one of 12 new poppy species discoveries joining the ranks of new flora in the region [6c]. The species has a yellow centre surrounded by petals of deep red colour.

The orchid stands supreme in the plant kingdom for its beauty. In the Eastern Himalayas 21 new orchid species have been identified between 1998 and 2008. Roughly one quarter, including the pure white *Coelogyne pantlingii*⁵⁶ [6d], were found in Sikkim, an ancient land also known as Indrakil - the garden of Indra, the king-god of heaven in Hindu religious texts.

Among the newly discovered species of plant are trees, including the palm tree *Trachycarpus ukhrulensis*, or Saramati palm [6e]. The species is the most recent addition to the Trachycarpus genus, and the most interesting yet according to some scientists. The palm was discovered in Assam, on the border with Myanmar. Growing to a height of 15m, the tree has a hairless trunk, 30cm in diameter. The species produces between 24 and 28 palmate leaves, each about a metre long. The underside of the leaves are a stunning powdery white, and the top sides are dark green⁵⁷.

Other new finds include 15 new bamboo species and 46 species of fern.

reptiles

7b *T. gumprechtii* (male)



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7a *T. gumprechtii* (female)



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7d *Typhlops meszoeyli*



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7c *Lycodon zawi*

The Eastern Himalayas have yielded 16 new reptile species over the past 10 years. These include 13 lizards and three snakes.

The most colourful snake discovery has been the emerald green pitviper, *Trimeresurus gumprechtii*. Officially discovered in 2002⁵⁸, Gumprecht's green pitviper is venomous and capable of growing to 130cm in length. Scientists predict that larger specimens exist. The species is known to occur around Putao, at altitudes above 400m in the far north of Myanmar⁵⁹. There are some striking differences between the males and females of this species; females reach a greater size, with a thin, white or whitish-blue streak on the head, and deep yellow eyes [7a]; males are shorter, have a red stripe on the head, and bright red or deep red eyes [7b].

This species is mainly found in rugged, forested areas, often in the vicinity of streams, as well as bamboo thickets. It also occurs near human settlements and along trails. Mostly nocturnal, this snake is definitely arboreal, but can also be found on the ground. The largest known specimens were collected while they were resting on branches near a stream, at about 1.5m above the ground. Rodents and skinks have been recorded as prey, but the species has also been observed killing and eating other pitvipers of a similar size.

Another nocturnal snake, Zaw's wolf snake (*Lycodon zawi*) [7c], was discovered dwelling in forests and near streams at elevations of less than 500m high in Assam, India, including in the Garbhange Reserve Forest and in northern Myanmar. The black snake, with white bands, can grow to half a metre in length, and feeds mainly on geckos⁶⁰. The find increases the diversity of the *Lycodon* genus to four in Myanmar and to five in north east India.

In 1999, a new species of blind snake was officially described from Darjeeling, Assam, near India's border with Nepal⁶¹. Also called the Darjeeling worm snake on account of its appearance, *Typhlops meszoeyli* [7d] was discovered in the forest-covered foothills of the Himalayas. As the name suggests, the snake's eyes are covered by scales, a sign of its adaptation to a subterranean life spent digging and moving underground. Its body is encased in very smooth, shiny scales, allowing it to move easily through earth. The snake feeds mainly on the eggs and larvae of termites and ants, and can occasionally be found high in trees, having reached these heights by using termite galleries. *Typhlops meszoeyli* belongs to super family Typhlopidae, which comprises more than 200 different blind snake species world-wide.

According to scientists, several new species of reptiles still await description⁶², including a new species of pitviper caught after a one-year hunt in the rainforests of north-east India. The new species can measure longer than two metres and is already the stuff of local legend. "Barta", as the snake is known by the local Nyishi tribesmen, is the most-feared creature among the tribes in Arunachal Pradesh. According to Nyishi folklore, sighting of a barta, meaning the deadliest of all snakes, is a very bad omen⁶³.

A 100 million-year-old gecko

Perhaps the most fascinating and globally significant new reptile species discovery over the past 10 years is one that is not 'new' in the classic sense. *Cretaceogecko burmae*, a 100 million-year-old gecko [7e], the oldest fossil gecko species known to science, was discovered in an amber mine excavated in the Hukawng Valley in the Himalayan region of far north Myanmar⁶⁴. Originally baffling scientists, who were unable to assign the gecko preserved in amber to any known taxon, they officially described the species and genus as entirely new in 2008.

The species discovery is significant, as it transformed the existing understanding about the origin of geckos. Because the species has the foot proportions and adhesive toe pads found in modern geckos, the discovery provided evidence that modern geckos had already evolved 100 million years ago. The specimen is tiny, even when compared with hatchlings of the smallest geckos living today. However, the high numbers of lamellae on its toe pads suggest it is from a species with a relatively large adult body size. The find even surprised the scientific community. Cretaceous amber from Myanmar includes a plethora of plant and invertebrate remains but vertebrate fossils are very rare⁶⁵. Further new amber discoveries include a termite that has intestinal protozoa [7f], showing the oldest example of mutualism; the oldest known mushroom [7g]; the oldest described tick; and the oldest fern in amber [7h].





Above: Anti-poaching staff display a leopard skin, a python skin, and a tiger skin at the Tikauli Museum, Terai Arc, Nepal. WWF funds education programmes at the museum that help educate visitors and local people about the effects of poaching on Nepal's wildlife.



Right: Forest destruction in Arunachal Pradesh.

Once remote, now in danger

The remarkable Eastern Himalayas is an extraordinary region of unique life and natural wonder, but one that is also gravely threatened. Despite protection efforts, in the last half-century the region has rapidly faced a disastrous combination of pressures as a result of population growth and the rapidly increasing demand for commodities by global and regional markets.

The host of threats include forest destruction as a result of unsustainable and illegal logging, leading to floods; shifting cultivation; unsustainable fuel wood collection; overgrazing by domestic livestock; illegal poaching and wildlife trade for pelts and traditional Asian medicine; mining; water diversion and pollution; tourism; and poorly-planned infrastructure, especially dam and road construction. The region is also among the most vulnerable to global climate change, which will amplify the impacts of these existing threats.

The result is severe habitat loss, degradation and fragmentation, eroding a fragile and vibrant landscape. Only 25% of the original habitats in the region remain intact⁶⁶.

The impact human activity has wrought on the unique diversity of the Eastern Himalayas is devastating. For the unique species of the Eastern Himalayas, this means that today 163 are considered globally threatened - comprising 45 mammals, 50 birds, 17 reptiles, 12 amphibians, 3 invertebrates, and 36 plant species⁶⁷ⁱⁱⁱ. Species endemic to the Eastern Himalayas, account for approximately half this number, therefore representing globally important populations⁶⁸. An alarming 14 species are considered Critically Endangered by IUCN, currently facing the abyss of extinction, with a further 46 considered Endangered⁶⁹.

Among the important globally-threatened mammals are Asia's three largest herbivores - the Asian elephant, the greater one-horned rhinoceros and the wild water buffalo - and its largest carnivore, the tiger, as well as snow leopard, Ganges river dolphin and several large birds such as vultures, adjutant storks and hornbills.

The human cost is also severe. The environment is the base for all human development, so while the impact on wildlife is taking its toll, the once plentiful resources and cultural treasures available to people have continued to decline. In the long term, this will transform livelihoods, the availability of essential food and freshwater, and ultimately exacerbate poverty in the region. Little will change unless environmental protection and development are mutually supportive.

The governments of the region have recognized the importance of the Himalayas for biodiversity, livelihoods and fresh water, and are actively engaged with the work of conserving ecosystems.

ⁱⁱⁱ Of the 163 species 146 (90%) occur in north-eastern India, including 70 species that are endemic to the Eastern Himalayas region; 75 (46%) occur in Nepal; and 49 (30%) occur in Bhutan. As the figures suggest, many of these species occur in more than one country.

The Eastern Himalayas are a truly magnificent part of the world. The enormous cultural and biological diversity belies the fragile nature of the environment on which all depend and which risks being lost forever unless we take concerted action now.

As human populations grow and development activities unfold we must ensure that these take place in a way that is sustainable, not just for our own generation but for the sake of those to come as well. This will be our legacy to our children and grandchildren and one we hope they will thank us for.

WWF believes that real progress can be made in tackling the pressing issues in the Eastern Himalayas, like global warming, deforestation, the illegal wildlife and timber trade and the need for sensitive infrastructure development. At the same time, good environmental management will help increase livelihood options and help secure food and freshwater availability for millions of people throughout the region. This in turn, will address the poverty that underpins so many of the current, unsustainable, demands on the landscape.

In order to maintain a Living Himalayas, WWF believes several key undertakings have to be realized:

- * That the governments of Bhutan, India and Nepal, who already recognize the importance of the Himalayas at a national level, develop a shared three-country vision for the region as a whole. This will result in a unified conservation and sustainable development plan that ensures the connectivity of landscapes within the Eastern Himalayas, allowing for the free movement of wildlife across political borders and combating illegal trade at a regional level.
- * Broadening the scope and scaling up the local stewardship of forests, grasslands, and wetlands. Local communities already have many rights to manage the natural resources within the environment where they live, as these increase there will be mutual benefits for both biodiversity conservation and sustainable livelihoods. With increased rights come increased responsibilities but the future of the wildlife that live there is best assured by giving the people, who share these landscapes, a vested interest in their survival.
- * Ensure that regional mechanisms are in place to respond to climate change and the inevitable changes that it will bring. Communities will need to be supported to cope with the rising threat of floods from glacial lake collapse and to respond to changing weather patterns. Water availability will be a key concern and, since major rivers rising in the Eastern Himalayas support millions of people downstream as well as the rich biodiversity, so river management will need to take place at a regional, river-basin scale, if it is to meet the needs of all.
- * Development initiatives must take into account the environment if we are not to damage, irretrievably, the very resources on which economic development depends. This applies to all industries but is of particular relevance to growth in the energy and tourism sectors. Landscape level planning and the development of 'best practice' guidelines will help ensure that the richness of the Eastern Himalayas is maintained and that the economic growth requirements of the region are met.



Above: The environment is the base for all human development. Good environmental management can help increase livelihood options and help secure food and freshwater availability for millions of people.

Appendix: New species in the Eastern Himalayas, 1998-2008

Species	Scientist(s)	Date of discovery	Distribution within Eastern Himalayas
AMPHIBIANS			
<i>Amolops aniqiaoensis</i>	Dong et al	2005	Tibet
<i>Amolops assamensis</i>	Sengupta et al	2008	Assam
<i>Amolops bellulus</i>	Liu et al	2000	Myanmar
<i>Amolops medogensis</i>	Li & Rao	2005	Tibet
<i>Hylarana chitwanensis</i>	Das	1998	Nepal
<i>Ichthyophis garoensis</i>	Pillai & Ravichandran	1999	Assam
<i>Kaloula assamensis</i>	Das et al	2005	Arunachal Pradesh / Assam
<i>Leptobranchium smithi</i>	Matsui et al	1999	Assam
<i>Nanorana medogensis</i>	Fei & Ye	1999	Tibet
<i>Odorrana zhaoi</i>	Li, Lu, & Rao	2008	Tibet
<i>Philautus sahai</i>	Sarkar & Ray	2006	Arunachal Pradesh
<i>Philautus terebrans</i>	Das & Chanda	1998	Arunachal Pradesh
<i>Pseudepidalea zambaensis</i>	Fei et al	1999	Tibet
<i>Rhacophorus suffry</i>	Bordoloi et al	2007	Arunachal Pradesh / Assam
<i>Scutigera bhutanensis</i>	Delorme & Dubois	2001	Bhutan
<i>Tomopterna maskeyi</i>	Schleich & Anders	1998	Nepal
		Sub-total	16
BIRDS			
<i>Jabouilleia naungmungensis</i>	Rappole et al	2005	Myanmar
<i>Liocichla bugunorum</i>	Athreya	2006	Arunachal Pradesh
		Sub-total	2
FISH			
<i>Badis pyema</i>	Kullander & Britz	2002	Myanmar
<i>Batasio macronotus</i>	Ng & Edd	2004	Nepal
<i>Channa aurantimaculata</i>	Musikasinthorn	2000	Assam
<i>Conta pectinata</i>	Ng	2005	Bengal
<i>Erethistoides ascita</i>	Ng & Edds	2005	Nepal
<i>Erethistoides cavatura</i>	Ng & Edds	2005	Nepal
<i>Pseudecheneis eddsi</i>	Ng	2006	Nepal

Species	Scientist(s)	Date of discovery	Distribution within Eastern Himalayas
<i>Pseudolaguvia foveolata</i>	Ng	2005	Assam
<i>Pseudecheneis crassicauda</i>	Ng & Edds	2005	Nepal
<i>Pseudecheneis serracula</i>	Ng & Edds	2005	Nepal
<i>Psilorhynchus amplexcephalus</i>	Arunachalam et al	2007	Assam
<i>Psilorhynchus nepalensis</i>	Conway & Mayden	2008	Nepal
<i>Puntius tiantian</i>	Kullander & Fang	2005	Myanmar
<i>Psilorhynchoides arunachalensis</i>	Nebeshwar et al	2007	Arunachal Pradesh
		Sub-total	14
INVERTEBRATES			
<i>Aegialia (Silluvia) gansuensis</i>	Frolov	2008	Tibet
<i>Aegialia (Silluvia) igori</i>	Frolov	2008	Tibet
<i>Aegialia (Silluvia) yunnanica</i>	Frolov	2008	Tibet
<i>Agabus joachimschmidti</i>	Brancucci & Hendrich	2008	Bhutan / Tibet
<i>Bhutaniella dunlopi</i>	Jäger	2001	Bhutan
<i>Bhutaniella gruberi</i>	Jäger	2001	Bhutan
<i>Bhutaniella haenggii</i>	Jäger	2001	Bhutan
<i>Bhutaniella hillyardi</i>	Jäger	2000	Nepal
<i>Bhutaniella rollardae</i>	Jäger	2001	Nepal
<i>Chinattus chichila</i>	Logunov	2003	Nepal
<i>Heterometrus nepalensis</i>	František Kovarik	2004	Nepal
<i>Heterometrus tibetanus</i>	Lourenco et al	2005	Tibet
<i>Itagonia cordiformis</i>	Ai-Min Shi & Guo-Dong Ren	2007	Tibet
<i>Itagonia zayica</i>	Ai-Min Shi & Guo-Dong Ren	2007	Tibet
<i>Lucanus pani</i>	Huang	2006	Tibet
<i>Macrobrachium agwi</i>	Klotz	2008	Bengal
<i>Mesobuthus songi</i>	Lourenco et al	2005	Tibet
<i>Noseolucanus zhengi</i>	Huang	2006	Tibet

Species	Scientist(s)	Date of discovery	Distribution within Eastern Himalayas
<i>Prismognathus prossi</i>	Bartolozzi & Xia Wan	2006	Tibet
<i>Pseudopoda abnormis</i>	Jäger	2001	Bengal / Sikkim
<i>Pseudopoda albolineata</i>	Jäger	2001	Nepal
<i>Pseudopoda albonotata</i>	Jäger	2001	Bhutan
<i>Pseudopoda alta</i>	Jäger	2001	Nepal
<i>Pseudopoda ausobskyi</i>	Jäger	2001	Nepal
<i>Pseudopoda biapicata</i>	Jäger	2001	Myanmar
<i>Pseudopoda brauni</i>	Jäger	2001	Nepal
<i>Pseudopoda chauki</i>	Jäger	2001	Nepal
<i>Pseudopoda chulingensis</i>	Jäger	2001	Nepal
<i>Pseudopoda cuneata</i>	Jäger	2001	Nepal
<i>Pseudopoda dama</i>	Jäger	2001	Nepal
<i>Pseudopoda damana</i>	Jäger	2001	Nepal
<i>Pseudopoda dhulensis</i>	Jäger	2001	Nepal
<i>Pseudopoda diversipunctata</i>	Jäger	2001	Nepal
<i>Pseudopoda everesta</i>	Jäger	2001	Nepal
<i>Pseudopoda gogona</i>	Jäger	2001	Bhutan
<i>Pseudopoda grasshoffi</i>	Jäger	2001	Nepal
<i>Pseudopoda heteropodoides</i>	Jäger	2001	Nepal
<i>Pseudopoda hingstoni</i>	Jäger	2001	Bengal / Sikkim
<i>Pseudopoda huberti</i>	Jäger	2001	Nepal
<i>Pseudopoda hyatti</i>	Jäger	2001	Nepal
<i>Pseudopoda jirensis</i>	Jäger	2001	Nepal
<i>Pseudopoda kalinchoka</i>	Jäger	2001	Nepal
<i>Pseudopoda khimtensis</i>	Jäger	2001	Nepal
<i>Pseudopoda latembola</i>	Jäger	2001	Nepal
<i>Pseudopoda marmorea</i>	Jäger	2001	Nepal
<i>Pseudopoda martensi</i>	Jäger	2001	Nepal
<i>Pseudopoda martiniae</i>	Jäger	2001	Nepal
<i>Pseudopoda megalopora</i>	Jäger	2001	Myanmar
<i>Pseudopoda minor</i>	Jäger	2001	Bengal / Sikkim
<i>Pseudopoda monticola</i>	Jäger	2001	Nepal
<i>Pseudopoda platembola</i>	Jäger	2001	Myanmar
<i>Pseudopoda schawalleri</i>	Jäger	2001	Nepal

Species	Scientist(s)	Date of discovery	Distribution within Eastern Himalayas
<i>Pseudopoda sicca</i>	Jäger	2008	Bengal
<i>Pseudopoda sinopodoides</i>	Jäger	2001	Nepal
<i>Pseudopoda tinjura</i>	Jäger	2001	Nepal
<i>Pseudopoda triapicata</i>	Jäger	2001	Nepal
<i>Pseudopoda trisuliensis</i>	Jäger	2001	Nepal
<i>Pseudopoda varia</i>	Jäger	2001	Nepal
<i>Suffasia kanchenjunga</i>	Ono	2006	Nepal
<i>Suffasia martensi</i>	Ono	2006	Nepal
<i>Umbopilio martensi</i>	Klimes	2006	Assam
		Sub-total	61
<i>Macaca munzala</i>	Sinha et al	2005	Arunachal Pradesh
<i>Muntiacus putaoensis</i>	Rabinowitz et al	1999	Arunachal Pradesh / Myanmar
		Sub-total	2
PLANTS			
<i>Askellia ladyginii</i>	Tzvelev	2007	Tibet
<i>Acronema ioniostyles</i>	Farille & Lachard	2002	Nepal
<i>Agapetes arunachalensis</i>	D.Banik & Sanjappa	2007	Arunachal Pradesh
<i>Agapetes dalaiensis</i>	D.Banik & Sanjappa	2007	Arunachal Pradesh
<i>Agapetes siangensis</i>	D.Banik & Sanjappa	2007	Arunachal Pradesh
<i>Aleuritopteris flavopygmaea</i>	S.R.Ghosh	2004	Sikkim
<i>Aleuritopteris sikkimensis</i>	S.R.Ghosh	2004	Sikkim
<i>Amblyanthus obovatus</i>	G.S.Giri	2002	Arunachal Pradesh
<i>Anaphalis yangii</i>	Y.L.Chen & Y.L.Lin	2003	Tibet
<i>Aphragmus bouffordii</i>	Al-Shehbaz	2003	Tibet
<i>Arisaema siangense</i>	Gusman	2006	Arunachal Pradesh
<i>Arisaema tsangpoense</i>	J.T.Yin & Gusman	2006	Tibet
<i>Artemisia mustangensis</i>	Yonek.	2008	Nepal
<i>Artemisia nepalica</i>	Yonek.	2008	Nepal
<i>Arthromeris indica</i>	S.R.Ghosh	2004	Sikkim
<i>Asplenium kukkonenii</i>	Viane & Reichst.	2003	Bhutan / Nepal
<i>Asplenium semivarians</i>	Viane & Reichst.	2003	Assam
<i>Astragalus barclayanus</i>	Podlech	2004	Nepal
<i>Astragalus baxoiensis</i>	Podlech & L.R.Xu	2007	Tibet
<i>Astragalus blandulus</i>	Podlech & L.R.Xu	2006	Tibet

Species	Scientist(s)	Date of discovery	Distribution within Eastern Himalayas
<i>Astragalus brachytrichus</i>	Podlech & L.R.Xu	2007	Tibet
<i>Astragalus despectus</i>	Podlech & L.R.Xu	2007	Tibet
<i>Astragalus golubojensis</i>	Podlech & L.R.Xu	2007	Tibet
<i>Astragalus griersonii</i>	Podlech	2004	Bhutan
<i>Astragalus hysophilus</i>	Podlech & L.R.Xu	2006	Tibet
<i>Astragalus jiazaensis</i>	Podlech & L.R.Xu	2007	Tibet
<i>Astragalus jumlaensis</i>	Podlech	2006	Nepal
<i>Astragalus lachungensis</i>	L.B.Chaudhary	2006	Sikkim
<i>Astragalus laetabilis</i>	Podlech & L.R.Xu	2007	Tibet
<i>Astragalus montivagus</i>	Podlech & L.R.Xu	2006	Tibet
<i>Astragalus notabilis</i>	Podlech	2006	Nepal
<i>Astragalus oreocharis</i>	Podlech & L.R.Xu	2006	Tibet
<i>Astragalus praeteritus</i>	Podlech & L.R.Xu	2006	Tibet
<i>Astragalus sanjappae</i>	L.B.Chaudhary & Z.H.Khan	2005	Nepal / Sikkim
<i>Astragalus tibeticola</i>	Podlech & L.R.Xu	2004	Tibet
<i>Astragalus zadaensis</i>	Podlech & L.R.Xu	2007	Tibet
<i>Asystasia indica</i>	H.J.Chowdhery & Av.Bhattacharjee	2006	Bengal
<i>Bambusa alemtemshii</i>	H.B.Naithani	2007	Assam
<i>Bambusa assamica</i>	Barooah & Borthakur	2002	Assam
<i>Bambusa barpatharica</i>	Borthakur & Barooah	2002	Assam
<i>Bambusa garuchokua</i>	Barooah & Borthakur	2002	Assam
<i>Bambusa nagalandiana</i>	H.B.Naithani	2007	Assam
<i>Bambusa rangaensis</i>	Borthakur & Barooah	2002	Assam
<i>Beilschmiedia bhutanica</i>	M.Gangop.	2006	Bhutan
<i>Biermannia arunachalensis</i>	A.N.Rao	2006	Arunachal Pradesh
<i>Bistorta albiflora</i>	Miyam. & H.Ohba	2002	Tibet
<i>Bistorta attenuatifolia</i>	Miyam. & H.Ohba	2004	Tibet
<i>Bistorta tubistipulis</i>	Miyam. & H.Ohba	2002	Tibet
<i>Bulbophyllum manipurensense</i>	C.S.Kumar & P.C.S.Kumar	2005	Assam
<i>Butea tibetensis</i>	X.Y.Zhu & Y.F.Du	2007	Tibet
<i>Calanthe yuksommensis</i>	Lucksom	1998	Sikkim
<i>Callitriche fuscicarpa</i>	Lansdown	2006	Nepal
<i>Callitriche glareosa</i>	Lansdown	2006	Bhutan

Species	Scientist(s)	Date of discovery	Distribution within Eastern Himalayas
<i>Caragana aliensis</i>	Y.Z.Zhao	2008	Tibet
<i>Carex gandakiensis</i>	Katsuy.	2008	Nepal
<i>Chaetosaris albiflora</i>	Tzvelev	2007	Tibet
<i>Chaetosaris ladyginii</i>	Tzvelev	2007	Tibet
<i>Chaetosaris neglecta</i>	Tzvelev	2007	Tibet
<i>Chaetosaris potaninii</i>	Tzvelev	2007	Tibet
<i>Cinnamomum bhaskarii</i>	M.Gangop.	2006	Arunachal Pradesh
<i>Cinnamomum bishnupadae</i>	M.Gangop.	2006	Assam
<i>Cinnamomum blandfordii</i>	M.Gangop.	2006	Arunachal Pradesh / Myanmar
<i>Cinnamomum champokianum</i>	Baruah & S.C.Nath	2008	Assam
<i>Cinnamomum lohitensis</i>	M.Gangop.	2006	Arunachal Pradesh
<i>Cinnamomum sanjappae</i>	M.Gangop.	2006	Arunachal Pradesh
<i>Cinnamomum suvrae</i>	M.Gangop.	2006	Assam
<i>Clematis erectisepala</i>	L.Xie, J.H.Shi & L.Q.Li	2005	Tibet
<i>Coelogyne pantlingii</i>	Lucksom	2005	Sikkim
<i>Colocasia tibetensis</i>	J.T.Yin	2006	Tibet
<i>Conioselinum nepalense</i>	Pimenov & Kljuykov	2003	Nepal
<i>Corydalis brachyceras</i>	Lidén & Van De Veire	2008	Tibet
<i>Corydalis kuruchuensis</i>	Lidén	2008	Tibet
<i>Corydalis milarepa</i>	Lidén & Z.Y.Su	2007	Tibet
<i>Corydalis nubicola</i>	Z.Y.Su & Lidén	2007	Tibet
<i>Corydalis regia</i>	Z.Y.Su & Lidén	2008	Tibet
<i>Corydalis tenuipes</i>	Lidén & Z.Y.Su	2007	Tibet
<i>Croton nepalensis</i>	T.Kuros.	2005	Nepal
<i>Cryptocarya burkillii</i>	M.Gangop.	2006	Arunachal Pradesh
<i>Cryptocarya dekae</i>	M.Gangop.	2006	Assam / Sikkim
<i>Ctenitis holtumii</i>	Sarn.Singh & Panigrahi	2005	Arunachal Pradesh
<i>Curcuma rubrobracteata</i>	Škorničk., M.Sabu & Prasanthk.	2003	Assam
<i>Cyathea nayarii</i>	T.Bandyop., T.Sen & U.Sen	2003	Arunachal Pradesh
<i>Cyathea sharmae</i>	T.Bandyop., T.Sen & U.Sen	2003	Arunachal Pradesh
<i>Cyclosorus holtumii</i>	Sarn.Singh & Panigrahi	2005	Arunachal Pradesh
<i>Cyclosorus krameri</i>	Sarn.Singh & Panigrahi	2005	Arunachal Pradesh

Species	Scientist(s)	Date of discovery	Distribution within Eastern Himalayas
<i>Cyclosorus mantoniae</i>	Sarn.Singh & Panigrahi	2005	Arunachal Pradesh
<i>Cyclosorus pseudoacuminatus</i>	Panigrahi & Sarn.Singh	2005	Arunachal Pradesh
<i>Cyclosorus pseudobalansae</i>	Panigrahi & Sarn.Singh	2005	Arunachal Pradesh
<i>Cyclosorus sledgei</i>	Panigrahi & Sarn.Singh	2005	Arunachal Pradesh
<i>Cymbidium chawalongense</i>	C.L.Long, H.Li & Z.L.Dao	2003	Tibet
<i>Dasymaschalon tibetense</i>	X.L.Hou	2005	Tibet
<i>Dehaasia arunachalensis</i>	M.Gangop.	2006	Arunachal Pradesh
<i>Delphinium lihengianum</i>	Q.E.Yang & Y.Luo	2003	Tibet
<i>Dendrobium arunachalense</i>	C.Deori, S.K.Sarma, Phukan & A.A.Mao	2006	Arunachal Pradesh
<i>Dendrobium meghalayense</i>	Y.Kumar & S.Chowdhury	2003	Assam
<i>Dendrobium numaldeorii</i>	C.Deori, Hynn. & Phukan	2004	Arunachal Pradesh
<i>Desideria mieheorum</i>	Al-Shehbaz	2005	Tibet
<i>Dinetus rhombicarpus</i>	Staples	2006	Assam
<i>Diplazium apicisorum</i>	Panigrahi & Sarn.Singh	2005	Arunachal Pradesh
<i>Diplazium chittagongense</i>	Sarn.Singh & Panigrahi	2005	Arunachal Pradesh
<i>Diplazium cuneipinnulum</i>	Panigrahi & Sarn.Singh	2005	Arunachal Pradesh
<i>Diplazium josephii</i>	Sarn.Singh	2005	Arunachal Pradesh
<i>Diplazium miaoense</i>	Sarn.Singh & Panigrahi	2005	Arunachal Pradesh
<i>Diplazium namdaphaense</i>	Sarn.Singh & Panigrahi	2005	Arunachal Pradesh
<i>Diplazium nanolobum</i>	Sarn.Singh & Panigrahi	2005	Arunachal Pradesh
<i>Diplazium paleaceum</i>	Sarn.Singh & Panigrahi	2005	Arunachal Pradesh
<i>Diplazium panigrahanum</i>	Sarn.Singh	2005	Arunachal Pradesh
<i>Diplazium pseudocrinipes</i>	Sarn.Singh & Panigrahi	2005	Arunachal Pradesh
<i>Diplazium sarojiniae</i>	Sarn.Singh	2005	Arunachal Pradesh
<i>Diplazium singhii</i>	Panigrahi	2005	Arunachal Pradesh
<i>Diplazium subdoederleinii</i>	Sarn.Singh & Panigrahi	2005	Arunachal Pradesh
<i>Diplazium tirapense</i>	Panigrahi & Sarn.Singh	2005	Arunachal Pradesh
<i>Draba micheorum</i>	Al-Shehbaz	2004	Tibet
<i>Draba poluniniana</i>	Al-Shehbaz	2004	Nepal
<i>Drepanostachyum merretii</i>	Demoly	2006	Nepal
<i>Dryoathyrium chingii</i>	Sarn.Singh & Panigrahi	2005	Arunachal Pradesh
<i>Eclipta angustata</i>	Umemoto & H.Koyama	2007	Bengal /Nepal

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<i>Eria annapurnensis</i>	L.R.Shakya & M.R.Shrestha	2007	Nepal
<i>Eria baniaae</i>	Bajrach., L.R.Shakya & Chettri	2002	Nepal
<i>Eria kamlangensis</i>	A.N.Rao	2002	Arunachal Pradesh
<i>Eria nepalensis</i>	Bajrach. & K.K.Shrestha	2003	Nepal
<i>Eria pokharensis</i>	Bajrach., Subedi & K.K.Shrestha	2003	Nepal
<i>Fargesia daminiu</i>	T.P.Yi & J.Y.Shi	2007	Tibet
<i>Festuca chayuensis</i>	L.Liu	2002	Tibet
<i>Flickingeria abhaycharanii</i>	Phukan & A.A.Mao	2005	Assam
<i>Gastrochilus sonamii</i>	Lucksom	2003	Sikkim
<i>Gaultheria akaensis</i>	S.Panda & Sanjappa	2006	Arunachal Pradesh
<i>Gaultheria bryoides</i>	P.W.Fritsch & L.H.Zhou	2008	Myanmar
<i>Gaultheria lohitiensis</i>	S.Panda & Sanjappa	2006	Arunachal Pradesh
<i>Gentiana tetramera</i>	Miyam.	2008	Nepal
<i>Glochidion mandakamdevi</i>	Borthakur & Kalita	2006	Assam
<i>Glochidion mandakatense</i>	Kalita & Borthakur	2006	Assam
<i>Gomphogyne nepalensis</i>	W.J.de Wilde & Duyfjes	2007	Nepal
<i>Goniophlebium krameri</i>	Panigrahi & Sarn.Singh	2005	Arunachal Pradesh
<i>Himalayacalamus planatus</i>	Stapleton	2007	Nepal
<i>Hymenidium lhasanum</i>	Pimenov & Kljuykov	2004	Tibet
<i>Hymenidium mieheanum</i>	Pimenov & Kljuykov	2004	Tibet
<i>Hypecoum zhukanum</i>	Lidén	2008	Tibet
<i>Impatiens namcharbarwensis</i>	R.J.Morgan, Y.M.Yuan & X.J.Ge	2005	Tibet
<i>Jasminum cardiomorphum</i>	P.S.Green	2003	Assam
<i>Juncus mustangensis</i>	Miyam. & H.Ohba	2003	Nepal
<i>Lepidogrammitis sikkimensis</i>	S.R.Ghosh	2004	Sikkim
<i>Leymus mundus</i>	L.B.Cai & X.Su	2007	Tibet
<i>Liparis chungthangensis</i>	Lucksom	2004	Sikkim
<i>Liparis dongchenii</i>	Lucksom	2000	Sikkim
<i>Mallotus bicarpellatus</i>	T.Kuros.	2005	Nepal
<i>Meconopsis chankheliensis</i>	Grey-Wilson	2006	Nepal

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<i>Meconopsis ganeshensis</i>	Grey-Wilson	2006	Nepal
<i>Meconopsis simikotensis</i>	Grey-Wilson	2006	Nepal
<i>Meconopsis staintonii</i>	Grey-Wilson	2006	Nepal
<i>Meconopsis tibetica</i>	Grey-Wilson	2006	Tibet
<i>Metathelypteris krameri</i>	Sarn.Singh & Panigrahi	2005	Arunachal Pradesh
<i>Microlepia macrorhomboides</i>	Sarn.Singh & Panigrahi	2005	Arunachal Pradesh
<i>Microlepia singhii</i>	Panigrahi	2005	Arunachal Pradesh
<i>Microula mustangensis</i>	Yonek.	2008	Nepal
<i>Mulgedium roborovskii</i>	Tzvelev	2007	Tibet
<i>Myrmechis bakhimensis</i>	D.Maity, N.Pradhan & Maiti	2007	Sikkim
<i>Oberonia hymniewtaii</i>	Lucksom	2007	Sikkim
<i>Oxytropis iridum</i>	Dickoré & Kriechb.	2006	Tibet
<i>Oxytropis lhasaensis</i>	X.Y.Zhu	2004	Tibet
<i>Pedicularis bhutanomuscoides</i>	T.Yamaz.	2003	Bhutan
<i>Pedicularis cacuminidentata</i>	T.Yamaz.	2003	Bhutan
<i>Pedicularis elephantiflora</i>	T.Yamaz.	2003	Bhutan
<i>Pedicularis flexosoides</i>	T.Yamaz.	2003	Bhutan
<i>Pedicularis griniformis</i>	T.Yamaz.	2003	Bhutan
<i>Pedicularis inflexirostris</i>	F.S.Yang, D.Y.Hong & Xiao Q.Wang	2003	Tibet
<i>Pedicularis limithangensis</i>	T.Yamaz.	2003	Bhutan
<i>Pedicularis pseudohookeriana</i>	T.Yamaz.	2003	Bhutan
<i>Pedicularis rigidescens</i>	T.Yamaz.	2003	Tibet
<i>Pedicularis roseialba</i>	T.Yamaz.	2003	Bhutan
<i>Pedicularis sunkosiana</i>	T.Yamaz.	2003	Tibet
<i>Penkimia nagalandensis</i>	Phukan & Odyuo	2006	Assam
<i>Persea arunachalensis</i>	M.Gangop.	2006	Arunachal Pradesh
<i>Persea haridasanii</i>	M.Gangop.	2006	Arunachal Pradesh
<i>Persea himalayaensis</i>	M.Gangop.	2006	Nepal
<i>Persea lohitisensis</i>	M.Gangop.	2006	Arunachal Pradesh
<i>Persea sharmae</i>	M.Gangop.	2006	Assam
<i>Persea sikkimensis</i>	M.Gangop.	2006	Sikkim
<i>Phoebe baishyae</i>	M.Gangop.	2006	Arunachal Pradesh

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<i>Phyllanthus pseudoparvifolius</i>	R.L.Mitra & Sanjappa	2003	Assam / Bhutan / Sikkim / Myanmar / Nepal
<i>Piper arunachalense</i>	Gajurel, Rethy & Y.Kumar	2001	Arunachal Pradesh
<i>Piper nirjulianum</i>	Gajurel, Rethy & Y.Kumar	2007	Arunachal Pradesh
<i>Polygala bomiensis</i>	S.K.Chen & J.Parn.	2008	Tibet
<i>Polystichum panigrahiianum</i>	Sarn.Singh	2005	Arunachal Pradesh
<i>Polystichum sublentum</i>	Sarn.Singh & Panigrahi	2005	Arunachal Pradesh
<i>Porpax seidenfadenii</i>	A.N.Rao	2004	Arunachal Pradesh
<i>Potentilla spectabilis</i>	Businský & Soják	2003	Tibet
<i>Potentilla squalida</i>	Soják	2006	Tibet
<i>Potentilla stipitata</i>	Soják	2006	Tibet
<i>Primula rebecca</i>	A.J.Richards	2004	Bhutan
<i>Pronephrium clarkei</i>	Sarn.Singh & Panigrahi	2005	Arunachal Pradesh
<i>Pseudocyclosorus subornatipes</i>	Sarn.Singh & Panigrahi	2005	Arunachal Pradesh
<i>Pteris beddomei</i>	Sarn.Singh & Panigrahi	2005	Arunachal Pradesh
<i>Pteris himalayensis</i>	S.R.Ghosh	2004	Assam / Sikkim
<i>Pteris panigrahiiana</i>	Sarn.Singh	2005	Arunachal Pradesh
<i>Pteris pseudoconfusa</i>	Sarn.Singh & Panigrahi	2005	Arunachal Pradesh
<i>Pteris pseudoesquirollii</i>	S.R.Ghosh	2004	Assam
<i>Pteris subhirtula</i>	Sarn.Singh & Panigrahi	2005	Arunachal Pradesh
<i>Pteris submiaensis</i>	Sarn.Singh & Panigrahi	2005	Arunachal Pradesh
<i>Pteris tirapensis</i>	Panigrahi & Sarn.Singh	2005	Arunachal Pradesh
<i>Pteris vijaynagarensis</i>	Sarn.Singh & Panigrahi	2005	Arunachal Pradesh
<i>Ptilagrostis macrospicula</i>	L.B.Cai	2003	Tibet
<i>Puccinellia strictura</i>	L.Liu	2002	Tibet
<i>Pyrrosia arunachalensis</i>	Sarn.Singh & Panigrahi	2005	Arunachal Pradesh
<i>Rhynchosyilis albiflora</i>	I.Barua & Bora	2002	Assam
<i>Rivina bengalensis</i>	S.C.Srivast. & T.K.Paul	2003	Bengal
<i>Roscoea ngainoi</i>	A.A.Mao & Bhaumik	2008	Assam
<i>Salix nepalensis</i>	Yonek.	2008	Nepal
<i>Salvia transhimalaica</i>	Yonek.	2008	Nepal
<i>Saussurea erecta</i>	S.W.Liu, J.T.Pan & J.Quan Liu	2005	Tibet
<i>Saussurea rolwalingensis</i>	Fujikawa & H.Ohba	2007	Nepal
<i>Saxifraga dingqingensis</i>	J.T.Pan	2006	Tibet

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<i>Schefflera zhuana</i>	Lowry & C.B.Shang	2006	Tibet
<i>Selaginella namdaphaensis</i>	Sarn.Singh & Panigrahi	2005	Arunachal Pradesh
<i>Silene akiyamae</i>	Rajbh. & Mits.Suzuki	2007	Tibet
<i>Silene davidlongii</i>	Rajbh. & Mits.Suzuki	2007	Nepal
<i>Silene greywilsonii</i>	Rajbh. & Mits.Suzuki	2007	Nepal
<i>Silene hideakiohbae</i>	Rajbh. & Mits.Suzuki	2007	Nepal
<i>Sinocarum latifoliolatum</i>	Pimenov & Kljuykov	2006	Nepal
<i>Sinocarum meeboldioides</i>	Pimenov & Kljuykov	2006	Nepal
<i>Solms-laubachia calcicola</i>	J.P.Yue, Al-Shehbaz & H.Sun	2008	Tibet
<i>Sorbus khumbuensis</i>	McAll.	2005	Nepal
<i>Sorbus kongboensis</i>	McAll.	2005	Tibet
<i>Sorbus parvifructa</i>	McAll.	2005	Tibet
<i>Sorbus rushforthii</i>	McAll.	2005	Tibet
<i>Sorbus sujoyi</i>	Ghora	2007	Assam
<i>Strobilanthes abbreviata</i>	Y.F.Deng & J.R.I.Wood	2006	Assam / Myanmar
<i>Strobilanthes paniculiformis</i>	J.R.I.Wood	2006	Assam
<i>Taraxacum candidatum</i>	Kirschner, Štěpánek & Klimeš	2006	Tibet
<i>Tectaria khonsaensis</i>	Sarn.Singh & Panigrahi	2005	Arunachal Pradesh
<i>Tectaria mehrae</i>	Panigrahi & Sarn.Singh	2005	Arunachal Pradesh
<i>Thamnocalamus unispiculatus</i>	T.P.Yi & J.Y.Shi	2007	Tibet
<i>Tibetoseris angustifolia</i>	Tzvelev	2007	Tibet
<i>Tibetoseris ladyginii</i>	Tzvelev	2007	Tibet
<i>Trachycarpus ukhrulensis</i>	M.Lorek & K.C.Pradhan	2006	Assam
<i>Trapa assamica</i>	Wójcicki	2003	Assam / Bengal
<i>Trichomanes indicum</i>	S.R.Ghosh	2004	Arunachal Pradesh
<i>Trigonospora loyalii</i>	Panigrahi & Sarn.Singh	2005	Arunachal Pradesh
<i>Trigonospora subcaudipinna</i>	Sarn.Singh & Panigrahi	2005	Arunachal Pradesh
<i>Vaccinium myodianum</i>	S.Panda & Sanjappa	2008	Arunachal Pradesh
<i>Vulpia alpina</i>	L.Liu	2002	Tibet
<i>Zeuxine pantlingii</i>	Av.Bhattacharjee & H.J.Chowdhery	2006	Bengal
		Sub-total	242

Species	Scientist(s)	Date of discovery	Distribution within Eastern Himalayas
REPTILES			
<i>Asymblepharus mahabharatus</i>	Eremchenko et al	1998	Nepal
<i>Asymblepharus nepalensis</i>	Eremchenko et al	1998	Nepal
<i>Cnemaspis assamensis</i>	Das & Sengupta	2000	Assam
<i>Cretaceogekko burmae</i>	Arnold & Poinar	2008	Myanmar
<i>Gonydactylus markuscombati</i>	Darevsky et al	1998	Nepal
<i>Gonydactylus martinstolli</i>	Darevsky et al	1998	Nepal
<i>Gonydactylus nepalensis</i>	Schleich & Kästle	1998	Nepal
<i>Japalura dasi</i>	Shah & Kästle	2002	Nepal
<i>Laudakia papenfussi</i>	Zhao	1998	Tibet
<i>Laudakia wui</i>	Zhao	1998	Tibet
<i>Lycodon zawi</i>	Slowinski et al	2001	Assam / Myanmar
<i>Sitana fusca</i>	Schleich & Kästle	1998	Nepal
<i>Sitana schleichi</i>	Anders & Kästle	2002	Nepal
<i>Sitana sivalensis</i>	Schleich et al	1998	Nepal
<i>Trimeresurus gumprechtii</i>	David et al	2002	Myanmar
<i>Typhlops meszoelyi</i>	Wallach	1999	Assam
		Sub-total	16
		GRAND TOTAL	353

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