



# Mountain Biodiversity of the Hindu Kush-Himalayas

International Year of Biodiversity 2010



# Foreword

**T**his pictorial booklet was produced as a contribution to the International Year of Biological Diversity, and showcases selected images of mountain biodiversity and related issues from the 2010 ICIMOD Photo Contest on Mountain Biodiversity.

This booklet aims through visual images to sensitise readers to the importance of biodiversity in the Hindu Kush-Himalayan region, and to highlight the need for conservation and sustainable management at all levels.

In particular, I hope that it will remind participants at the Tenth Meeting of the Conference of the Parties to the Convention on Biological Diversity (CBD COP 10) being held in Nagoya, Japan, of what is at stake – not just biodiversity but the entire way of life of the people who depend on it.

I thank all those who contributed images to the competition, and the ICIMOD team, for making this publication possible.

Please enjoy the booklet and think of what needs to be done to ensure that this treasure is maintained for the future.

Andreas Schild  
Director General, ICIMOD

# Mountain Biodiversity of the Hindu Kush-Himalayas

International Year of Biodiversity 2010

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**Cover photo:** Blue sheep grazing in the grasslands of Manang (at 4000 masl),  
Nepal, *Sunil Sharma*

All photos were entries in the ICIMOD Photo Contest on Mountain Biodiversity  
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# Introduction

**B**iodiversity, or the variability of all life forms, is the basis of life on Earth and is needed to maintain the Earth and all of its living systems. It influences all key ecosystem processes, including productivity, nutrient cycling, resilience, and evolution; these processes, in turn, provide multiple benefits to mankind through a variety of ecosystem goods and services. For people, biodiversity increases food security and adaptability during environmental stress, while its loss increases vulnerability to natural disasters. The continued loss of biodiversity affects the availability of water for household use and the productivity of the landscape, upon which human livelihoods and the economy depend.

Mountain biodiversity is particularly vulnerable. The landscapes are fragile, and easily degraded. The extreme slopes and variation in altitude give rise to many ecosystems in a small area, leading to a rich biodiversity with many endemic and rare species, sometimes adapted to a very small range. The people who live in the mountains are dependent on the natural resources – the biodiversity – for their livelihoods. Changes in the biodiversity threaten the lifestyles of this culturally highly diverse region, and the basis of the ecosystems that provide services to a vast population downstream. The major threats to mountain biodiversity are habitat degradation and fragmentation; over extraction of resources, including poaching; and introduction of invasive non-native species.

Early in 2010, ICIMOD held a photo contest on 'Mountain Biodiversity', photos to be taken within the Hindu-Kush Himalayan portion of ICIMOD's regional member countries of Afghanistan, Bangladesh, Bhutan, China, India, Myanmar, Nepal, and Pakistan. The contest was held to mark the International Year of Biodiversity 2010 and to raise awareness of the vital

role that mountain biodiversity plays in sustaining life in the Hindu Kush-Himalayas. More than 300 contestants, most from the region, submitted more than 800 entries. This booklet features a selection of the entries, each highlighting a mountain biodiversity issue or telling a story, and grouped under six thematic headings. The aim is to provide a snapshot of different aspects of biodiversity in the region and raise awareness about its value and some of the issues involved, and thereby encourage all concerned to work towards biodiversity conservation and management in the region.



# 1 Mountain Flora and Fauna

**T**he Hindu Kush-Himalayan region has a large number of endemic species – flora and fauna of significant value found nowhere else in the world. Many of the birds, mammals, insects, plants, and micro-organisms are icons of the mountain world, be it the red panda (*Ailurus fulgens*), the snow leopard (*Uncia uncia*), the cordyceps (*Ophiocordyceps sinensis*), or the Sikkim rhubarb (*Rheum nobile*). Mountain flora and fauna play a vital role in sustaining the fragile mountain ecosystem, and are the basis for the lives, livelihoods, and culture of the mountain people. But wildlife and plant species are rarely confined within national boundaries, rather they range across this vast area, oblivious to artificial borders, and transboundary approaches are needed for effective conservation and management.

# Singalila National Park, Darjeeling, India

*Shristi Kamal*



A fungus grows on deadwood on the forest floor in the fringe area of Singalila National Park. Thus nature's own decomposing agents provide a valuable ecosystem service by helping unlock and recycle nutrients.

# Gasa, Bhutan

## *Lhendup Dorji*



The Sikkim or noble rhubarb (*Rheum nobile*) is a herbaceous plant found in high-altitude alpine pastures of the Hindu Kush-Himalayas from Afghanistan to Myanmar, including Bhutan. The whole plant is used in traditional medicine to cure constipation and diseases related to indigestion, and the root can be used to dye wool yellow.

# Zarabad, Pakistan

*Ali Rehmat Musofer*



Seabuckthorn (*Hippophae rhamnoides*), a deciduous shrub, is found in many arid parts of the Himalayan region, as here in Gozal, Hunza. Rich in vitamin C, its berries are used to make juice, and its thorny branches for fencing to keep out animals. The shrub can be used for land reclamation because of its extensive root system and ability to fix nitrogen.

# Sikkim, India

*Ghanashyam Sharma*



Himalayan cliff honeybees (*Apis dorsata*) feed on nectar from all kinds of aromatic and medicinal plants in alpine pastures, while also pollinating them. The honey extracted from these honeycombs can be intoxicating, and is often sold as a cure for various ailments at a premium price.



# Khunjarab National Park, Hunza, Pakistan

*Ghulam Rasool Mughal*



A pair of white-winged redstarts (*Phoenicurus erythrogastrus*) engage in a courtship ritual one snowy morning in Khunjarab National Park. A landscape livened by such a colourful display is a sight to behold. Birdwatching holds great promise for promoting tourism and birdlife conservation.

# Kalaiya, Bara district, Nepal

*Susheel K Shrestha*



When monsoon rain hits the Terai (lowland) region of Nepal, the Indian bull frog (*Hoplobatrachus tigerinus*) appears out of the blue in the paddy fields to call out to a mate. Conversion of rice fields to housing land, and use of pesticides and chemical fertilisers, mean that every year there are fewer and fewer sightings of this species.

# Ilam, Nepal

*Sonam Tashi Lama*



The red panda (*Ailurus fulgens*), endemic to the temperate forests of the Eastern Himalayas, is declining over much of its range as a result of habitat loss and fragmentation. Forests are being cleared, resulting in the loss of nesting trees and bamboo shoots, prime food of the red panda.



# Feisabad, Afghanistan

*Richard Fite*



Although snow leopards (*Uncia uncia*) are an endangered species, poaching remains common. The blank stare on this illegally captured leopard reveals the stress of its captivity. Although seized by Afghan authorities, it died before it could be released into the wild.



## 2 Mountain Biodiversity as Food

**T**he Hindu Kush-Himalayan region supports a wide variety of locally adapted crops and breeds of livestock, wild edibles, and aromatic and medicinal plants that contribute to ensuring ecosystem productivity and sources of food. Traditionally, mountain farmers relied on diversity, rather than maximising productivity, as the main strategy for ensuring food security in a region with an extreme and unpredictable climate. Landraces of staples and vegetables resistant to drought, waterlogging, frost, sun, and poor and high nutrient soils, ensured that whatever the climate in a particular year, at least something would flourish. Similarly livestock, the traditional source of livelihoods at higher altitudes, were bred to withstand extremes of climate. Wild edibles did and do provide an important source of food, and a supplement that ensures a variety of nutrients. Millions of mountain inhabitants who have no access to doctors continue to rely on traditional healers and medicinal herbs. Bees alone provide pollination services estimated at millions of dollars, not to mention honey and wax.

The integrated agricultural systems were designed to ensure that farmers could survive independent of the outside world, while maintaining the fertility and health of the ecosystems on which they rely. The present trend towards commercial farming of monocultures (tea, coffee, rubber, to name a few) threatens to erode these genetic resources and patterns that are the basis of livelihood security. Dangers from genetically modified (GM) crops and terminator seeds also loom. Unless small farmers' innovations are protected and promoted, and put at the centre of agrobiodiversity conservation, a valuable basis for conservation and adaptation to change may be lost.

# Kalimpong, India

*Samuel M Thomas*



Local seeds sold or exchanged in weekly bazaars such as here in Kalimpong have kept alive much local agrobiodiversity. The high genetic diversity at the local level is the result of farmers' innovations and seed selection over centuries, and formed the basis for sustenance of remote hill and mountain communities. Today, this diversity is threatened by the introduction of hybrids and genetically modified crops.

# Tura market, Meghalaya, India

*Bhupendra Singh Adhikari*



A woman from a hill tribe sells wild edibles such as piper, betel, areca nut, and dioscorea (a tuber), from the nearby forests of Meghalaya.



# Jhyalbas, Nawalparasi District, Nepal

*Eloise Biggs*



The creation of a herbal remedy to relieve stomach ailments is underway. Local produce is used to concoct a wide variety of medicines which are locally sold or bartered to obtain commodities.

# Bajura, Nepal

*Narayan Singh Khawas*



Bajura district in Western Nepal is a food-deficit area. Constantly faced with insufficient food, village women go to the forests to forage for wild spinach (locally called rugi sag), a kind of wild edible.

# Upper Spiti, India

*Rishi*



A matrix of agricultural plots adds to the beauty of the Spiti Valley landscape. The primary crop is pea, seen as lush green patches, with patches of barley interspersed. Some fields are left fallow to maintain the productivity over the years. Peas are sold as far away as Delhi, where they command a high price.



# Nuwakot, Nepal

*Kishor Shrestha*



Nature is bountiful: she gives, we take. The yam shown in the picture above is a wild edible, a delicacy often cooked as an alternative vegetable. The men are preparing this vegetable for a wedding party in Bahundada village in Nuwakot.

# Ziro, Arunachal Pradesh, India

*Samuel M Thomas*



An Apatani woman harvests fish from her rice field. The Apatanis of Arunachal Pradesh have perfected an advanced rice-fish culture model that is a low-cost and sustainable practice. The rice-fish integration reduces use of fertiliser and pesticides in the fields, brings in income from fish sales, and also helps meet animal protein requirements.

# Shan State, Myanmar

*Kyaw Kyaw Winn*



Raising livestock, especially water buffaloes, is part of the agricultural lifestyle of Myanmar's farmers. Water buffalo are not only a measure of wealth in many ethnic tribes, but are also used in rituals in many cultures.



# 3 Biodiversity for Livelihoods

**M**ountain communities have been using biodiversity resources as raw materials to fashion goods for use, or to sell for cash income or barter for other required commodities, since time immemorial. Many cottage industries have sprung up around biodiversity-based products such as seabuckthorn juice, apricot jelly, yak cheese, brooms, handicrafts, paper products, garments and others made of natural fibres, tea and coffee, dried meat, and alcoholic drinks from millet, rice, and corn. Many products that are an integral part of the lifestyle and culture of the mountain people themselves, are now sold to tourists or in far-away markets.

There are many measures that can contribute to poverty alleviation by helping mountain people benefit more from such activities such as providing access to micro credit and markets; training for quality improvement; establishing cooperatives to maximise producer profits; and research into value chains to identify the most effective approach. But it is also important to link biodiversity-dependent livelihoods to larger conservation values, not just profits, to ensure the long-term sustainability of the resources that they draw upon.

# Khimti, Ramechhap, Nepal

*Leela Ghimire*



A local fisherman is throwing a line to catch fish in a Himalayan river. Unfortunately, infrastructure development such as dams has adversely impacted fishermen's traditional livelihoods, forcing them to look elsewhere for alternatives.



# Sankhuwasabha, Nepal

*Frances Klatzel*



Beekeeping helps promote the natural pollination of crops that is so essential to enhancing food security as well as maintaining mountain biodiversity.

# Arunachal Pradesh, India

*Jayahari KM*



Winrock International set up the first community-owned fruit processing centre in Arunachal. The women here are preparing a squash-type drink from *Rhododendron* petals. The initiative has not only provided livelihoods to women but also helped in conservation of *Rhododendrons*, which were earlier used solely as fuelwood.



# Fikkal Bazaar, Eastern Nepal

*Sanej Prasad Suwal*



Dried yak cheese (locally called chhurpi), is a smoke-dried or simply wind- and sun-dried cheese made from yak milk. Making chhurpi has developed into a cottage industry in its own right over the years.

# Southern Bhutan

## *Kado*



Bhutanese villagers traditionally made ropes from natural fibres. Rope-making is now a dying art, as the demand for natural ropes has been replaced by the growing demand for nylon or synthetic ropes.

# Thimphu, Bhutan

*Tshering Zangmo*



In Bhutan, cane and bamboo products, such as plates and bowls for household use, are usually hand woven by country farmers and sold in markets as far away as Thimphu, the capital.

# Chainpur, Nepal

Ravi K Shrestha



Biobriquettes – an environmentally friendly source of alternative energy – can be made from invasive weed species such as *Eupatorium adenophorum* (banmara in Nepali), giving the ‘forest killer’ a use. In Nepal, a cottage industry has grown around biobriquettes, enhancing the livelihood options for many hill communities.



# Ranikhet, Uttarakhand, India

*Sarika Samdani*



Resin from pine trees has a number of commercial uses, especially in making turpentine and rosin. Small cuts are made in the tree and the resin that seeps out is collected in metal cups tied around it.



# 4 Women and Biodiversity

Women and men play different roles in dealing with biodiversity resources. Women's role as gatherers of wild plants, home gardeners, plant domesticators, herbalists, and seed custodians is recognised across the world. However, the enormous contribution made by women in conserving and managing biodiversity, and their capacity to do so, is rarely recognised or valued.

The consequences of the impact of climate change on biodiversity could also be different for men and women. Women may face greater challenges in adapting to environmental change, because they do the majority of agricultural work and are usually responsible for providing daily household commodities such as food, fodder, fuelwood, medicine, clothing, and shelter. The increasing trend for mountain men to migrate for work is also increasing women's burden and responsibilities, leaving them to take on tasks that were earlier reserved for men.

It is important to pay serious attention to both women's and men's knowledge, use, rights, and needs with respect to biodiversity. Women must be involved as major partners in planning for biodiversity conservation and carrying out conservation measures. Without women's participation, conservation will not be possible.

# Rolpa, Nepal

*Himalyog Anonymous*



Indigenous mountain women in Nepal make clothes, bags, rugs, and other household fabrics from hemp. Cooking oil is also extracted from hemp seeds.



# Garro Hills, Sherpur District, Bangladesh

*Mohammad Rakibul Hasan*



The Garo Hills are home to the indigenous Garo tribe, especially in Mymensingh. Garo women are very hard working and grow their food in a natural way without using the chemical fertilisers that could harm the local biodiversity.

# Mon State, Myanmar

*Kyaw Kyaw Winn*



A village woman is chopping firewood in front of her house in a small village in the mountains of Myanmar. Women collect firewood from the nearby forest and chop it into manageable pieces to sell in a local market. This is part of their daily life.

# Chitwan, Nepal

*Sanej Prasad Suwal*



Two local Tharu women are collecting snails in a stream running through Kumrose Community Forest near Chitwan National Park. Snails are a delicacy in the Tharu diet; their shells are used for decoration and as ornaments.

# Western Sichuan, China

*Wong Chi Keung*



Yak milk has a high fat content and is usually made into butter, yogurt, or cheese. Milking yaks is a task usually reserved for Tibetan women.



# Mir Malik Valley, Northern Areas, Pakistan

*Ruth Goehlen*



A married woman, recognisable by her black woollen hat, is making butter. Milk and ice are put in a closed goat's skin and shaken strongly for several hours until the butter separates out.

# Southern Samangan, Afghanistan

*Mohammad Ayub Alavi*



In Afghanistan, women traditionally herd goats and collect milk from livestock to feed the family. Raising livestock is the principal economic activity in most mountain areas of the world.



# Almora, India

*GB Mukherji*



The pine needles offer an assured livelihood to these women, but collecting them from the mountainside and carrying to market is not easy.



# 5 Traditional and Indigenous Knowledge Associated with Mountain Biodiversity

**T**raditional knowledge and indigenous knowledge refer to the knowledge, innovations and practices of indigenous and local communities around the world. Such knowledge is developed from experience gained over centuries, adapted to the local culture and environment, and transmitted orally and by demonstration from generation to generation.

There is a vast store of traditional knowledge associated with biodiversity in the Hindu Kush-Himalayas, on such diverse topics as seed storage techniques, ways of making wooden bowls, extracting juice from sugar cane, husking rice grains, finding and using plant species for traditional medicine, identifying and cooking wild edibles, and controlling pests. The landraces developed over centuries, with selection of genes that help adaptation to the extreme mountain environment, are a special form of such knowledge. Modern laws offer ways of reducing biopiracy – the taking of such knowledge without prior informed consent – but the global intellectual property rights regime and national laws are still inadequate for protecting the rights of traditional and indigenous knowledge holders, or for recognising and rewarding them for their intellect and creativity. Conservation activities must also focus on equitable benefit sharing for mountain people.

# West Kameng District, Arunachal, India

*Gibji Nimachow*



The ethnomedicinal plant *Zanthoxylum rhetsa* is used as a cure for diarrhoea. The tender leaves can be eaten raw or as a cooked vegetable. There is a need to document indigenous and traditional knowledge on the use of medicinal herbs for different purposes.

# Kohsan, Heart, Afghanistan

*Kaneez Hasna*



Pieces of linen fabric are tied around the entire sunflower heads – an ingenious indigenous method for protecting the seeds from birds and insects. The fabric also catches falling seeds, making seed harvesting easier.

# Juye Village, Achham, Nepal

*Rajesh Sharma*



This bin for storing different kinds of cereal crops is made from leaves and stitched with stems. Do we really need a plastic container when we have such a biodegradable option available to us?



# Sankhuwasabha, Nepal

*Gyanbandhu Sharma*



Farmers of Karamarang village in eastern Nepal leave their maize to dry on a bamboo structure near their house. This crop storage technique not only protects the crop from pests, but also frees up much-needed space in their small houses for other purposes.

# Lumang Geog, Eastern Bhutan

*Ngawang Tenzin*



The photo shows an indigenous technology for extracting juice from sugar cane. However, its use is dying out due to the advent of the mechanical sugarcane crusher.

# Kermi, Upper Humla, Nepal

*Rabindra Roy*



Furu, a traditional wooden bowl used for drinking butter tea and local liquor (chhang), is a niche product of the Lama community in Upper Humla. Making furu is an off-season income-generating activity, especially in winter. Furu are carved from the knots of the tilaailo tree (*Acer spp.*).

# Bandarban, Bangladesh

*Mahbubur Rahman*



Tribal women from Bandarban weave cloth from natural fibres, dyed with natural pigments on their own looms. They make all kinds of products from the cloth – shawls, carpets, bags, and so on – and sell to them to tourists and the public to generate much-needed cash income.



# Gojal Hunza, Pakistan

*Ali Rehmat Musofer*



When the leaves turn red, yellow, and orange in autumn, local musicians gather in Hunza for post harvest celebrations. Folk oral traditions such as group singing are a powerful medium for transmitting traditional wisdom about living in harmony with nature.





# 6 Threats to Mountain Biodiversity

**L**oss of biodiversity is a significant issue across the globe: species are becoming extinct, populations reduced, and ecosystems lost, at the fastest rate known in geological history – and most of these extinctions are tied to human activity. This is as true of the fragile and vulnerable landscapes of the Hindu Kush-Himalayas as elsewhere.

The main threat to biodiversity is habitat loss and destruction: quarrying or mining in fragile ecosystems; clearing forests to make way for commercial farming and monoculture plantations; draining of wetlands for farmland; development of infrastructure such as roads and dams – all play a role. Introduction of exotic (non-native) species that kill or compete with populations of native plants or animals is another major problem for mountain biodiversity. Over-exploitation (hunting, fishing, or collecting) is affecting many species; and poaching and illegal trade in animal parts poses a real threat to rare and endangered species such as the snow leopard, the red panda, and the musk deer. Pollution and contamination from human activities, and alterations in ecosystem composition (where changes in one species leads to a chain reaction with losses in others) also play a role. Last but not least, global climate change may alter environmental conditions and lead to loss of species and populations that cannot adapt to new conditions or relocate. Climate change may pose the biggest threat so far to mountain biodiversity, its implications are still being studied.

Implementing the Convention on Biological Diversity at all levels, and especially the Programme of Work on Mountain Biological Diversity, can help mitigate, if not eliminate, many of these threats. We need to recognise biodiversity as a ‘public good’ for all humanity, and secure the political will and financial commitment of the world’s leaders to protect our biodiversity for posterity.

# Gufa Pokhari, Sankhuwasabha, Nepal

*Susheel K Shrestha*



The locals told me that this sacred pond at an altitude of 1875 m was never as dry and waterless as this year (2010). Perhaps it is the result of climate change.

# Chitwan National Park, Nepal

*Mridaney Sharma Poudel*



*Mikania micrantha*, an invasive plant species, is slowly killing off or crowding out the native flora of Chitwan National Park, on which various forms of wildlife such as the one-horned rhinoceros depend. To date, this species has invaded an estimated 20% of the area of the Park.

# Mengla County, Yunnan, China

*Wang Yun*



Many primary forests have been felled over the years to make way for tea gardens and rubber plantations in South Yunnan. Such monocultures – narrowly focused on short-term gains – invariably come at the expense of biodiversity richness.

# Mon State, Myanmar

*Kyaw Kyaw Winn*



A group of villagers are going to the mountain forest to collect raw materials for traditional medicine: seeds, leaves, and stems of medicinal plants. Unsustainable harvesting can pose future uncertainty.

# Feisabad, Afghanistan

*Richard Fite*



Hunting of wild animals and birds for local consumption and sale is rampant in the Hindu Kush-Himalayan region. These partridges were put on sale in an urban market in northeastern Afghanistan.



# Trashigang, Bhutan

*George Joseph*



A forest fire in Eastern Bhutan destroys a large swathe of forest – pockets of biodiversity – in a matter of days. Lack of resources and trained manpower is a major impediment to forest fire management in this Himalayan Kingdom.

# Cherrapunjee, Meghalaya, India

*Nitul Das*



Rat-hole coal mining is degrading the ecosystem of Cherrapunjee. Although the miners make enough to scrape by, they pay the ultimate price: their health deteriorates due to constant inhaling of coal dust in an oxygen-deficit environment.

# Yunnan-Kweichow Plateau, China

*Chi Keung Wong*



Changes in land use patterns, especially conversion of prime forests to agricultural terraces, have contributed to the erosion of wild genetic resources, threatening the very basis of sustainable agrobiodiversity.



# Postscript

**T**he mountain landscapes of the Hindu Kush-Himalayas are home to a unique biodiversity and ecosystems that cross political boundaries and deliver crucial services to people in the region and beyond.

Changes in these ecosystems will not only affect the people of the region, they will have impacts on the people living in the river basins downstream, close to one-fifth of the world's population. There is an urgent need for long-term environmental, ecological, and socioeconomic monitoring to understand the changes taking place as a result of climate change and other drivers, and to identify and promote appropriate adaptation strategies to build the resilience of people and biodiversity to global and climate change.

ICIMOD has adopted key elements of the CBD Programme of Work on Mountain Biodiversity to develop a landscape approach to biodiversity management in the region – including elements of transboundary biodiversity management, connectivity and corridors, indigenous and traditional knowledge, and a focus on livelihoods linked to conservation. The Regional Cooperation Framework co-developed by ICIMOD and partners provides a guide for transboundary biodiversity management in the region.

Over the years there has been a growing realisation that a broader biodiversity management vision and political will at the national level, development of joint institutional coordination, landscape level planning, and the involvement of more stakeholders are important elements in enhancing regional biodiversity management.

In the International Year of Biodiversity, ICIMOD and its partners in the eight countries of the region renew their commitment to work together to contribute to the overall conservation and management of the mountain biodiversity of the Hindu Kush-Himalayan region.





# About ICIMOD

The International Centre for Integrated Mountain Development, ICIMOD, is a regional knowledge development and learning centre serving the eight regional member countries of the Hindu Kush-Himalayas – Afghanistan, Bangladesh, Bhutan, China, India, Myanmar, Nepal, and Pakistan – and based in Kathmandu, Nepal. Globalisation and climate change have an increasing influence on the stability of fragile mountain ecosystems and the livelihoods of mountain people. ICIMOD aims to assist mountain people to understand these changes, adapt to them, and make the most of new opportunities, while addressing upstream-downstream issues. We support regional transboundary programmes through partnership with regional partner institutions, facilitate the exchange of experience, and serve as a regional knowledge hub. We strengthen networking among regional and global centres of excellence. Overall, we are working to develop an economically and environmentally sound mountain ecosystem to improve the living standards of mountain populations and to sustain vital ecosystem services for the billions of people living downstream – now, and for the future.





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