



Introduction

An incredible 139 new species were discovered in the Greater Mekong region in 2014, including 90 plants, 23 reptiles, 16 amphibians, nine fish, and one mammal.

The Greater Mekong Region (Cambodia, Laos, Myanmar, Thailand, and Vietnam) teems with life. Irrawaddy dolphins splash in the Mekong River, wild elephants and tigers roam Thailand's forests, and giant ibises stalk the watering holes of Cambodia's Eastern Plains Landscape.^{1, 2, 3} In total, over 430 mammal species, 800 reptiles and amphibians, 1,200 birds, 1,100 fish and 20,000 plant species call this region home.⁴ Every year, scientists describe new species increasing this tally and highlighting how much more is left to discover: between 1997 and 2014, 2,216 new species were discovered.^{5,6,7,8,9,10}

In 2014, new species included a soul-sucking "dementor" wasp, a color-changing thorny frog, a stealthy wolf snake, the 10,000th reptile species discovered in the world, a bat with remarkable fangs, a new crocodile newt, a feathered coral, four Thai "Princess" moths, the world's second-longest insect, and two orchids discovered through the wildlife trade.

This incredible biodiversity underpins life for the Greater Mekong's people. The Mekong's fertile waters generate an estimated 2.6 million tonnes of fish per year – up to 25 percent of the global freshwater catch – and replenish the farms and rice paddies along its course with nutrient rich sediment. Forests and wetlands provide the raw materials for industry, purify the air and water, and protect towns and cities against natural disasters like floods and storms. Around 80 percent of the region's 300 million people depend directly on these natural systems for food security, livelihoods, and cultural traditions.¹¹

These critical natural resources are under threat. The Greater Mekong is one of the top five threatened biodiversity hotspots in the world, according to the Critical Ecosystem Partnership Fund.¹² Hydropower developments threaten the integrity of the Mekong river; later this year, construction on the Xayaburi Dam in Laos will block the lower Mekong River for the first time, disrupting the free flow of fish and sediment. Communities downstream have vocally protested against Xayaburi and the impending construction of the Don Sahong dam near the border of Cambodia, one of an additional 11 planned mainstream dams that would irrevocably transform the Mekong.^{13,14} Roads and other planned infrastructure developments through the region's wilderness areas will fragment habitats and provide access to saola and other endangered species.¹⁵ Climate change only increases the pressures on the landscapes through rising temperatures, rising sea levels, and more extreme storms, droughts and floods.¹⁶

WWF works with governments, businesses, and civil society to create a sustainable future for the Greater Mekong based on healthy, functioning ecosystems. We are spearheading efforts to protect species, helping businesses develop sustainable supply chains, encouraging sustainable forestry and non-timber forest product management, helping communities and governments adapt to climate change, and promoting the sustainable use of freshwater resources.¹⁷

Scientific exploration has an important role to play in the future of the Mekong region. Fascinating new species like the ones discovered in 2014 can draw more conservation attention to the region, while a thorough understanding of the patterns and distribution of biodiversity can help direct conservation resources to the highest priority areas.

Featured Species

1. Soul-Sucking “Dementor” Wasp



© MICHAEL OHL / MUSEUM FUER NATURKUNDE

A wasp that steals its prey’s free will with a single sting before eating it alive sounds like a monster straight out of a storybook. Visitors to the Berlin natural history museum Museum für Naturkunde (MfN) certainly thought so, voting to name this wasp *Ampulex dementor* after the soul-sucking dementors from the Harry Potter series.^{18, 19, 20, 21}

A. dementor hunts cockroaches, injecting a venom into the mass of neurons on its prey’s belly that turns the roach into a passive zombie. Cockroach wasp venom blocks receptors of the neurotransmitter octopamine, which is involved in the initiation of spontaneous movement. With this blocked, the cockroach is still capable of movement, but is unable to direct its own body.²² Once the cockroach has lost control, the wasp drags its stupefied prey by the antennae to a safe shelter to devour it.²⁰

The dementor wasp and its bizarre hunting tactics bewitched the public at MfN during a public poll to name the yet-undescribed wasp. After participating, visitors said they felt a personal connection to the dementor wasp and were more interested in this region’s unexplored nature.²³

This type of personal bond with nature is essential for conservation.²⁴ Despite the global impacts of environmental degradation, biodiversity loss can seem very divorced from people’s day-to-day lives. Opportunities to participate in describing biodiversity create an immediate connection with the wild, weird world beyond visitors’ usual urban lives. “I am convinced that events like this increase people’s curiosity about local and global fauna and nature,” said Dr. Michael Ohl, one of the researchers who led the naming process. People’s perceptions of nature have real world consequences: positive views of previously ignored or disliked organisms can lead to calls for better conservation management.^{25, 26}

2. World's Second-Longest Insect



© JEROME CONSTANT

At 54 cm long from its back legs to its tip, *Phryganistria heusii yentuensis* subsp. nov. is the world's second longest insect – but it might not hold on to its title for long.^{27, 28, 29} “Three of the biggest insects have just been described last year. There are more for sure!” said Jerome Constant, leader of the expedition that discovered the giant *P. heusii yentuensis* as well as several other species. “We now have more than 150 new species of stick insects to describe, only from Vietnam after a few expeditions, so imagine what there remains to discover.”

These super-sized insects live among us: one of the new giant species (*Phryganistria tamdaoensis* Bressel & Constant 2014) was discovered in the small Vietnamese town of Tam Dao. The record-breaking female *P. heusii yentuensis* was found less than 1 km away from villages and rice fields. To locate these stick insects, Constant and his colleagues survey likely habitats at night with headlamps, torches, and well trained eyes (combined with the occasional shaking of branches) to spot and pick up sleeping insects.³⁰

Once collected, the real hard work of describing the species begins. Despite their relative morphological simplicity, stick insect species can be tricky to identify due to differences between the sexes. Luckily for researchers, stick insects are easy to breed in captivity, and the eggs and nymphs provide valuable identifying information. This also provides an excellent opportunity for citizen science: Constant and his colleagues work with several plasmid enthusiasts who breed, raise, and observe the stick insects to provide valuable scientific information for use in the species descriptions.³¹ “There is huge work to do, but less and less people to do it,” said Constant, citing worldwide research budget cuts and difficulties gaining access to sample sites. Citizen science and open scientific collaboration help taxonomists keep biodiversity discovery moving forward in the face of these challenges.

3. [Redacted] Orchids



© JACOB PHELPS

Two new species of orchids were discovered during market surveys assessing illegal trade in wild ornamental plants.³² There is a long history of botanical discovery through the plant trade, but Dr. Jacob Phelps nearly didn't publish this new find, concerned that attention could mean these orchids' doom.

Can description mean extinction?

Sometimes the very act of documenting a new species can put it at increased risk of extinction. When a species is considered rare, wildlife collectors who prize novelty will rush to own a specimen, creating sharp spikes in trade of that species.³³ This increased collection pressure can pose a serious threat to a newly described species. "When the targeted species are narrowly distributed or only occur in small populations, the conservation effects can be sudden and dramatic," said Dr. Jacob Phelps, the scientist specializing in the illegal wildlife trade who discovered these orchids.

In the case of another recently described orchid from Malaysia, *Bulbophyllum kubahense*, press attention around its description as a new species elevated it from just another orchid to a "must have" for rare plant collectors. Its price at online auctions spiked from tens to hundreds of dollars, creating an enormous economic incentive for wild plant harvesters to collect more.³⁴

To protect species at risk, some scientists have taken to withholding information, like species localities, to thwart potential collectors. However, this tactic doesn't work for species that are already in trade, with established illegal procurement networks.³⁵ In that case, is it better to let a species go undescribed?

Probably not, as the lack of attention carries its own risks. "Put simply, it's very hard to conserve something we don't know exists," said biologist Dr. Jodi Rowley, a member of the IUCN Amphibian Red List Authority. "Once a species is known to science, it is typically much easier to direct conservation resources towards it, if needed." Suppressing publicity may keep market demand for a species down, but it won't protect the species completely – as the discovery of new species via trade illustrates. Formally recognizing a species brings the potential for legal protections.

Still, Dr. Phelps hopes taxonomists will consider these issues while naming new species. "Our field does not have a tradition of critical self-reflection about the conservation implications of our actions." Considering potential conservation impacts before publication gives researchers the chance to collaborate with conservation organizations and governmental bodies and mitigate potential risks.³⁶

4. Color-Changing Thorny Frog



© JODI ROWLEY / AUSTRALIAN MUSEUM

When her then-students Le Thi Thuy Duong and Dau Quang Vinh showed Dr. Jodi Rowley the pictures of a frog covered in “sandpaper” that they had spotted in the forest, she knew they’d discovered something unique. “As soon as I saw the spikes on the back of the male, I knew it was something different to any frog I’d seen before,” said Dr. Rowley.

It wasn’t until a year later when she returned with Duong and Vinh to the remote mountain forests of central Vietnam that Dr. Rowley first saw the thorny tree frog in person. The first frog they found was a male surrounded by eggs in a tree hole, making it one of 2 percent of frog species that breed in phytotelm, or small bodies of water contained in a plant.^{37, 38} The tadpoles hatch and fall into the tree’s pool, where they can grow up safe from most of the predators that inhabit larger bodies of water.³⁹

The adult frogs are a distinctive combination of pink and yellow – at least at night. During the day, their yellow backs fade to a duller brownish hue. Why and how the frog changes colour is unclear, though the change itself is not uncommon. “Many frog species can change colour depending on time of day, temperature, or even mood,” shared Dr. Rowley.

More unusual are the spikes that give the thorny tree frog its name.^{40, 41} The males’ backs are covered in white conical thorns, giving it the sandpapery look that first caught Duong and Vinh’s eyes. As only the males have spikes, it is thought that they may play a role in mate recognition. Females may recognize males in breeding condition at least in part by how “thorny” they are, according to Dr. Rowley.

5. Long-Fanged Bat



© JUDITH L. EGER

Smile! The long-toothed pipistrelle's impressive canines set it apart from its closest relatives.⁴² The canines were "very conspicuous even for the first sight," said Tamas Gorfol, one of the researchers who named this new species.

These extra-large fangs may have evolved to allow *Hypsugo dolichodon* to prey upon larger or harder-shelled insects than its smaller-toothed relatives. Over time, the long-toothed pipistrelle would have carved out its own ecological niche, consuming different prey and possibly using different habitat than its closest relatives.⁴³ Though *H. dolichodon* is known from three locations in Laos and Vietnam, its exact habitat is still a mystery – it could either live in caves, like its more common relatives, or be a forest dweller, according to Gorfol.

The long-toothed pipistrelle was the only bat named in the Greater Mekong region in 2014, but there are others waiting in the wings. The Hungarian Natural History Museum alone has representatives of more than 10 new taxa that are waiting to be described. It can take years for a new species to be formally described, after careful comparison of the potential new species to known relatives, involving genetic analyses and physical comparisons with specimens that are often scattered in museums around the globe.⁴⁴

There is a chance some of these bats could go extinct even as they are being named. Southeast Asian landscapes are changing dramatically due to rapid development, leaving fewer and fewer refuges for bats. The caves and forests of one of *H. dolichodon*'s known habitats in Laos are threatened by dam construction and quarrying. The loss of bats would have serious ecological consequences: insectivores like the long-toothed pipistrelle keep insect populations in check, while fruit bats keep forests alive by dispersing seeds and pollinating flowers.⁴⁵

6. Stealthy Wolf Snake



© THY NEANG MoE / FFI

Well-camouflaged, tree-dwelling, and nocturnal: it's no wonder the Zoos Victoria wolf snake previously escaped discovery despite the intensive study of Cambodian reptiles over the past decade. It's also rare: of the 22 reptile species collected during the authors' field survey in Phnom Samkos Wildlife Sanctuary, the researchers found only a single specimen of this new species. One specimen was all it took to identify this as new to science, thanks to its distinctive "flying bat" patterning.^{46, 47} "There is no other species of wolf snake that looks like this," said Thy Neang, the leader of the field survey that discovered the snake.

Little is known about this cryptic snake. Like all wolf snakes, it has large but non-venomous teeth in both jaws, which it likely uses to eat small lizards and frogs, the usual diet for this genus.^{48, 49} It hunts for these at night, its disruptive coloring helping it blend with the tree bark and mosses of the Cardamom mountain forests. Though stealth is likely one of its primary defenses, *L. zoosvictoriae* is quick to defend itself aggressively when threatened, striking repeatedly at the threat, shaking its tail like a rattlesnake, or hiding its head inside its coiled body.⁵⁰

The snake's home in the Cardamom mountain forests is threatened by encroaching roads, which increase accessibility to illegal loggers, poachers, and developers.⁵¹ Collaborative efforts are needed to protect this region for the Zoos Victoria's wolf snake and all the area's varied inhabitants, including species yet to be discovered.

7. Thai “Princess” Moths

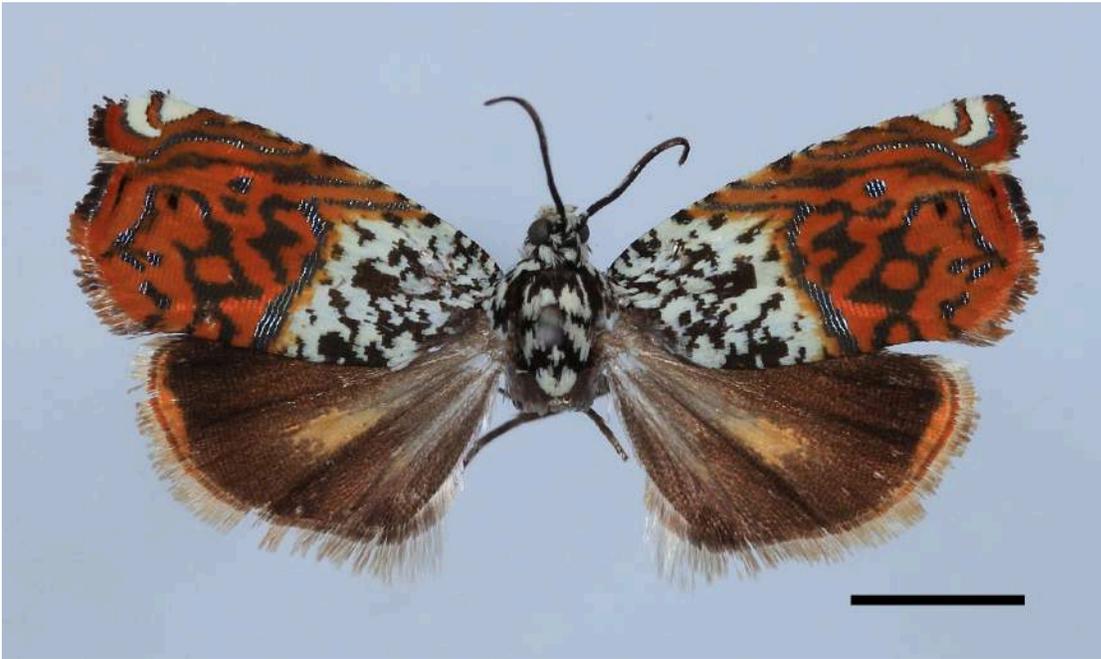


©NANTASAK PINKAEW

Just because an area has been well researched doesn't mean there aren't still discoveries to be made, as scientists from Kasetart University found. Sopita Muadsub and Nantasak Pinkaew surveyed three well-studied forests in Thailand to document moth diversity, and discovered four species of an entirely new genus of moth. The genus was named in honor of Princess Maha Chakri Sirindhorn of Thailand, who supports the Chaipattana Foundation, owner of the community forest where most of the specimens were collected.⁵²

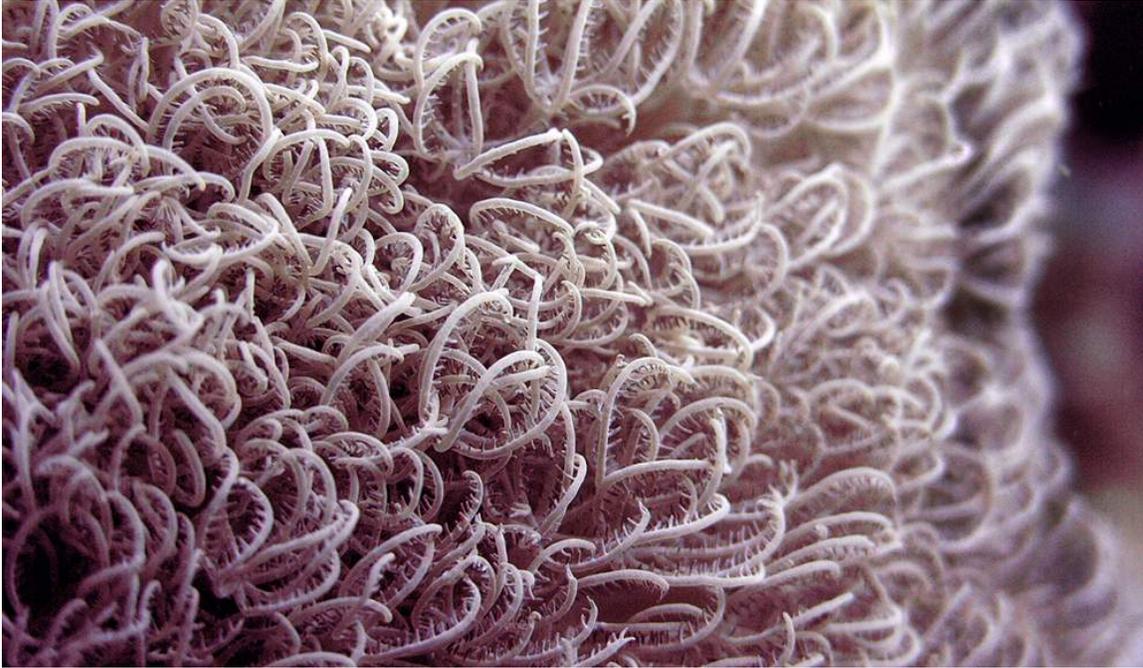
These tiny moths – their wings are only about 5 mm long – have the history of Southeast Asian moths and butterflies written across their genitalia. Moth genitals are wildly complex, involving graspers, tufts, spines, and teeth unique to each species, preventing cross-species breeding and hybridization.⁵³ Variations in these structures, as well as in their wings, distinguish the *Sirindhornia* species as a new genus while also creating links between the related *Anthozela* and *Irianassa* genera.

When not providing scientists with clues to the history of evolution, these moths are busy supporting their forest ecosystems. Moths form an important part of the base of the food web, converting plant matter into animal protein and serving as food for many animals.⁵⁴



©NANTASAK PINKAEW

8. Feathered Coral



©MICHAEL JANES

Finding this feathery-tentacled soft coral near Thailand's famous Phuket Island would have seemed as unlikely as finding a new species of African ape in Asia – until it happened. That's because previously, species of the *Ovabunda* genus were only known from the Red Sea and the western Indian Ocean.⁵⁵ The discovery of *O. andamanensis* increased the eastern edge of *Ovabunda*'s distribution by an amazing 5,000 km.⁵⁶

Now that one species of the *Ovabunda* genus has been discovered in the Andaman Sea, it makes it much more likely that others will be found in the greater Indian Ocean. Other taxonomic surprises are also possible, as coral research from the Greater Mekong is still in its infancy compared with other tropical regions.⁵⁷ "We are now seeing more emphasis on coral reef research and education, including taxonomy, at the government and university level occurring in Thailand, as well as Cambodia and Vietnam," remarked Michael Janes, leader of the team that discovered *O. andamanensis*. "[This] shows great promise for the future of coral reefs in the region."

9. New Crocodile Newt from Myanmar



© TIM JOHNSON

This newly named crocodile newt lurks in and around the ponds of Taunggyi, the capital of Shan State, Myanmar, from which its name was derived. It's no stranger to the people of Taunggyi, but for years it was mistaken for a close relative with a wide range. On closer inspection, researchers noticed *T. shanorum*'s flattened head and duller coloration and confirmed it as a new species using genetic analyses.⁵⁸

These stout newts may disappear just as we're getting to know them. According to local experts, construction on Taunggyi University campus threatens to cut off the water flow to their core breeding ponds, threatening their survival. Many newts are already struggling with their close co-habitation with humans. Their preferred shady hiding places are disappearing with urbanization, and many are killed by traffic during season migrations to and from breeding ponds, which are increasingly clogged with litter.⁵⁹

Collection for the international newt trade poses another serious risk to this species and Myanmar newts in general. Unnamed or newly discovered species are not on the lists regulating international trade in endangered species, so they can be freely imported.⁶⁰ Newts from Myanmar are heavily collected for the traditional medicine trade in China, and occasionally sold as pets. *T. shanorum* has already been discovered in the pet trade: two of the specimens used to describe the species were pet-traded.⁶¹ For species like *T. shanorum* with unknown or small populations, even a little bit of collection can do a lot of damage.

10. The 10,000th Reptile Species Discovered



© THY NEANG

This bent-toed gecko leapt from the karst cliffs of Laos straight into the world record books. The publication of its discovery made *Cyrtodactylus vilaphongi* the 10,000th reptile species known to science, according to The Reptile Database, which records all known species of reptiles.^{62, 63, 64}

The bent-toed geckos are the kings of the Gekkonidae family. An astonishing 16 bent-toed gecko species were discovered in the Greater Mekong region in 2014 alone, bringing the total number of bent-toed gecko species to 197. No other gecko genus contains more than 15 species in total.⁶⁵

The record-breaking discovery of *C. vilaphongi* took place only 500 m from a cornfield carved out of the forest, a reminder of how little is still known about the species living right alongside us – and how many of them are at risk before we even know they exist. Every year, scientists discover new species in the karst landscapes of Laos and Vietnam at a pace that shows no sign of slowing. In Vietnam alone, the number of recorded *Cyrtodactylus* species increased from five in 2006 to 33 in 2014.⁶⁶ Even as researchers begin to understand these biodiverse ecosystems, they are disappearing, victims of logging, slash-and-burn agriculture, and quarrying.^{67, 68}

Biodiversity research can play an important role in protecting these at-risk habitats. Creating a more complete picture of an ecosystem's diversity helps make the case for an area's biological importance, which allows decision makers to take steps to protect it. Truong Quang Nguyen, one of the discoverers of *C. vilaphongi*, hopes that further study of the diversity of Luang Prabang province could lead to the establishment of a nature reserve.

Going Forward: Recommendations

The future of these species – and the people they live alongside – depends on many things – protection from poachers, conservation of their habitat, maintenance of free flowing rivers, smart infrastructure development and much more. There is no one single solution, but most importantly, governments, businesses and citizens need to commit to the growth of a green economy* in the Greater Mekong. This involves developing the economy sustainably, prioritizing thriving natural ecosystems at all levels of decision making so that people and wildlife can enjoy their benefits for generations to come.

The governments of the Greater Mekong Subregion (Cambodia, Laos, Myanmar, Thailand, Vietnam, and China's Yunnan Province) have all pledged their support to “the development of a green, inclusive, and balanced economy” to reduce poverty, biodiversity loss and greenhouse-gas emissions.⁶⁹

WWF is working to unite governments, businesses, and communities to make this vision a reality. From infrastructure planning to sustainable energy to wildlife-centered river basin and landscape management, WWF-Greater Mekong's green economy initiatives aim to transform the way natural resources are managed in the region. WWF supports policies that promote a green economy, such as investments in green development and sustainable production, community-based natural resource governance, and reforming subsidies that encourage environmentally damaging activities. We work closely with key decision makers to make sure they have the information they need to meet their environmental, social and economic goals.
70

On the ground, a green economy means balancing the needs of humans and nature. As the Greater Mekong develops, creative solutions are needed to help people and wildlife live side by side, like infrastructure developments that connect instead of fragment areas of high biodiversity. (Photo of wildlife crossing adjacent) Protecting biodiversity means ending the wildlife trade; investing in protection from poaching, ending demand for illegal wildlife products, and sustainable alternative livelihoods for poachers such as ecotourism. It means empowering people and businesses to end practices that degrade their natural resources and create new paradigms that share nature's benefits equally, reducing poverty and ecological shortages. A green economy means we can all thrive – people and wildlife, including those species we have yet to discover.



* *“A green economy results in improved human well-being and social equity, while significantly reducing environmental risks and ecological scarcities.”*
~ United Nations Environment Programme, Green Economy Initiative