

# 102 new species described by the California Academy of Sciences in 2015

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*greenamyeri* and dreamy pink-and-orange *Doto splendidissima* (pictured here) -- were discovered during a student training expedition led by Gosliner in 2008. In terms of sea slug richness, South Africa's diverse temperate marine environments rival those of nudibranch-packed California. Credit: © California Academy of Sciences

In 2015, researchers at the California Academy of Sciences added 102 new plant and animal species to our family tree, enriching our understanding of Earth's complex web of life and strengthening our ability to make informed conservation decisions. The new species include two frogs, 23 ants, three beetles, eight wasps, 11 spiders, 26 fishes, nine sea slugs, two corals, nine plants, one water bear, and eight new viruses. More than a dozen Academy scientists—along with several dozen international collaborators—described the discoveries.

Proving that our planet contains unexplored places with never-before-recorded plants and animals (with their own set of evolving viruses), the scientists made their finds over five continents and three oceans, ventured into steamy rainforests and plunged beneath the sea, looked in their own San Francisco backyards and traveled to remote islands in Africa. Their results, published in 43 different scientific papers, help advance the Academy's mission to explore, explain, and sustain life on Earth.

"Biodiversity scientists estimate that we have discovered less than 10% of the [species](#) on our planet," says Dr. Meg Lowman, the Academy's Chief of Science and Sustainability. "Academy scientists tirelessly explore the unexplored regions of Earth—not only to discover [new species](#), but also to uncover the importance of these species to the health of our natural systems. Our findings help inform [conservation decisions](#) meant to sustain the future of life for our children and grandchildren.

Even in our own backyards," she adds, "new discoveries abound."

Below are a few highlights among the 102 species described by the Academy in 2015.

## **Tiny, blood-sucking Dracula ants**

Dr. Brian Fisher, Academy curator of entomology and real-life "Ant-Man," recently discovered six new species of strange, so-called Dracula ants from Madagascar and Seychelles. These tiny, subterranean ants are part of a larger group of fierce predators—the genus *Prionopelta*—known for hunting down prey with dagger-like teeth.

Academy researchers Fisher and Dr. Rick Overson say Dracula ants inhabit much of the tropical world undetected for two reasons: miniscule size and mysterious lifestyle. At 1.5 mm in length and 0.2 mm wide, the new discoveries are barely-visible flecks as thin as two stacked sheets of paper. Unlike the ants that invade picnics and march in broad daylight, *Prionopelta* species prefer underground tunnels and deep, damp pockets of leaf litter on rainforest floors. Some species live their entire lives without a single glimpse of sunlight.

"There is a reason we call these strange *Prionopelta* ants 'Dracula,'" says Fisher, who has worked tirelessly in Madagascar, where five of the six new ant species were discovered, for more than a decade. "They are known to wound the young of their colonies before drinking their blood—called 'hemolymph' in insects. It's a bizarre but fascinating means of distributing nutrients throughout the colony."

Fisher, a fierce advocate for the importance of small animals that support all terrestrial communities, has devoted his life to the study and conservation of ants and biodiversity. By documenting the species diversity and distribution of this "invisible majority," Fisher is helping to

establish conservation priorities for Madagascar, identifying areas that should be set aside to protect the highest number of species. Thanks to a prestigious Fulbright Scholar grant, Fisher will continue his critical, climate-focused research in northern Mozambique in 2016. During this seven-month expedition, Fisher will extend his prolific exploration of African ants to Mozambique's little-known mountain and coastal forests, shedding light on regional arthropod diversity, generating data to inform conservation planning, and surfacing new species along the way.

In related arthropod news: Academy entomologist Dr. Sandor Csz described an incredible 14 new ants (including eight from the genus *Temnothorax*) in 2015 alone, joining eight new sand wasps and three previously-unknown beetles on the insect tree of life.

## **Vogue-worthy sea slugs**

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Two jaw-dropping species from southern Africa—the cartoonishly bulbous *Doto greenamyeri* and dreamy pink-and-orange *Doto splendidissima*—were discovered during a student training expedition led by Gosliner in 2008. In terms of sea slug richness, South Africa's diverse temperate marine environments rival those of nudibranch-packed California.



Academy Research Associate Dr. David Ebert is on a global search for the world's 'lost sharks' -- the little known, or undiscovered, fishes overshadowed by a handful of high-profile charismatic species that only represent a fraction of the sharks in need of protection. Ebert travels the world, working with fellow researchers and students to discover and study these threatened marine species before they disappear forever. In 2015, Ebert described a new species of electric 'torpedo' ray from the cool waters of the southeastern Atlantic. The newly discovered electric ray-- *Tetronarce cowleyi*--is a shiny black-topped, cream-bottomed predator that glides along the seafloor (seen at depths of nearly 500 feet), feasting on bony fishes and small sharks. Torpedo rays earn their names from a potent ability to stun or paralyze prey with an electric discharge from organs located on their heads. 'Torpedo rays have an amazing set of defenses,' says Ebert, who named the new species for Dr. Paul Cowley, a South African ichthyologist and frequent collaborator who assisted in the discovery. 'These rays can discharge a powerful electric shock of 45 volts--enough to knock down a

human adult!' Credit: © David Ebert

Three of this year's new nudibranchs were discovered during the Academy's late-spring expedition to the Philippines.\* This multidisciplinary expedition zeroed in on the Verde Island Passage—the veritable treasure trove of marine life nestled between the Philippine islands of Luzon to the north and Mindoro to the south. Though the Verde Island Passage houses wildly diverse marine habitats, Gosliner says one spot "shines like a beacon" for sea slug experts on the lookout for new species.

"This remarkable stretch of coral rubble was carpeted in colorful nudibranchs—we discovered more than 40 new species," says Gosliner, who reported that most slugs, including the three formally described new Philippines species, he encountered in the region appeared entirely new to science. "It was like an underwater Easter egg hunt. It was one of the most exciting scientific dives of my 50-year career."

The scientists were pleased to find live specimens of a nudibranch—*Chelidonura alexisi*—initially discovered during the Academy's 2011 expedition. Gosliner based his nearly published species description on examinations of a deceased specimen, and the live, speckled nudibranchs provided valuable additions to the official species description.

"I was able to submit new details about *Chelidonura alexisi*—what it looks like, how it lays eggs, and how it varies within its species—literally two weeks before the study came out," says Gosliner. "It's thrilling to return to such an incredibly diverse region year after year. Whether we're finding new species or adding to our understanding of previously known creatures and habitats, these expeditions help us pinpoint how

and where to focus protection efforts."

## **"Lost sharks" and an ancient fossil plankton-feeder**

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In 2015, Ebert described a new ghost shark from New Zealand, a deep-sea ("dusky snout") catshark from the southwestern Indian Ocean, and a new species of electric "torpedo" ray from the cool waters of the southeastern Atlantic. The newly discovered electric ray—*Tetronarce cowleyi*—is a shiny black-topped, cream-bottomed predator that glides along the seafloor (seen at depths of nearly 500 feet), feasting on bony fishes and small sharks. Torpedo rays earn their names from a potent ability to stun or paralyze prey with an electric discharge from organs located on their heads.

"Torpedo rays have an amazing set of defenses," says Ebert, who named the new species for Dr. Paul Cowley, a South African ichthyologist and frequent collaborator who assisted in the discovery. "These rays can discharge a powerful electric shock of 45 volts—enough to knock down a human adult!"

In more ancient news: Dr. Douglas Long, Academy Research Associate, helped describe a previously unknown group of sharks—called *Pseudomegachasma*—that roamed the oceans approximately 100 million years ago. This "new" fossil shark, dubbed the "False Megamouth," is the oldest known plankton-feeding shark in the fossil record.

Long and a team of fossil shark experts described *Pseudomegachasma* from shark tooth fossils pried from old rock in Texas and Russia. Though tooth fossils are the only shark specimens built to survive millennia underground, they tell expansive stories about long-dead animals they belonged to, and shed light on ancient conditions in the warm, shallow oceans of the mid-Cretaceous period. The presence of large plankton-feeding sharks shows that ocean conditions during that period were able to support large plankton populations, and prompts scientists to continue exploring the evolution of plankton-feeding as it relates to changing ocean environments.

## Ten armor-plated goblin spiders, plus a musical tribute





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Arachnologist Dr. Charles Griswold, Emeritus Curator, attributes this year's discovery of ten new species of microscopic goblin spiders to decades of fieldwork on the island nation of Madagascar. When Griswold and a team of Academy insect and arachnid experts first began exploring the dark, damp leaf litter of Madagascar's forests in 1993, they had no idea their expedition would morph into more than 20 years of research, educational outreach, and at least 100 new species of goblin spiders to date. Though the forest floor is literally teeming with this group of light-averse spiders, they were unknown in the region before Griswold's first expeditions in the 1990's.

"Small-but-mighty goblin spiders are extremely unusual," says Griswold. "Unlike most spiders that spin webs above the ground and hunt above the leaves, these goblins exist in darkness. They use their tough armor to bulldoze their way through the substrate, parting leaves and soil as easily as a fish moves through water. In that way, they are more like beetles and cockroaches than spiders."

Griswold's research has helped reveal an entire world that thrives in the

leaves and soil of Madagascar's remaining natural forests. Measuring in at only 1 to 2 mm long, goblin spiders are one of the country's most important predators on the forest floor. Patient researchers collect these barely-visible crawlers by hand, or allow them to drop into jars from cloth tunnels edged with delicate screens. Their strange anatomy comes alive under the microscope in Academy labs.

Scientific discoveries—from small ants and spiders to new tropical plants—help inform regional conservation work by cataloguing "what lives where," and highlighting the important connections between species large and small in every ecosystem. Griswold says there is "plenty left to explore and protect" in Madagascar and other tropical nations facing unprecedented habitat and climate threats.

Farther away in southern Chile, Griswold and former Academy postdoctoral Fellow Dr. Lina Almeida named a brand new spider after famed violinist (and Almeida's musical hero) Joshua Bell. *Emmenomma joshuabelli* hails from a larger spider group where males communicate via vibrations from an organ called the stridulatory apparatus. Almeida says the vibrations can be translated into sound for research, adding that scientists are "curious to know what kind of 'music' these spiders play."

## **New viruses**

Eight 2015 Academy discoveries defy traditional "plant" or "animal" classifications. Academy curators—Drs. Shannon Bennett (microbiology) and Jack Dumbacher (ornithology and mammalogy)—recently discovered several new viruses in Californian mosquito specimens and one ill Alaskan bird. Because viruses are too small to see, scientists use other tools, including their unique genetic sequences, to classify them first into known major virus types (e.g.: Bunyavirus, Narnavirus, etc.) and later into species as more about their biology is revealed through extensive follow-up studies.

Bennett studies infectious diseases that can be transmitted from animals to humans. While invisible to the naked eye, these microbes have a major impact on global human health. The race is on to understand how they work so scientists and public health officials can develop new defenses against infection and prevent future epidemics. Bennett and a small Academy team identified seven new viruses found in mosquitoes collected in Northern California. Though these viruses were found specifically in mosquitoes and it is not known whether they infect other organisms, Bennett's team grouped the new viruses into larger groups known to infect humans using the information encoded in their genomes.

"Our work suggests that a lot of virus groups that infect humans or other animals also include viruses that infect mosquitoes only, implying some degree of shared ancestry," says Bennett. "If we want to know how viruses make the jump from other species to humans, we have to rigorously explore where these pathogens come from. Sequencing mysterious new viruses found in mosquitoes is an important first step."

Provided by California Academy of Sciences

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