



# Canyon Chatter

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Murphy JC. 2023. Have you ever seen a  
toothpick grasshopper? Canyon Chatter  
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# Have you ever seen a toothpick grasshopper?

## Species described from Madera Canyon & the Santa Rita's

John C. Murphy

Ask this relatively simple question, how many species are there? And the answer often given is 8.7 million species. This is because of a popular paper by Mora and colleagues (2011). But, many other papers before and after have provided estimates that vary dramatically with, no real satisfactory answers.

The number of species on the planet remains uncertain. About 1.5 million species have been described and named. Many researchers have tried to estimate the number of species, with results ranging from 5.3 million to 1 trillion.

Arthropods (they have exoskeletons and jointed legs) are the most abundant group of animals on the planet and much of the effort to estimate the number of species has focused on them. In 1982, American entomologist and curator of the beetle collection at the Smithsonian National Museum of Natural History, Terry Erwin sprayed one hectare (about 2.5 acres) of the canopy of a seasonal Panamanian rainforest and collected the beetles that fell out of the trees. He found about 1200 species, 163 of those species live on a single species of tree. Based on this

data Erwin estimated Panama has 41,000 species of arthropods and extrapolated this number to 30 million arthropods globally.

Thus, we don't have a good estimate of the number of species found on the planet. But how many species could exist in a small area; say, Arizona's Madera Canyon? The Canyon is popular with birders, insect collectors, herpers (those interested in amphibians and reptiles), and botanists.

I decided to investigate a slightly different question, how many species have been described from Madera Canyon. This would mean how many species have their holotype, syntypes, or paratypes from Madera Canyon? Type specimens are the specimens used to describe a new species. The type locality or localities is/are where those species came from.

Searching Internet databases for a few days I found 170 candidate species that may have their original descriptions from specimens collected in Madera Canyon. On my list, the first species described from the canyon seemed a likely place to start. My database suggested *Conchylis fulvotinctana*



Figure 1. Snow's Toothpick Grasshopper. Photographed in a grassland on the east side of the Santa Rita's at 5200 ft ASL. Photography by John C. Murphy.



Figure 2. Eugene A. Schwartz, perhaps the first natural history collector to visit Madera Canyon is shown seated on the right. The image shows the Entomology staff of the Division of Insects, United States National Museum. A bank of storage cabinets containing trays are along the back wall. Some large specimens including a head showing teeth of an animal are lying on a shelf on the left. A tall ladder leans against storage units on the right. Image ca 1905. Smithsonian Institution Archives, Record Unit 7323, Systematic Entomology Laboratory Records, Image No. SIA2015-002670.

Walsingham, 1884 was likely the first species described from the canyon. The two words in italics form the scientific name of the species. “Walsingham, 1884” is the name of the person who described the moth, and the year it was described. This is a moth in the family Tortricidae commonly known as tortrix moths or leafroller moths, and globally the family has over 11,000 described species. Today, this moth is known as *Mimcochylis fulvotinctana* (Walsingham, 1884). The name of the person and date of description are now in parenthesis indicating that the species has been reassigned to a different genus than the one it was originally assigned.

Walsingham’s actual name was Thomas de Grey, and he was the 6th Baron of Walsingham and an amateur lepidopterist, who collected butterflies and moths from a young age. When I checked the original description, the two specimens (the syntypes) were simply labeled as being from Arizona with no specific location. However, the species is known from the Sierra Vista and Tucson areas and it could very possibly be in Madera Canyon.

Second on my list was the orb weaving spider, *Araneus arizonensis* Banks, 1900. Again I hit a dead end. The type locality was Arizona, with no specific location. However, Nathan Banks was prolific, he authored 440 publications and described over 425 species.

Banks worked for the United States Department of Agriculture and Harvard’s Museum of Comparative Zoology. In a 1901 paper Banks examined 55 species of arthropods collected by Eugene Schwartz. Included was the description of *Chelifer hubbardi* Banks, 1901, the third species on my list. This species belongs to a poorly known group of arthropods known as pseudoscorpions. Bank’s species is now known as *Parachelifer hubbardi* (Banks, 1901) since it is now placed in a different genus the authors name and date of description are in parenthesis. It has three type localities: Catalina Springs, Santa Catalina Mountains, Pima County, Arizona, USA; Madera Canyon, Santa Cruz County, Arizona, USA; and Oracle, Pinal County, Arizona, USA. So, the pseudoscorpion *Parachelifer hubbardi* (Banks, 1901) was the first species described from Madera Canyon. Based on the information I have to date.

Eugene A. Schwarz (1844-1928) visited Madera Canyon and the Santa Rita Mountains in June of 1898. Schwartz was a compulsive collector and sent packages of plants, insects, and arachnids almost daily to the Smithsonian and the United States Department of Agriculture. Schwartz’s journals and diaries are online but they are opaque – some are written in a mosaic of French, German and English; they re-

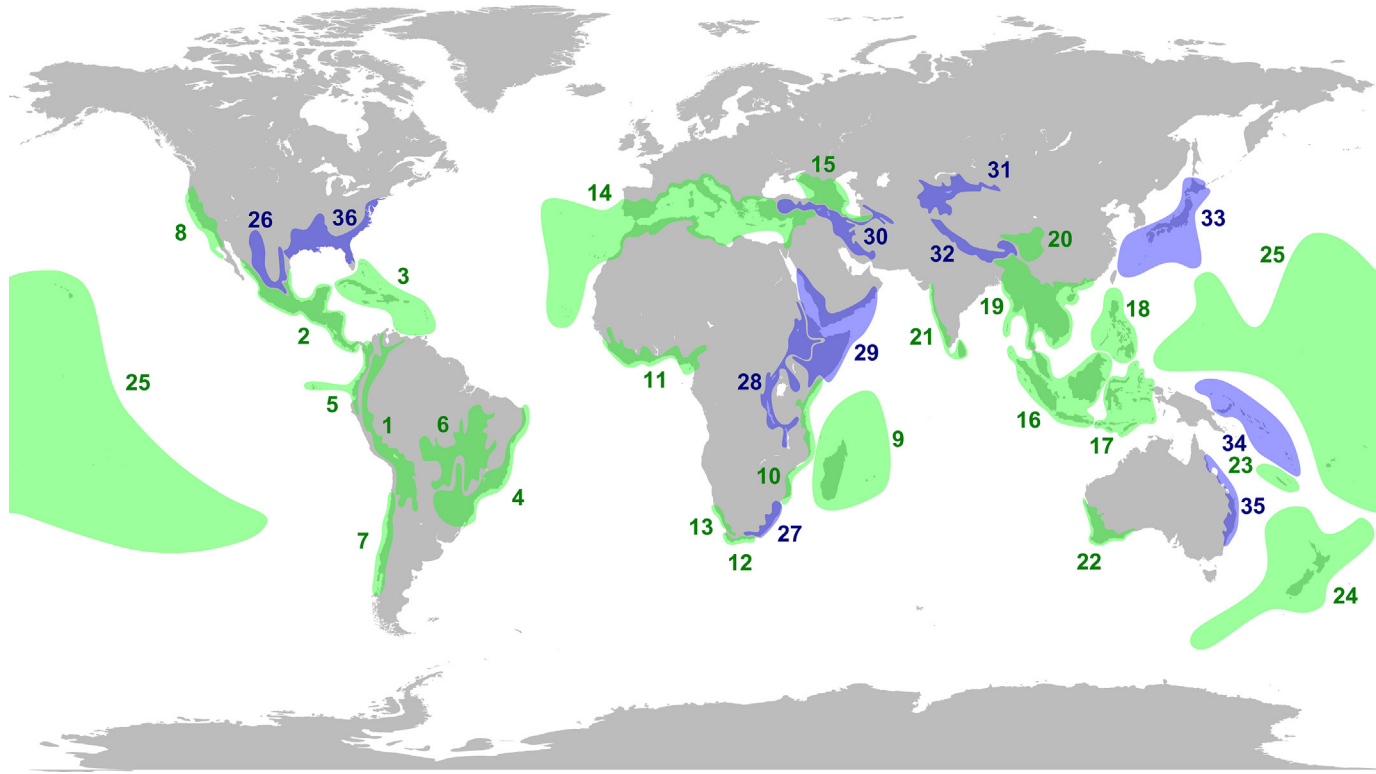


Figure 3. The globe's biodiversity hotspots are shown in this map. Madera Canyon and the Santa Rita's are in the Madrean Pine-oak Woodlands (Number 26). The twenty-five biodiversity hotspots (green) as indicated in Myers, N., et al. (2000) "Biodiversity hotspots for conservation priorities." *Nature* 403:853–858. doi:10.1038/35002501 1. The Tropical Andes 2. Mesoamerica 3. The Caribbean Islands 4. The Atlantic Forest 5. Tumbes-Chocó-Magdalena 6. The Cerrado 7. Chilean Winter Rainfall-Valdivian Forests 8. The California Floristic Province 9. Madagascar and the Indian Ocean Islands 10. The Coastal Forests of Eastern Africa 11. The Guinean Forests of West Africa 12. The Cape Floristic Region 13. The Succulent Karoo 14. The Mediterranean Basin 15. The Caucasus 16. Sundaland 17. Wallacea 18. The Philippines 19. Indo-Burma 20. The Mountains of Southwest China 21. Western Ghats and Sri Lanka 22. Southwest Australia 23. New Caledonia 24. New Zealand 25. Polynesia and Micronesia An additional eleven hotspots (blue) have since been added. 26. The Madrean Pine-Oak Woodlands 27. Maputaland-Pondoland-Albany 28. The Eastern Afromontane 29. The Horn of Africa 30. The Irano-Anatolian 31. The Mountains of Central Asia 32. Eastern Himalaya 33. Japan 34. East Melanesian Islands 35. The Forests of East Australia 36. North American Coastal Plain

See also Lamoreux, J. F., et al. (2006) "Global tests of biodiversity concordance and the importance of endemism." *Nature* 440:212–214 doi:10.1038/nature04291

Pimm, S. L., et al. (2014) "The biodiversity of species and their rates of extinction, distribution, and protection" *Science* 344:–6187 doi:10.1126/science.1246752.

cord his daily activities while in the field and occasionally contain sketches of specimens or parts of specimens. Three languages is bad enough but his penmanship is often impossible to decipher.

The description of a new species requires several pieces of information: it needs to be based upon at least one specimen (known as the holotype, if the description is based on more than one specimen, they are called syntypes). Where the holotype or syntypes came from is known as the type locality. A new species is valid when the name becomes available to use in zoological publications – with the date of publication in a scientific manuscript, either as part of a book, or as a paper submitted to a scientific journal.

A scientific species description must fulfill several criteria laid out in the International Code of Zoological Nomenclature (ICZN). The species must be based on at least one type specimen (the holotype) or multiple specimens (syntypes). The species name needs to be clear and unambiguous.

The International Code of Zoological Nomenclature (ICZN) suggests names should be compact, euphonious, memorable, and do not offend. Scientific names are written using the letters of the Latin alphabet, but many species names are based on words from other languages and Latinized.

The actual description of the organism would include a written morphological de-

scription, measurements, photos, illustrations, and in the 21st century genetic sequences. Searching the literature for new species descriptions with holotypes from Madera Canyon was a challenge – but one made relatively easy thanks to the Internet, Google Scholar, and the online databases VertNet and GBIF. Within a few days I discovered 101 species with type localities in Madera Canyon. After a few more days I had boosted the number to 170 species.

Why is this important? It shows that a relatively small area can provide significant insight into the workings of the biosphere and the evolution of life. As I worked through the list checking for the exact type localities, I found 108 species with type specimens collected in Madera Canyon in the last 123 years.

### So, what about that Toothpick Grasshopper?

A couple of friends visiting from the east coast wanted to see and photograph as many species of rattlesnakes as they could in about six days. Both work for state conservation departments and both work on endangered species. Arizona has more species of rattlesnakes than any other state. While visiting localities where I had seen rattlesnakes in the Santa Rita's I glimpsed a green-brown insect that looked unfamiliar. Note that this was after I had

started looking for species described from the Canyon and the Santa Rita's. After capturing the insect, I realized this was one species with a type locality in the Santa Ritas.

Snow's Toothpick Grasshopper, *Procororypha snowi* is shown in Figure 2. James A. G. Ren of the University of Kansas described this grasshopper in 1911. The description was based upon a pair of grasshoppers collected in the Santa Rita's between 5000 and 8000 feet. No specific type locality was given. Ren named the new animal after Francis Hunting Snow. Between 1876 to 1901 Snow led 26 scientific expeditions, many times accompanied by his students. He supervised the collection and classification of thousands of insects, birds, reptiles as well as plants. As one newspaper described it, Snow "did not seem to be satisfied to rest until he had ascertained the name, age, sex, color and previous condition of every bug, moth and butterfly between the Mississippi and Rocky Mountains." Because of his enthusiasm for natural history, Snow's nickname was "Driven Snow."

### **Biodiversity Hotspots**

The sky islands are frequently described as biodiversity hotspots. There are 25 hotspots around the globe. Qualifications to be a hotspot include: being threatened with destruction, having already lost 70% of their original habitat, containing 1,500 endemic species of vascular plants, and having 30% or less of its natural vegetation.

Hotspots have 1.4 percent of the planet's land surface yet support nearly 60 percent of the world's plant, bird, mammal, reptile, and amphibian species. Figure 3 shows the planet's hotspots. You will note that most readers of this article live in or close to the Madrean Pine-Oak Woodland hotspot.

Biodiversity, is declining at rates unprecedented in human history, a leading intergovernmental scientific panel on biodiversity projects a million species are threatened with extinction, many are disappearing now and most of that million will be extinct within decades. The United Nations Convention of Biological Diversity met in December of 2022 in Montreal and was signed by more than 190 countries. The Kunming-Montreal global biodiversity framework contains a pledge to protect nearly one third of land, fresh-

water and seas by 2030, the framework also includes an agreement to reform \$500 billion of subsidies that are harmful to nature, and to increase biodiversity financing to developing countries.

Why should we be concerned about the loss of biodiversity?

Simply biodiversity is the life support system for the planet and humans are primary drivers of its destruction. We all need to work towards protecting nature and we do that by getting people to appreciate the tooth-pick grasshopper.

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JCM is also a Research Associate at the Field Museum (Chicago) in the Zoology Department and has authored books that can be viewed at:

<https://fieldmuseum.academia.edu/JohhCMurphy>

He is also a member of the International Union for the Conservation of Nature, Snake Specialist Group. John serves as a Board member of the Friends of Madera Canyon. Education: BS zoology, Southern Illinois University (Carbondale); MS in Environmental Science (animal behavior and ecology) from Governors State University (University Park, IL).