# New species of crocodile discovered in museum collections

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A member of the newly-described species of croc, living at a zoological park in Florida. Credit: © American Society of Ichthyologists and Herpetologists

By this point, scientists have a pretty good handle on what kinds of big animals exist. Researchers still turn up new species of rats and insects, but most animals bigger than your hand are old news. But by looking at 90-year-old crocodile skulls in museum collections and double-checking with live specimens at a zoological park in Florida, researchers have just discovered a new species of ten-foot-long croc.

The new crocodile, described in the journal *Copeia*, is from New

Guinea, the bigger-than-Texas tropical island just north of Australia. Scientists had known that New Guinea was home to a unique species of crocodile since the New Guinea Crocodile was officially described in 1928, but since then, researchers have wondered if the island was actually home to two separate species, one in the north and one in the south. This new study answers the question: yes.

Chris Murray, Assistant Professor at Southeastern Louisiana University, and Caleb McMahan, scientist at the Field Museum, started the project after hearing a talk in 2014 that posed questions that they had already been considering. That talk was essentially soliciting help in carrying on an unfinished investigation into these crocodiles that had been kicked off by another curious scientist, Philip Hall. Hall, a University of Florida researcher who passed away before his work could diagnose the distinctions among these crocodiles, had spotted key differences in the way the two groups of crocs nest and mate. This groundwork laid by Hall peaked the interests of McMahan and Murray, whose research focuses less on animal behavior and more on the subtle variations that can be found on different animals' skeletons. What excites these two is how an analysis of small details can reveal a big enough difference between animals to separate them as species.

"Chris does a lot of work on crocodilians, and I do a lot of evolutionary work, often with morphology, or the animals' physical features. Chris studies morphology too, so it was continuing along with a lot of the projects we were doing, but then lo and behold, it's this brand new crocodile species," says McMahan, a senior author of the paper.

Senior author Caleb McMahan examining crocodile skulls in the Field Museum's collections. The one in his left hand is *C. novaguinea*, and the one in his right is the new species, *C. halli*. Credit: Kate Golembiewski, Field Museum

Murray and McMahan examined 51 so-called *Crocodylus novaeguineae* skulls, analyzing differences between crocodiles that lived in the northern and southern parts of the island. To get 51 New Guinea crocs, the researchers had to look at specimens from seven different museum collections: the Field Museum, Louisiana State University Museum of Natural Science, Florida Museum of Natural History, American Museum of Natural History, Museum of Comparative Zoology at Harvard University, Queensland Museum, and Smithsonian National Museum of

Natural History.

Murray, the paper's lead author, notes that access to these collections "highlight the beauty of natural history museums. We didn't have to go to Papua New Guinea and collect a bunch of specimens, which would have been incredibly difficult anyhow, and very expensive."

"There are new species out there but a lot of them are sitting in drawers and cabinets in museums, and it just takes time to look at them and figure that out," says McMahan.

After an extensive analysis of these hulking skulls scattered throughout the world's collections, the team capped off their research by visiting the St. Augustine Alligator Farm Zoological Park in Florida. They wanted to see if the stark differences found in their research were as recognizable to the eye as they were within the data. "They have live individuals of what's called *novaeguineae*, and we were able to look at those and say, 'Oh yeah, this matches the north and this matches the south!' I thought that was super cool," says McMahan. After spending so much time on their analysis, the visual differences between the two species are easily recognizable to them in living crocs as well as skull specimens. "We could even look at a skull that they had there and tell what river it came from. So our analyses really did a good job at teasing apart where these things are from," adds Murray.


A skull from the new crocodile species. Credit: © American Society of Ichthyologists and Herpetologists

The northern and southern crocodiles proved different enough that the researchers were able to declare the ones from the south separate species, named *Crocodylus halli* for Philip Hall, the late scientist who sowed the seeds for the project. The team adds that understanding these populations as separate species opens the door for more thorough conservation assessments. "It could be that when we consider crocs on the whole island, they might be okay, but if we start looking at a species north of the highlands and one south of the highlands you might find more habitat degradation and population threats in one over the other. This highlights the importance of attention to ecology and conservation for both lineages," says McMahan. Similar work will also have to be

done in accurately identifying populations within zoos around the world.

This long-coming discovery would not be possible without an energetic, culture of collaboration within the team and the broader scientific community. McMahan and Murray see their work as part of a broader effort to distinguish these two crocodiles, and are happy that their analysis couples well with Hall's previous work. "The nice thing is that here we've got differences in the morphology, we've got ecological differences, they're separated by a mountain range, I think the synthesis of all of that is what really builds the case that these two crocodile entities are very different from each other," says McMahan.

Naming the crocodile came easy to the researchers, who were eager to honor the scientist who kicked off the investigation into the animals. "I think it was really special for me in particular, I've been reading his work since the beginning of my career in academia, in my first year as a Master's student, so to come full circle and help contribute to his work was meaningful," says Murray. "Being able to name the thing that he initially pondered after him was even more meaningful."

The team also notes that their passion is in the curiosity of new questions and executing the methodology of the work. There was no expectation of a new species discovery, just an earnest continuation of Hall's investigation. "For us, given the awesome ecological work and investigative work that Hall did on these crocs, it seemed fitting to name this new species after him," says McMahan.

Provided by Field Museum