Researchers use epigenetics to determine the age of dolphins

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Ph.D. student Andria Beal and researcher Jose Eirin-Lopez in FIU's Environmental Epigenetics Lab. Credit: Florida International University

Can you tell the difference between a young dolphin and an old one? Neither can scientists—not without pulling a tooth, sawing it in half and

counting the growth layers like the rings of a tree.

But that process isn't pleasant for anyone, especially the dolphins. It's also expensive and a complicated. This kind of information is important, though. Age isn't just a number. It's a critical part of learning more about the overall health of a population.

That's why Florida International University (FIU) researcher Jose Eirin-Lopez and Ph.D. student Andria Beal created and developed a tool that can determine a dolphin's age through a small skin sample. The less-invasive Bottlenose Dolphin Epigenetic Age Estimation Tool—or BEAT—gets rid of the guess work.

Epigenetics is a rapidly growing field of science that explores how living organisms interact and respond to their environment. DNA is the rulebook or manual for life, the genome. It is divided into different sections. Some cells will only use instructions in specific sections. Environmental factors, such as light, temperature, stress or even famine, control what chapters will be used at different times of life. The bookmarks in this rulebook—guiding how the rules are read and what adaptations happen in response to the changes—are the epigenetic markers.

Eirin-Lopez and his team used these epigenetic markers to figure out the age of common bottlenose dolphins. They collected about 50 DNA samples from dolphins at the Mote Marine Laboratory in Sarasota, Fla. that had known ages, so the team could search for epigenetic markers associated with the aging process. They found two specific genes—and corresponding marks on those genes—that allowed them to pinpoint the age of the dolphins.

"If there are a lot of older individuals, it will impact the population and their chance for survival," Eirin-Lopez said, who oversee FIU's

Environmental Epigenetics Lab. "At the same time, if there are a lot of young individuals, they are more susceptible to predators. A more even distribution of different ages means the population will be more effective."

For researchers like marine biologist Jeremy Kiszka, age has always been the missing piece of the puzzle.

"This is really exciting for us," Kiszka said. "With a simple biopsy I can have something that I have needed for years in my research to better understand how a dolphin's diet changes with age and how age affects pollutant levels in their tissue."

Beal will be implementing BEAT for the first time in Naples, Fla. with a population of dolphins with unknown ages. She's also exploring how to expand this testing process to other marine mammals. Sharks, for example, *never* tell their age. Currently, the only way to find out a shark's age is by examining its dead remains.

"I'm currently working on a proposal to get the funding to do this work with sharks," Beal said. "It's going to be a huge undertaking and more exploratory and we're going to essentially start the process from scratch, because we don't know what genes correlate with age and don't have a reference point."

This new technology would have larger implications for FIU's current work using DNA testing to determine which species of shark are most common in the fin trade. It would allow for a broader understanding of just how many younger sharks from already devastated populations are being killed.

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More information: *Frontiers in Marine Science*, DOI: 10.3389/fmars.2019.00561 , www.frontiersin.org/articles/1 … .2019.00561/abstract

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