SCIENCE

The Extremes a Walrus Will Go to for Love

In pursuit of a mate, Sivuqaq produced such stupendously loud sounds that researchers had to understand how they worked.

By Katherine J. Wu

Colleen Reichmuth

JUNE 29, 2021

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When Sivuqaq the walrus wanted a mate, he let it be known, loud and clear.

Each year, as winter turned to spring, the marine-animal center at Six Flags Discovery Kingdom in Vallejo, California, would reverberate with his come-hither calls—a nonstop orchestral mélange of whistles and warbles, barks and bellows, even clacks and clangs. The serenades emerged not just from Sivuqaq's mustachioed mouth, but also from his nose and flippers and chest, as well as from the ballooning pouch buttressing the back of his head. Sivuqaq was a one-walrus ensemble, an entire marching band; to maximize his shot at sex, he used his entire body to sing.

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His sounds ranged from rumbling to metallic, industrial, and almost unbiological. Some resembled the woody clunk of knuckles rapping on a door; others, the soft ringing of a gong. At times, Sivuqaq would simply clap underwater for hours on end, banging his flippers together at one-second intervals to generate a sort of metronomic thunder, each peal intense enough to clock in at 200 decibels. "It's right up there with the very loudest biological sounds ever recorded underwater," says Colleen Reichmuth, a biologist at UC Santa Cruz who worked with Sivuqaq from his adolescence until about the time of his death, in 2015.

His ballads lasted for days, weeks, months—morning, afternoon, and night—the entirety of his mating season, in an attempt to attract the attention of Uquq and Siku, the two lovely ladies who shared his enclosure. So dedicated was Sivuqaq to his craft that he would often skip meals in service of his song; in the lead-up to breeding time, his caretakers would bulk him up with a few extra pounds, "just in case," Holley Muraco, a walrus expert and reproductive biologist who worked with Sivuqaq for five years, told me. "He was just so into what he was doing."

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Colleen Reichmuth and Ole Larsen

The dedication paid off: Lured in, perhaps, by his grunts, groans, and gravitas, Uquq and Siku—Uquq especially—would chirp a few notes in return, sidling up to Sivuqaq, gripping his flanks, nuzzling up against his neck. "The girls loved him," Muraco said. "There was never really a time that he did not get them to come over."

To his human attendants, Sivuqaq's calls had a different appeal: His hearty hubba-hubbas remain some of the best insights Western scientists have into the love lives of walruses. (Native villagers and fishers, whose history has long intertwined with these hulking animals, have made many intimate observations that others have not.) Walruses typically inhabit the frigid, inaccessible seas fringing the North Pole, "a very hostile environment for us," Tony Fischbach, a walrus expert at the Alaska Science Center, told me. The creatures' intricate arias, some of the longest and most complex mammalian mating displays known to science, are thought to help "telegraph their size, their physical capability to potential mates," Fischbach said. They can be heard from miles away, but have rarely been witnessed up close.

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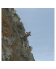

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Sivuqaq helped close that knowledge gap. He lived, admittedly, an un-walrus-y life, having been brought to Vallejo as an orphan calf in 1994. Nestled in Earth's mid-latitudes and in the constant company of humans, he spent his days training with keepers, entertaining the amusement park's many patrons, and, on occasion, lending his vocal stylings to creatures in the *Jurassic Park* and *Lord of the Rings* films. (He also famously nabbed a starring role alongside Adam Sandler in *50 First Dates*.)

But when Sivuqaq hit maturity at about age 13, he felt the same biological pangs as his wild counterparts, and began to score the California springs with his strange sexual soundtrack. His astounding underwater claps—so far documented only in captivity—were his "most distinctive behavior," Leah Coombs, a Six Flags walrus trainer who had worked with Sivuqaq since his infancy, told me. The union of his flippers yielded noises so illogically loud that they pierced through gallons of saltwater and inches of plexiglass, drowned out the chatter of park-goers, and reached the ears of people well outside the exhibit where he was housed. "It was an extremely large signal," Reichmuth told me. "It felt like one of those big pile drivers."

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Reichmuth became obsessed with finding the clap's mechanical roots. For three years, she and Ole Larsen of the University of Southern Denmark diligently recorded the walrus's underwater shenanigans, carefully parsing his motions and matching them up with the sounds he produced. Sivuqaq, they report in a study published today in *Royal Society Open Science*, accomplished his flippery racket through a phenomenon called cavitation.

Cavitation works only in fluid, and it is a fierce process, in which an object moves so quickly through water that it forces bubbles of air to materialize in its wake. "You're getting the liquid to a point where it experiences a phase shift into a gas," Jason Dinh, who studies marine acoustic communication at Duke University, told me. The bubbles then collapse, releasing gobs of energy, and an impulsive, firecracker-like noise. "It's actually about the limit of intensity of a sound an animal can produce underwater," Dinh said. Cavitation is also violent: Boat propellers that cavitate end up seriously damaged. And snapping shrimp, which deploy the maneuver to instantaneously incapacitate their prey, must molt repeatedly to keep their own tissues in fighting form.

Sivuqaq's cavitations were less catastrophic, though they did seem to noticeably callus his right flipper. Shrimp cavitate faster than walruses, but they're also far smaller; the fact that a mammal the size of a sedan manages the feat, which requires some epic speed and precision, is at least as impressive. It's an amazing example, said Dinh, who wasn't involved in the study, of the extreme measures animals will take to get a message across.

Sivuqaq happily performed for both walruses and humans alike. But his most important audience was undoubtedly Uquq and Siku. Reichmuth and the keepers noticed that his clapping intensified in lockstep with his testosterone levels. From late February to May, he'd "get rowdy" and playfully pursue the females throughout the day, she told me. "I believe the clapping was in part to show what a big, strong, amazing walrus he was," Muraco said. At his most boisterous, Sivuqaq would intersperse his coquettish claps with knocks and bells—a seductive trifecta—often sporting, according to Reichmuth, "a giant erection."

Getting captive walruses in the mood isn't tough; seeing reproduction through to the end very much is. Breeding troubles are an increasing concern for researchers, who worry about the fate of the world's walruses as the global temperature climbs and their northerly ice floes ebb. Walruses are mysterious, and rare in more ways than one: The only remaining members of the family Odobenidae, they're the sole envoys left in their lineage. They live and mate in some of the most remote and fastest-disappearing regions on the planet, and we humans still don't have a good handle on many of their essential, life-sustaining acts.

Sivuqaq, who died of heart failure several years ago, never became a parent: Though he and Uquq conceived in 2010, their calf arrived stillborn the next spring. But Sivuqaq's legacy lives on. Thanks to him, researchers now better understand how to collect and study walruses' sperm, and sync their hormones in captivity. His bizarre bodily noises have been immortalized in audio and on film, which Reichmuth and Larsen are still analyzing, in hopes of better understanding two more mating sounds—his hollow, clompy knocks and echoey, percussive bells. He was a born entertainer, his keepers told me, always game to put on a show at the window that separated him from his human fans. Most of them might not have known how rare and powerful a sound they were hearing, but they were always eager to applaud right back.

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