Eavesdropping on Shrimp's Snap Chat

TINY ANIMALS DOMINATE THE UNDERSEA SOUNDSCAPE

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Snapping shrimp look like tiny lobsters, with one front claw larger than the other. The shrimp use the supersized appendage to make their characteristic snapping sound. Below, Ashlee Lillis uses a small, waterproof microphone called a hydrophone to record the shrimp's snapping.

Put your head under water near a coral reef or an oyster bed, said Ashlee Lillis, and you'll likely hear a strange crackling sound.

"It's been described as sizzling or frying fat," said Lillis, a postdoctoral scholar at Woods Hole Oceanographic Institution. "The burning of dried twigs. Coal rolling down a metal chute."

For a long time, no one really knew what the noise was, or where it came from.

"It was attributed to all sorts of things," Lillis said. Sailors thought they were hearing crashing surf, underwater volcanoes, pebbles moving on the sea bottom, or even shipworms gnawing on the wooden hulls of their ships.

In World War II, the ubiquitous crackling sound started interfering with the U.S. Navy's ability to use sonar to detect enemy submarines. That compelled researchers to find its source: vast communities of tiny snapping shrimp.

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"They look more like little tiny lobsters," Lillis said. Snapping shrimp are smaller than your thumb, but like a lobster, they have two front claws, one much bigger than the other. "They have one special snapping claw that is usually at least half the size of their body."

Snapping shrimp, or pistol shrimp, as they're sometimes called, use that supersized appendage to make their distinctive sound. But they do it in a surprising way.

"The shrimp open their claw really, really wide," Lillis said. When they snap it shut again, the force produces what's known as a "cavitation bubble." The bubble expands and then collapses violently, emitting a resounding pop: the shrimp's signature snap.

"It produces a flash of light too," Lillis said. "And for that tiny fraction of a millisecond the bubble gets as hot as the surface of the sun."

An individual snap can be as loud as 220 decibels—much louder than a gunshot—but lasting only a small fraction of a second. The combined snaps of hundreds of shrimp create the underwater crackling heard by divers and mariners.

"They live in such dense aggregations that, even though an individual shrimp may not snap that much, there's a pretty much constant background noise of these shrimp snapping," Lillis said.

In many coastal waters, the shrimp are by far the loudest instrument in a symphony of underwater sounds, dominating the soundscape of marine life. As a result, they may have a big effect on species in their ambient acoustic environment, Lillis said, and play an overlooked, outsized role in how undersea ecosystems function.

"There is evidence that coral reef soundscapes, for example, are really important for navigation and orientation by larval fish and invertebrates, all the way up to adults," she said.

Lillis is studying how and why shrimp snapping varies with location, time of day, water temperature, and other factors, such as whether other shrimp are nearby.

And she is looking into the shrimp's impact on soundscapes. Where shrimp are abundant, their constant snapping could interfere with acoustic communication among other species—as it did with military sonar. Conversely, their pervasive snap-chatter could serve as a helpful sonic cue. ▲

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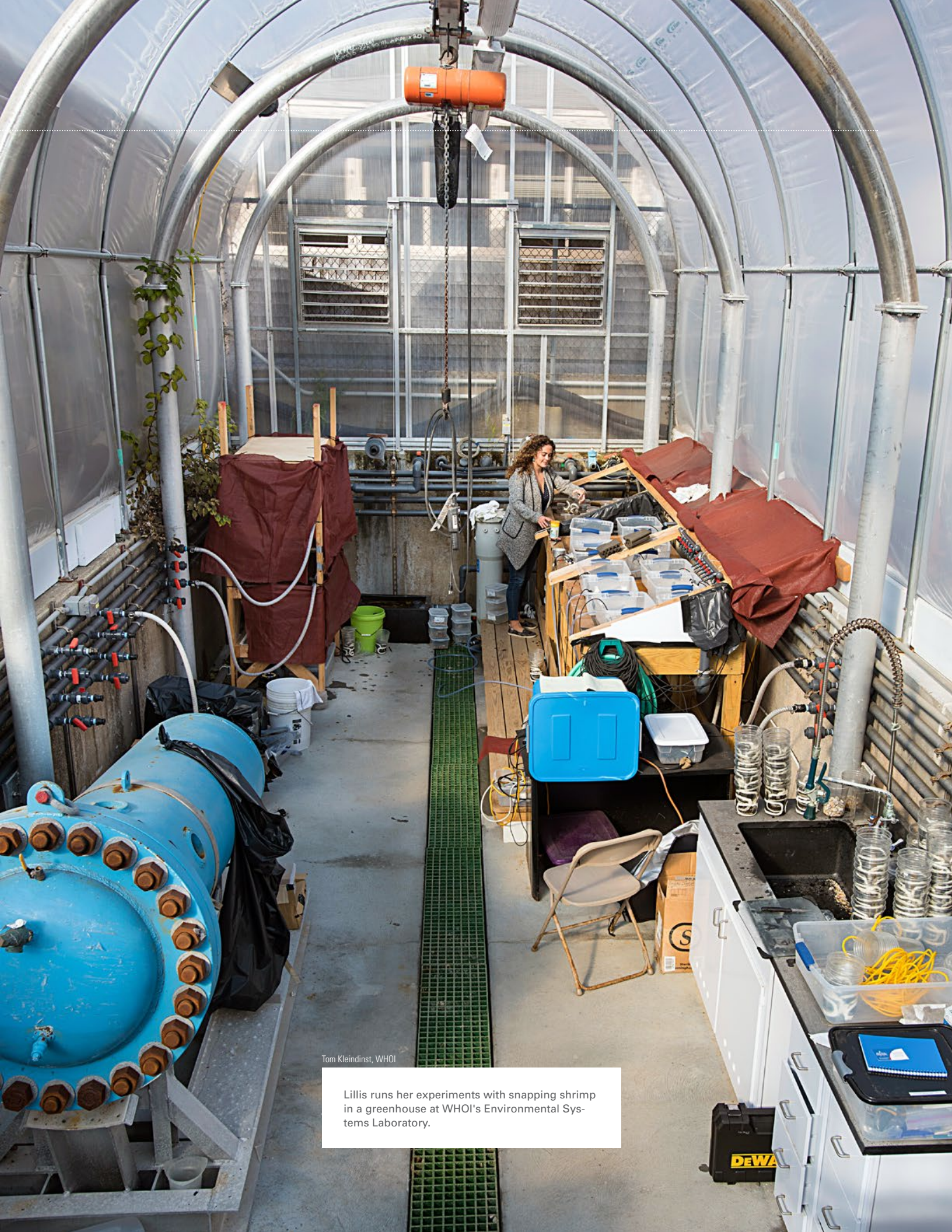

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Lillis runs her experiments with snapping shrimp in a greenhouse at WHOI's Environmental Systems Laboratory.