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Scientists just unveiled “cyborg” cockroaches that can breathe underwater for hours

The bionic bugs could be called up for aquatic search and rescue missions, according to the researchers

BY JACKIE FLYNN MOGENSEN EDITED BY CLAIRE CAMERON



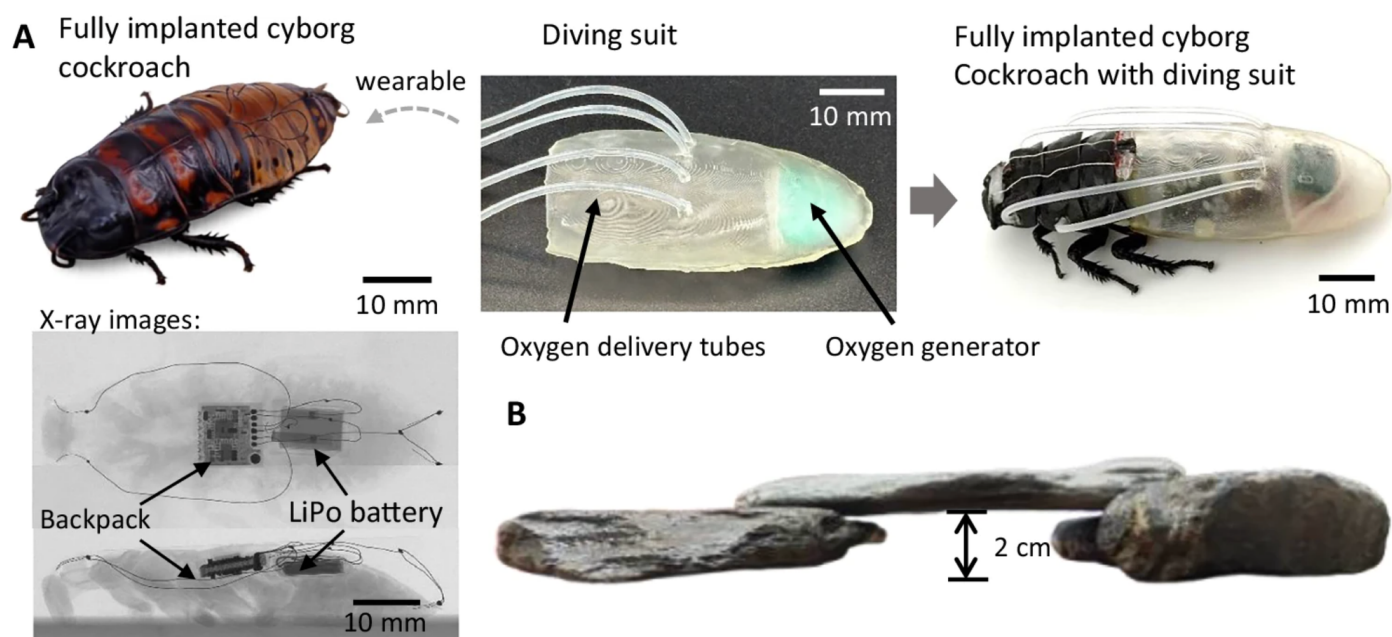
Close-up of the cyborg insect and the new diving suit, which has tubes that connect to the breathing holes of the insect and an oxygen generator mounted at the rear of the suit. NTU Singapore

Animals 

What's more unnerving than a giant cockroach? Perhaps a part-robot, part-insect giant cockroach capable of diving underwater for as much as three hours at a time. In a new study, researchers describe how they made “cyborg” bugs that could help explore aquatic spaces where humans can't safely go, such as flooded areas.

In the study, which was published on Monday in *Nature Communications*, researchers outfitted Madagascar hissing cockroaches—one of the largest species of cockroach in the world—with a “diving suit,” including oxygen tubes and a protective shell. The oxygen tubes, similar to a scuba diver's regulator, attach to the cockroaches' “thoracic spiracles,” or breathing holes, on their bodies.

“By fitting a cockroach, which is a terrestrial species, into this diving suit, we allowed it to survive and operate in oxygen-deprived environments such as underwater, transforming it into an amphibious cyborg robot capable of operation across land and water,” the authors write in the study.



The cockroach "diving suit" (A) and a constructed crevice (B) From: "Underwater Suit-Wearing Cyborg Insect Capable of Hours-Long Diving and Terra-Aqua Travel" by Zifu Fan et al., in *Nature Communications* 2026

The “cyborg” insects’ size and low energy demands could make them helpful in accessing hard-to-reach areas, such as [the inside of pipelines](#), or in disaster environments, such as in the aftermath of floods, according to the authors.

Cockroaches are among the “most promising” insects for this task, they say, because of their “[robustness](#).” Madagascar hissing cockroaches can grow to be as large as about 7.5 centimeters—about the length of an adult human’s finger—and live [up to five years](#). But the technology could also one day be applied to other insects, such as locusts and beetles, the authors write.

Disaster sites, such as flooded areas, can be hard or dangerous for humans to navigate, said Hirotaka Sato, the senior author on the paper and a professor in the School of Mechanical and Aerospace Engineering at Nanyang Technological University, in Singapore, [in a statement](#). Particularly if roads and other “access routes” get blocked by water and debris.

“By expanding the operating parameters of our cyborg insects to include underwater travel, we believe that they can enhance search and rescue efforts,” Sato said.

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[JACKIE FLYNN MOGENSEN](#) is a breaking news reporter at *Scientific American*. Before joining *SciAm*, she was a science reporter at *Mother Jones*, where she received a National Academies Eric and Wendy Schmidt Award for Excellence in Science Communications in 2024. Mogensen holds a master’s degree in environmental communication and a bachelor’s degree in earth sciences from Stanford University. She is based in New York City.

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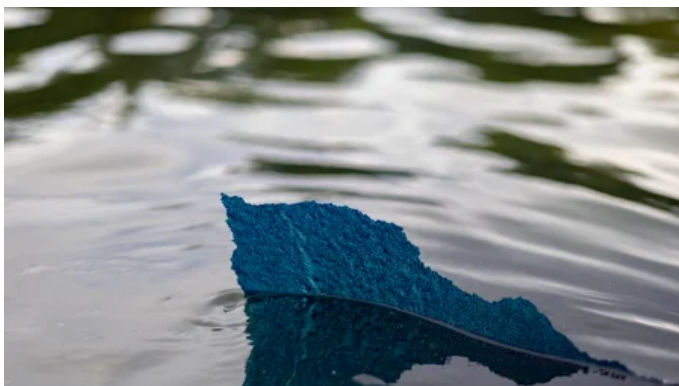


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