

Prosthetics Spinoff a Reel Success

by Paulette Campbell

When members of the Revolutionizing Prosthetics 2009 team gathered on Maryland's Eastern Shore last spring to kick off the second phase of their ambitious effort, they took **Jesse Sullivan** — a double amputee — fishing.

The APL-led team is in the fourth year of a project funded by the Defense Advanced Research Projects Agency (DARPA) to create a prosthetic arm that looks and is controlled like a natural limb. The 63-year-old Sullivan, who lost both arms in an electrical accident, is an important part of the effort.

"Before the accident, Jesse loved fishing and camping," says APL's

Matt Kozlowski, of the National Security Technology Department, who worked closely with Sullivan on the first "RP" prototype.

"On that fishing trip I said, 'how about next year you actually fish instead of watch?'"

I promised him that I would build him a reel so that he could fish for stripers during trophy season."

One year later, Kozlowski and other members of the RP 2009 team from the Biomedicine Business Area delivered on that promise, creating a motorized fishing reel that Sullivan could operate in the same way he operates a prosthetic arm. And on May 1, Sullivan went troll fishing on the Chesapeake Bay and caught a 32-inch rockfish.

"It was truly a historic moment," Kozlowski says, made even more amazing by the fact that the busy team took the reel from design to product in less than a week.

After Kozlowski came up with the concept, others in NSTD stepped up to make it happen. **Charles Schuman**,

Howard Conner and **Matthew Johannes** immediately began building hardware, gathering stock, machining parts and performing the rapid integration and rework.

Troll fishermen set up several lines at once; when one line indicates a fish has been caught, anglers rush to wrestle it in. So Kozlowski's team had to create a universal system that could be snapped into place and adjusted immediately when a line hooked a fish.

"We designed and built an electromyography-controlled fishing reel motor that would fit any of the rods on the boat," he explains. Revolutionizing Prosthetics collaborator Dr. **Ross Anderson**, a professor of

kinesiology and physical education at

McGill University, contributed

a fighting harness, which they strapped onto Sullivan so that he could hold the motor; and

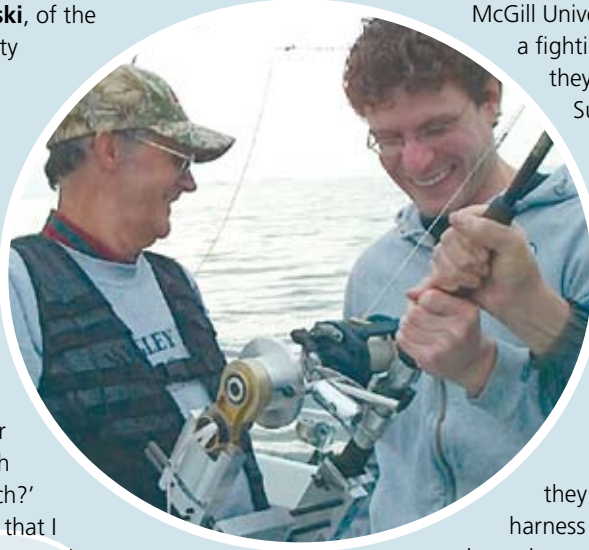
Bobby Armiger integrated the power and electronics, and reflashed new code to all of the control boards.

Out on the bay they hooked Sullivan's harness to a line; Sullivan drove the reel system by

thinking the command to open and close the hand on the prosthetic arm. "Of course it was a different experience than traditional fishing," Kozlowski says. "But he was in the loop this time. He controlled the catch. He could feel the fight of the fish."

The team has capitalized on its progress with the prosthetic arm. Its work has led to two prototypes and a surgical technique that reroutes the nerves that once controlled a patient's arm to the muscles that remain — allowing the patient to control the prosthetic arm in the same way. Sullivan's fishing set-up is one of several spinoffs from that project.

Now the team has turned its full attention back to the task at hand. In December, they are due to deliver the second arm prototype to DARPA, and perhaps run it through a limited clinical evaluation. ●



Above, Jesse Sullivan (left) gets ready to reel in a catch with the help of NSTD's Matthew Kozlowski.

