Shifting Sand and Strategy

The best-laid plans of scientists often go awry when they actually get into the field.

"That's when designing an experiment becomes adapting an experiment," said Peter Traykovski, an oceanographer at Woods Hole Oceanographic Institution (WHOI).

Traykovski had to adapt earlier this year when he confronted one of the most dynamic places on Earth—the New River Inlet in North Carolina. The inlet is a narrow, meandering chokepoint where the river and the Atlantic Ocean collide, where waves, winds, tides, and currents constantly jostle one another in unpredictable ways.

Traykovski and WHOI colleague Rocky Geyer had planned to use an underwater robotic vehicle to survey the inlet's sandy seabed. But shoals in the inlet proved too shallow and dynamic at low tides to accommodate the vehicle, so Traykovski had to improvise. He bought a commercial catamaran kayak, rigged scientific gear onto it, and navigated himself into the inlet to get detailed sonar images of the rippling sands.

Traykovski was among researchers from several institutions who have converged on New River Inlet in a five-year project funded by the Office of Naval Research to study the complex dynamics that move water and sand in inlets and river mouths. The inlet, just downstream of the Marine Corps Base Camp Lejeune, is a classic test bed to begin to understand similar places around the world where the Navy might have to navigate amphibious landings, dredge shipping channels, and make plans to mitigate potential pollution spills.

Traykovski studies how currents and tides move sand on the seabed—in particular, how small-scale sand shifts result in large-scale changes that move and shape sandbars and beaches, which, in turn, can redirect currents and waves.

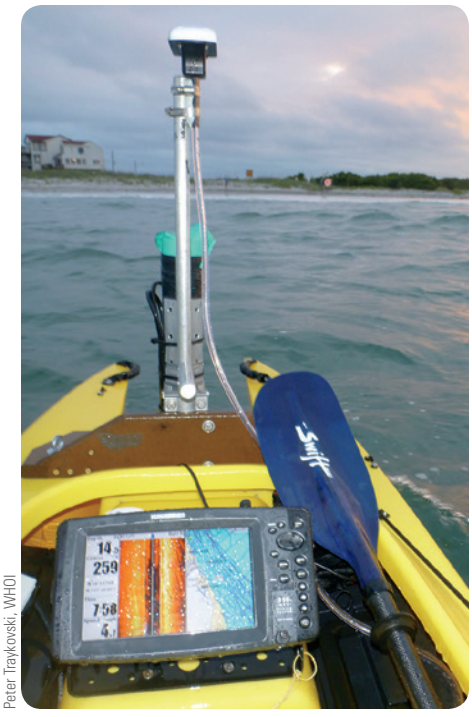
That's where Traykovski's one-of-a-kind, makeshift vehicle came in. He equipped his catamaran kayak with two types of sonar and a high-resolution GPS and traversed the inlet channel, grabbing precisely located sonar images of seabed sand patterns as he went. With its 2-horsepower motor and catamaran design, the craft could operate if breaking waves did not exceed 2 feet.

"The wave energy coming in against strong outgoing tides creates very rough and turbulent conditions," Traykovski said. "Every tidal cycle—every six hours—I found sand movement equivalent to what I've seen during big storms off Martha's Vineyard. The water flowing through the narrow inlet creates strong currents, about 3 knots, and the potential for rapid sand movement. That explains why they have to dredge the inlet constantly."

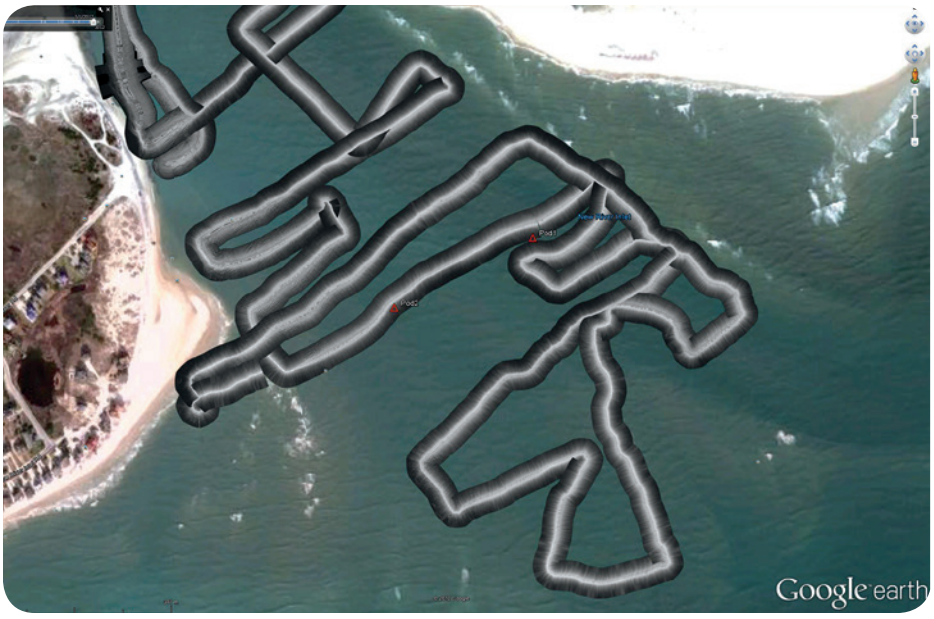
—Lonny Lippsett

Rocky Geyer, WHOI

Shallow shoals sabotaged WHOI scientist Peter Traykovski's plans to use a robotic underwater vehicle to survey sand patterns in the New River Inlet in North Carolina. So he innovated, outfitting a catamaran kayak with special equipment to do the job.



Peter Traykovski, WHOI



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The squiggly lines above are sonar images of sand patterns on the seabed (superimposed on a Google Earth map). Traykovski obtained the images as he motored his kayak back and forth across the inlet. He could monitor the images in real time on a screen (left) aboard his kayak.