South Africa tackles crime at sea with ship-spotting satellites

Automated vessel-tracking system aims to spy poachers and smugglers.

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South Africa has started to combine data from satellites, vessel transponders and radar to monitor ships in its waters in real time.

In October last year, a fishing boat set out from Velddrif, a small town on South Africa's west coast. It sailed northwest for about 25 nautical miles (46 kilometres), then turned sharply and headed back the way it had come. Staying clear of coastal settlements, it entered the West Coast National Park marine protected area — a strictly no-fishing zone — where it slowed down and began to sail in a zigzag pattern.

"It was obvious what they were doing," says Niel Malan, a marine biologist who works in South Africa's Department of Environmental Affairs in Cape Town. "They were poaching."

On any other day, the transgression would probably have passed undetected. But Malan and his colleagues were testing a new vessel-tracking system that — when fully operational — will send out alerts when ships are acting suspiciously anywhere in South African waters.

A test version of the Integrated Vessel Tracking Decision Support Tool was launched on 7 November by the South African Oceans and Coastal Information Management System (OCIMS), at its annual meeting in Cape Town. The tracking system, which has taken US$1 million and 5 years to develop, combines data from satellites, vessel transponders and radar to monitor ships in real time and spot any that might be engaged in criminal activities, such as illegal fishing or smuggling.

Similar remote-sensing systems have been developed over the last decade or so by countries including the United States, Australia and India. But South Africa is a particularly crucial area for maritime crime-fighting, because of its geographical location at the joining of three oceans — the Atlantic, Indian and Southern — and because of the sheer extent of its waters. The country's Exclusive Economic Zone, which extends 200 miles off the coastline and includes an additional 400-mile-diameter circle around the Prince Edward Islands, exceeds its land area by 25%. "Because of the vastness of our EEZ, we see this as a critical technology," says Waldo Kleynhans, the system's lead developer based in Pretoria.

South Africa's coast is also a busy shipping lane and an area rich in natural resources. Cold, nutrient-rich waters sustain extensive commercial fishing on South Africa's west coast and to the south, while every year billions of sardines migrate down the east coast, attracting flocks of birds, as well as dolphins, sharks and whales.

South Africa has a well-documented problem with coastal poaching of high-value species such as abalone and rock lobster, whereas the extent of illegal fishing in its open oceans is largely unknown. The area around the Prince Edward Islands — home to the prized Patagonian toothfish (*Dissostichus eleginoides*) — is particularly vulnerable, says Timothy Walker, a researcher focusing on maritime and water security at the Institute for Security Studies in Pretoria. South African authorities are also concerned about human trafficking and the smuggling of drugs or banned wildlife items, such as rhino horn and ivory.

Yet the navy has scant physical resources to monitor illegal activities, says Mark Blaine, a captain in the South African Navy and a part-time researcher in nautical science at Stellenbosch University — four frigates, three submarines and a handful of patrol vessels and aircraft — which he describes as equivalent to "a country the size of Algeria using around six police cars to patrol the entire country".

Satellite spotting

The satellite data used by the new system includes information from automated identification system (AIS) trackers, which all ships above a certain size are required to carry. South Africa currently buys this data from third-party suppliers, but plans to launch its own constellation of AIS nano-satellites in 2018 to collect the information. Meanwhile, satellites using synthetic-aperture radar, which can spot vessels in the dark or through thick cloud, will help to detect 'dark targets' that are not carrying trackers or that have turned them off.

Malan says that the tracking system can be set to flag up different suspicious behaviours. Users such as the fisheries department or the South African navy might create a digital fence around a marine reserve or other sensitive area, for example, and ask to receive alerts when ships enter it. Or they could request to be alerted if two ships meet in the open ocean for an extended time.

Ultimately, Malan says, the system's success will depend on the end-users, who will have to monitor incoming data, set up appropriate alerts and decide how to respond. Enforcement will also be a challenge. Malan says that details of the suspicious boat he spotted in October 2016 were relayed to the fisheries department. "But we're not sure if they finished the investigation," he says.

He hopes that once a few miscreants have been caught using the tracking system, however, its existence will act as a deterrent: "I think once we start prosecuting a few people, then the word will spread quickly — and we hope that will lead to better behaviour."