



Business Innovation

Below the surface

A Kiwi company's leading-edge equipment is helping to unlock secrets in one of the world's most fragile, challenging and important environments.

STORY **MATT PHILP**

STEP OUTSIDE SCOTT Base and the Antarctic landscape appears lifeless, a white void. Yet if you penetrate the ice, you'll find the water teeming. "It's like when you fly above the clouds and the sun is always shining," says Dr Regina Eisert, who heads a New Zealand programme researching the continent's predators. "In Antarctica, life is in the water."

In early January, Eisert and her team were able to get their best glimpse yet of that abundant below-ice world, thanks to

a groundbreaking piece of equipment from Auckland venture Boxfish Research.

Founded in 2014 by three long-time divers with complementary engineering, electronics and software strengths, Boxfish hit the market a couple of years ago with a spherical 360-degree underwater camera. But its flagship development is the innovative Remote Operated Vehicle, or ROV, which Eisert got to use for the first time in January. Touted as the world's first mini submersible built specifically for

scientists, educators, filmmakers and explorers, it's a manoeuvrable and stable platform for shooting underwater footage, yet at 23kg so portable that, as Eisert puts it, "One person can throw it in."

She says the goal of using the mini-sub in Antarctica was to get some insight into how orca and minke whales behave below the surface. "Usually, we see the bits that aren't in the water, and, of course, that's not their reality. It's like studying birds only when they walk on the ground."





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which are stuck in a horizontal position. Thrusters are often added to achieve tilt, with the camera set on an independent mount, but these solutions tend to create new problems, says Anderson. “They tilt the camera, but the lights aren’t connected to the camera so they end up looking into the dark.”

Traditional mini-sub also tend to struggle in tight spaces and lack stability when brought to a halt. Boxfish’s answer was novel – but also completely unproven. “No one had done this before,” he says. “There was an unknown: would it be good enough?”

To achieve its drone-like manoeuvrability, the Boxfish uses eight thrusters, allied to a proprietary dynamic stabilisation system. “Essentially, it’s completely active stabilisation. If you push on it, it will push against you.” It can travel and orientate itself in any direction, and stop on a dime. It also shoots broadcast-quality video, operates as deep as 1000m and can be fitted with useful tools such as grabbers and sample bottles.

“The software that runs the control system is the crux,” says King, “but as Craig says, we’ve solved a hundred other small problems that ROVs have. There are 100 little details that make it unique and extremely powerful.”

So what’s the ambition? “We want to be one of the leading suppliers of mini-ROVs,” he says. “We think our platform is such that we can take a big chunk of the market by offering a much more powerful system in a similarly sized package.”

They’ve identified four potential markets. Science and exploration is the obvious one. But they’re also pursuing industries that have a need for underwater inspection. The ROV could be used to check ship hulls, for example, or underwater infrastructure, including aquaculture farms. There’s also potential in the high-end leisure market – super yacht owners, say – and for cinematography.

In the latter case, there’s been plenty of interest, says King. “We’ve talked to some of



Clockwise from above left: The Boxfish ROV on sea ice at McMurdo Sound, Antarctica; lowering the 360 camera into the water at Scott Base; the ROV deployed in a dive hole at McMurdo Sound; the team being dropped off at McMurdo Sound.



the big names in the industry, and we’re in discussion with the BBC about them using it for their next *Blue Planet* TV series and other shows. It’s been well received. The difficulty with that industry is that they’re accustomed to renting equipment rather than buying.”

At around \$92,000 (the amount varies according to what’s on board) it’s a serious investment. Even so, Boxfish has already found buyers here and in Japan, French Polynesia and the Netherlands.

Meanwhile, the 360 camera, which captures stills and video for viewing on

a virtual reality headset, has been selling all over the world, with the profits ploughed back into the development of the ROV.

Self-funded from the start, the company is now looking for investment to expand. The future is looking exciting, but King is still pinching himself about his trip to Antarctica: “It was a lifelong dream for me to work down there.”

What’s more, he got to use the ROV in important scientific research. “This is what we always hoped to do – and we’re doing it.” [boxfish.nz](https://www.facebook.com/boxfish.nz)



Boxfish Research co-founder Ben King accompanied Eisert's team to Antarctica to operate the ROV, which he deployed from the edge of the ice on a 440m-long tether. Conditions weren't conducive to getting footage of the whales feeding, says King, but during 21 hours in the water the ROV captured some stunning video, including footage of type-C orca seemingly ignoring nearby penguins, confirming the researchers' hunch about their food sources.

Eisert was impressed by both the footage and the ROV's ease of use. "I've talked to colleagues on the German polar programme and they have an ROV that costs about a million euros and needs a winch to be launched, and every time they use it, it needs to spend the next six months in the shop. The Boxfish isn't like that. The first thing Ben would say to people is, 'Hey, do you want to drive?'"

King was delighted with the production prototype's performance in some of the harshest imaginable conditions. "I took a lot of tools and spares and ended up using almost none of them. It was exceptional."

Boxfish's journey began one afternoon in 2014, when King first met his Boxfish co-founders Craig Anderson and Axel Busch (who has since left the company) at Lake



Pupuke, on Auckland's North Shore. King, a mechanical engineer, was at the lake to test a submersible he'd built – as, by unlikely coincidence, were Anderson and Busch. Both submersibles proved to be disappointments.

"I said to Craig and Axel that we should put our heads together and see if we couldn't do this properly," says King. "It was almost said as a joke, but we started catching up, chatting about what would be the most difficult incarnation of an ROV that we could think of. What we saw in the marketplace was a bunch of old technology that hadn't really changed since the 1980s. We wanted

to push the boundaries of what was possible, to emulate some of the success of the drone industry, but underwater."

Their big innovation was to make the ROV neutrally balanced in the water, as opposed to the traditional method of incorporating foam at the top and weight on the bottom. "Our thing has no inherent stability; it would just as much prefer to be upside down as right-side-up," says Anderson, whose strengths are in software, electrical engineering and electronics.

In theory, their approach offered an answer to the failings of orthodox ROVs,

This page clockwise from top left: Craig Anderson (left) and Ben King (right) test and prep the Boxfish. Left: King and Dr Regina Eisert review shots from Antarctica. Opposite page: Anderson, Eisert and King with the Boxfish ROV.