



MARINE MAPMAKER

DEAKIN UNIVERSITY'S Daniel Ierodiaconou is doing for Victoria's coastal sea floor what William Lawson did for New South Wales hundreds of years ago. And his research could have an impact on everything from commercial fisheries to climate change. The 32-year-old senior lecturer at Deakin's Warrnambool campus draws inspiration from his younger sister, Lydia Lassila, a skier who won gold at this year's Olympics in the women's freestyle aerials. "It was her third Olympics and she finally made it," he recalls. "So you have to put in the hard work, but it's really about persistence."

That kind of drive has helped Ierodiaconou conquer uncharted waters – literally – off Victoria's Surf Coast. He and his research team have mapped 520,000 hectares of the sea floor, revealing gardens of sponges, seaweed forests and seagrass meadows. To do so, they pioneered new methodologies for characterising seafloor habitats, and cross-disciplinary studies integrating genetics data and spatial information for understanding population structures.

"We are seeing ancient river systems, volcanic cones, craters, lava flows and biological habitats that

sometimes make me feel like a modern-day explorer," he says, citing another inspiration, Matthew Flinders. This is the first information that's been gained about some parts of the sea floor since Flinders took depth readings off the Australian coast from his boat, the *Investigator*, in 1802.

MULTI-DISCIPLINARY APPROACH

Ierodiaconou's work is all about integrating multiple disciplines. For instance, he's not just into water. He works with land-based eco-systems, too. In one example, he teamed up with geneticists from Charles Darwin University who were puzzled by the population structure of a native freshwater crayfish. Current river systems didn't explain the animal's population distribution. But working together, they realised that 18,000 years ago, when sea levels were as much as 140 metres lower than today, many of the catchments that are now isolated were then connected. "It's something that we've really got to think about when we try to manage these environments," says Ierodiaconou.

More than 90 per cent of the 12,000 plants and animals in

MODERN DAY EXPLORER
Daniel Ierodiaconou is drawing new maps of the sea floor.

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Australia's coastal waters are found nowhere else in the world. As the continent drifted away from Antarctica, the nature of the currents kept the area isolated, making for a unique ecosystem. "Unless we can get an understanding of what's there, it's really hard to monitor changes like those to do with climate change," explains Ierodionou. "These marine systems might be a very good indicator of what we're doing to our climatic system – they could be an early warning."

His research is also key for coastal users – commercial fishing and the tourism industry. Ierodionou hopes to increase understanding of these environments so they can be preserved for future generations.

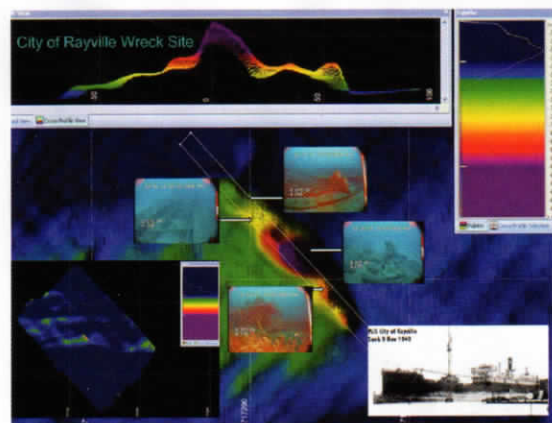
CULTURAL CONTRIBUTIONS

Mapping the sea floor has paid off in historical and cultural discoveries, too, such as Aboriginal artefacts found on the offshore island of Deen Maar. That posed a mystery because the Gunditjmarra people of the region were not traditionally canoe builders, so how did they get there? Tales had been handed down of their forefathers walking to the island, and, sure enough, Ierodionou found that there had been a land bridge thousands of years ago connecting the island to the mainland.

Beyond natural history, Ierodionou last year used state-of-the-art sonar imagery and remote-controlled vehicles to take detailed images of the first US warship sunk during World War II. In 1940, the MV City of Rayville was blasted by a German mine off the coast of Cape Otway in more than 70 metres of water. The sonar was used to construct a 3D image of the wreck, and video showed for the first time that the hatches were blown off by the blast.

TRIBUTE TO TECHNOLOGY

Part of what makes Ierodionou's groundbreaking work possible is technology that wasn't available 10 years ago. Multi-pulse sonar with up to 100 pulse beams can now map large swathes under a vessel, like



"These marine systems might be a very good indicator of what we're doing to our climatic system"

a lawn mower cutting a whole garden.

Towed video systems have become more compact so that they require much smaller, cheaper boats. And as computing power has increased, it has become easier to store and process all the data gathered. Ierodionou's genius is in tying the geophysical data from the sonar to the biophysical data. "That allows us to use computer-modelling techniques to make predictions about habitats beyond those sampling locations alone, where we have our camera systems."

Deakin University is well stocked with all that and more. Ierodionou cites extensive aquaculture facilities, survey vessels, underwater positioning equipment and remotely operated vehicles. The Warrnambool campus backs onto a pristine estuary system, and there is no shortage of marine experts with whom to do cross-disciplinary work.

INSPIRING THE NEXT GENERATION

Earlier this year, Ierodionou was awarded a continuing lecturing position teaching 70 undergraduate students a course called 'Blue Planet, Water and Life'. "It's oceanography mixed with things like using sonar to map things in shallows or measuring physical properties of water like the surface temperature."

He hopes to get his students as excited as he is about the amazing environment he sees around him. "In 10 or 15 years, some of these guys are going to be lecturing the next generation; some of them are going to be leaders in their field. So I'm just hoping that I can inspire them to follow their paths and get excited about marine and coastal ecosystems in general."—YG

▲ UNIQUE DISCOVERIES
More than 90 per cent of the plants and animals in our waters are found nowhere else in the world.

◀ MULTI-TECH
Multi-pulse sonar and towed video systems are some of the technologies used by Ierodionou to map the sea floor.