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COOL SCIENTIST — by Katherine Munkres

Seeking Clues to Coral Bleaching

Marine biologist Karin Ulstrup, a PhD student from the Australian Institute of Marine Science (AIMS) and University of Technology, Sydney (UTS), is living the life many young people dream of. At just 29 Ulstrup has travelled to five continents (including Antarctica), presented her research at major international conferences throughout the world, and scuba-dived on some of the world's most amazing coral reefs – all in the name of work.

Raised by a family of scientists, Ulstrup always envisioned a career in research. "I know a lot of young girls dream of a job playing with dolphins, but for me the drive to discover something new was what led me to become a marine biologist," she says. "The exotic destinations, interesting people and stimulating conversations are just the perks of the job. I like to think of these things as the salary bonus since the salaries aren't always that great."

Born in Denmark, Ulstrup laughs as she admits that while she wouldn't trade her job for anything, the life of a scientist isn't always sweet sailing. "There is an idea that marine science is a very glamourous job. In reality, though, a lot of young scientists and students do it pretty tough. The work is hard, the hours are long, extensive travel and weeks at sea are often required for the job, and the pay cheques range from minimal to non-existent.

"That said, I can't imagine doing anything else! People ask me how they can get a job like mine and I tell them the main thing you need to become a marine biologist is passion. There are so many things that can go wrong in science! Funding doesn't come through, an experiment doesn't work, bad weather prevents you from getting the samples you desperately need, and the list goes on.

"You really have to love what you do. It's those 'Eureka!' moments when you discover something no one else knows that make up for the tough times."

Ulstrup received an International Postgraduate Research Scholarship from the Australian government to complete her doctoral degree in Australia. During this time she has studied the unique relationship between corals and the single-celled algae (called zooxanthellae) that live within their tissues.

"Zooxanthellae are like tiny power stations inside the coral," she says. "Like plants, they use photosynthesis to provide corals with food and energy for growth. In exchange, the coral provides a safe home and some vital nutrients for the zooxanthellae.

"Some corals are more likely to survive temperature increases than others. One explanation for this is the type of zooxanthellae they host. For example, corals with one type of zooxanthellae might grow fast while corals with another type may grow less quickly but may be able to tolerate more extreme temperatures. Like little X-Men, each zooxanthellae type has its own superpowers," Ulstrup says .

"It is important to understand how this specific relationship between coral and zooxanthellae works if we are to predict how coral reefs will respond to climate change."

Ulstrup has studied two species of reef corals living on the Great Barrier Reef. One species was able to harbour multiple zooxanthellae types (type C and D) while another hosted only one type (type C). She found that the corals used different methods to adapt to warming environments.

"The Eureka moment in this study came when we realised that different corals were using different strategies to avoid bleaching. For corals with the potential to host either type C or type D zooxanthellae, only those that had the heat-tolerant (type D) zooxanthellae could withstand the increased temperatures. Because they couldn't rely on having different types of zooxanthellae, the corals with only one zooxanthellae type acclimatised to their local surroundings solely by altering their internal physiology – much like a plant adapts to light or shade," Ulstrup explains.

For the corals stuck with acclimatising to the heat, the ones that "grew up" in warmer waters had the advantage, whereas corals from cooler regions were less able to tolerate temperature increases. "What we observed was patchy bleaching based on the distribution of the zooxanthellae types (for the multi-type corals) and bleaching based on latitude (for the single-type corals).

"This has important implications for the management of corals in the face of climate change. My study shows that a one-size-fits-all management plan won't work for corals since they seem to respond differently to changing conditions depending on their location, their physiology, and the type of zooxanthellae they host," Ulstrup says.

Despite the long hours and average pay, Ulstrup can't get enough. "I can't wait to get started on the next piece of the puzzle. It is easy to see how people dedicate their lives to science – you never know what could be around the corner."

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