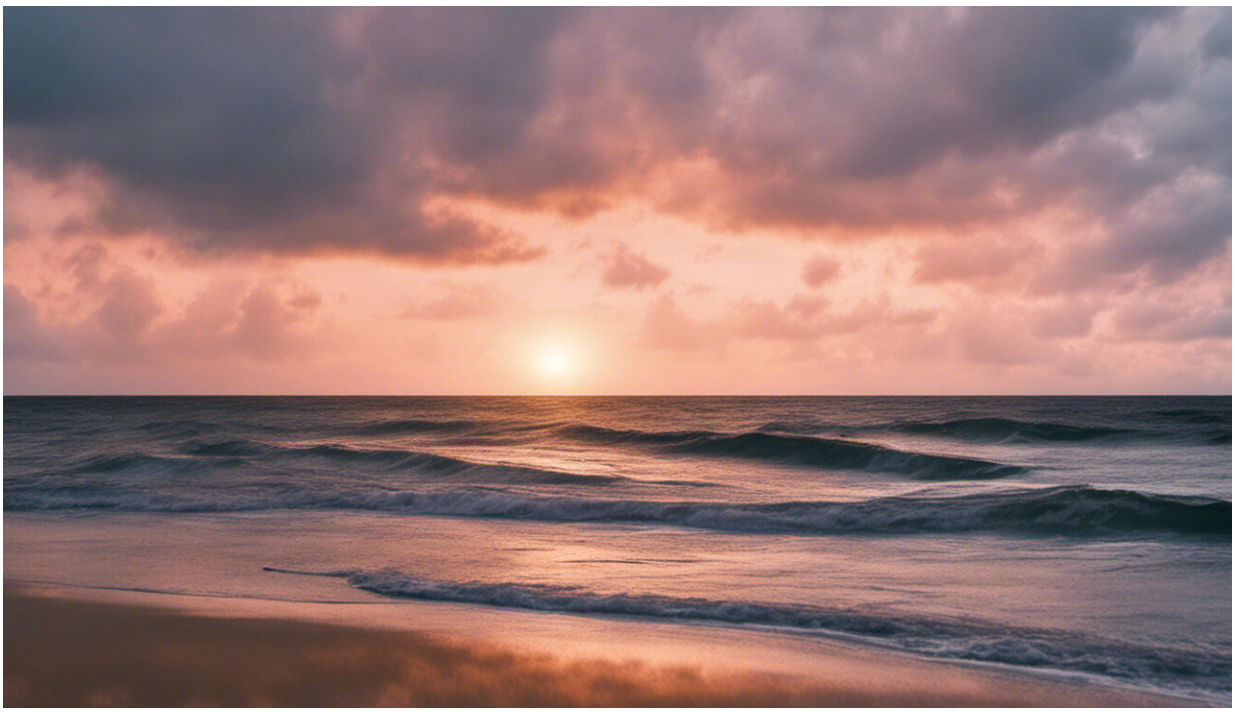
Research predicts which tropical vagrants will get permanent residency in warming waters

October 19 2016



Credit: AI-generated image (disclaimer)

Every year the temperate waters off south eastern Australia receive an influx of tropical fish larvae from the Great Barrier Reef. Transported southward by the East Australian Current they are doomed never to reach adulthood. By July, as water temperatures drop, juvenile mortality

reaches close to 100 per cent.

However, by 2100 sea surface temperatures in this region, considered a climate change "hot spot", are expected to rise by as much as 3 degrees Celsius. This means more of these "tropical vagrants" will survive and could establish populations off Sydney and the southeast coast of Australia.

UTS honours student Shannen Smith has spent the past year calculating which species of tropical reef fish will have the best chance of competing with the local fish species to establish viable populations.

She says it's even possible this could happen "within the next 15 years" when the 17 degree threshold temperature – currently estimated to be the constraint on physiological survival of tropical vagrant species – is predicted to be routinely exceeded.

"Predicting which tropical fish species might establish breeding populations here can help us understand what kind of response our existing temperate fish communities may have to climate change, as well as how warming will affect coral reef fish populations," Ms Smith said.

Previously few of these tropical vagrant species have been able to survive the winter, but with climate change driving increases in ocean temperatures at this warming hot spot, survival rates are increasing.

Dr Rebecca Fox, Chancellor's Postdoctoral Research Fellow in the School of Life Sciences at UTS, co-supervised the research and believes these findings are vital to understanding which species may thrive in future environments impacted by climate change.

"Scientists are trying to understand which species will be winners and losers under a warmer future in order to make predictions about how the

planet's biodiversity may be impacted and how the functioning of ecosystems may be altered," Dr Fox said.

"Shannen's research predicts which of the tropical reef fish species that are transported to Sydney each summer on the East Australian Current might have the best chance of establishing viable populations here in the future and, in turn, which segments of the native fish community might be most impacted by the invaders."

Shannen Smith conducting field research. Credit: University of Technology, Sydney

But how do you predict not only who will survive but who will thrive?

Applying similar techniques used in a study of fish that invaded the Mediterranean Sea via the Suez Canal, Ms Smith and her UTS colleagues used species' body shape (or morphology) as a predictive tool for invasion success.

"As minimum water temperatures rise, more and more of these tropical fish will be able to survive the entire winter and potentially set up breeding populations," she said.

"It will then be the ability to compete for and share resources that will determine which of the tropical fish can coexist as a population with the established temperate residents. Body shape can tell you a lot about the way a fish lives and the niche it occupies in the community."

The study suggests that the Moorish Idol, a fish species currently found in tropical waters, would be most likely to thrive in the warmer Eastern Australian coastal habitat.

"The Moorish Idol currently lives in tropical waters and doesn't appear to tolerate colder temperatures," Ms Smith said.

"However its body shape suggests that the way it lives would not bring it into direct competition with native fish species, meaning that it might be able to coexist with the locals living in warmer waters on the southeast coast of Australia."

The research was recently published in science journal Biology Letters. Ms Smith is one of few UTS Honours students to be lead author of a paper published in such a respected journal.

"My amazing supervisors put in a lot of work to guide me through the publication process, and I am so grateful for that," she said.

"It's definitely an important step for me career wise, and I'm proud to have been able to contribute to UTS's research."

More information: Shannen M. Smith et al. Predicting range-shift success potential for tropical marine fishes using external morphology, *Biology Letters* (2016). DOI: 10.1098/rsbl.2016.0505

Provided by University of Technology, Sydney