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Mapping UNSW Impact
Global Development

Primary SDG	**14: LIFE BELOW WATER**
Broad theme	Sustainable fishing in the South Pacific
Research	Simulation of tuna fish behaviour to aid sustainable fishing practices and food security in the tropical South Pacific
Impact region	South Pacific Ocean countries
Faculty	Science
School/Institute	Climate Change Research Centre
Academic	Dr Alex Sen Gupta
Project partners	Australian Research Council ($200,000 in funding, ends Dec 2017), Secretariat of the Pacific Community ($60,000 in funding), CSIRO (who provide state-of-the-art ocean models), Collecte Localisation Satellites (who provide tuna habitat models)
Related SDGs	12: Responsible consumption and production
	13: Climate action
	2: Zero hunger

Elevator pitch

UNSW's research into tuna populations in the South Pacific will help local governments across the region manage their marine environment, ensuring vital food supplies and sources of income from fishing are sustained for generations to come.

The Challenge: How many fish are in the sea?

Skipjack tuna is the third most harvested wild animal in the world. Three million tonnes of it are pulled from the sea every year. But how many are left in the ocean? Is our current fishing appetite sustainable? No one can answer these questions with confidence.

Demand for tuna has risen substantially over the last 20 years. The majority of yellowfin and bigeye tuna populations are believed to be overfished. Skipjack could be heading that direction with technological advances making it easier than ever to locate and extract huge schools of tuna fish from the ocean. Are we in danger of losing this valuable food source? Pacific Island countries are anxious to find answers.

Around 70% of the world's tuna fish come from the Tropical Pacific region. Seven countries in the region source over 40% of their income from tuna fishing licences and another five derive more than 25% of their GDP from fisheries. Fish are also the primary source of protein (around 60-70%) on the region's food plate. Add climate change and rising population levels to the mix and countries are naturally concerned about fish numbers and the impact on their economy and food security.

UNSW's solution: Simulate tuna fish behaviour

A number of strategies are being used to estimate fish numbers but they tend to be yard-stick measures that lack dynamism. For the lack of a better alternative, Pacific Island countries are spending millions of dollars on tagging programmes to gauge fish behaviour and numbers. But tagging provides limited information (such as where a fish was caught) rather than a broader picture of the fish population.

Stock assessments are made using historical data and computer algorithms. But these models are too abstract and fail to account for key influencers on fish populations, like the introduction of fishing technology that encourages tuna to pool together so they are easier to catch.

UNSW's simulation model provides richer answers. Incorporating tag data, catch data and other information (such as ocean temperatures, ocean currents and oxygen levels) it simulates where schools of fish go and where they have been. The model can not only provide better estimates of fish distributions, it can show the impact changes in currents and temperatures - caused by events like El Nino or climate change - have on fish behaviour and migration.

The Impact: More sustainable fishing and local economies

In one Pacific area, existing stock assessments estimate around 90% of tuna fish stay in that region. UNSW's model estimates that figure is only 53%, underpinning the uncertainty around current estimations. The model will impact fishing licence terms issued by countries, and the amount of fishing that can be done to ensure fish levels are sustainable.

UNSW's simulation model does not substitute for tagging and stock assessments. But the model can help countries make better informed decisions about their tagging programmes and fisheries management, saving them crucial money and time.

Future fish numbers and behaviour can also be predicted based on forecast changes in weather and ocean conditions. This appeals to governments looking to implement sustainable fishing practices to secure future income and food for their people. Another attractive feature of the simulation model is that it can be applied to any kind of oceanic fish, anywhere in the world.

Researchers

After working on research and government boats around the South Pacific region, Joe Phillips completed his PhD on tuna behaviour and their vulnerability to fishing. He is fascinated by the unknown behaviour of oceanic animals, and their status as a critical resource. This current project not only answers some academic questions surrounding animals, it develops pragmatic tools that so many of his Pacific island colleagues have been requesting for years.

Six years ago Alex Sen Gupta joined a large multi-institutional project to look at the effect of climate change on fisheries for developing states in the tropical Pacific. He was amazed and concerned by the profound effects that future physical changes would likely have on ecosystems and thereby island communities. It was clear that making the right fisheries management decisions was going to be critical to maintaining essential marine resources.

Ben Falkenmire 23.08.17