

Anglers have helped detect a shift in the habitat of black marlin

December 2 2015, by Tom Bridge, Andrew Tobin And April Reside



Catching black marlin is big business on Australia's east coast.

We know that [climate change is driving](#) changes in the world's oceans. Currents are shifting, temperatures are climbing and the availability and dynamics of nutrient upwelling is changing.

But the question is whether marine species can adapt at the rate at which these changes are occurring?

The coastal waters of south-eastern Australia are a [climate change](#) hotspot, warming at a rate [three to four times](#) the global average. This is in part due to an increase in the strength and [southward penetration](#) of the East Australian Current (EAC), which carries warm water from the tropics down Australia's east coast.

In response, numerous marine species have been documented extending their distributions polewards, affecting the [functioning of coastal](#) and marine ecosystems in south-eastern Australia. This will have knock on effects for [local communities and fisheries](#), many of which are not well prepared.

With so many species on the move and changes happening so quickly, scientists have enlisted the help of citizen scientists – such as recreational SCUBA divers and fishers – to help record when, where and how often species are sighted. Initiatives such as [Redmap](#) have helped scientists identify many tropical species shifting their ranges south.

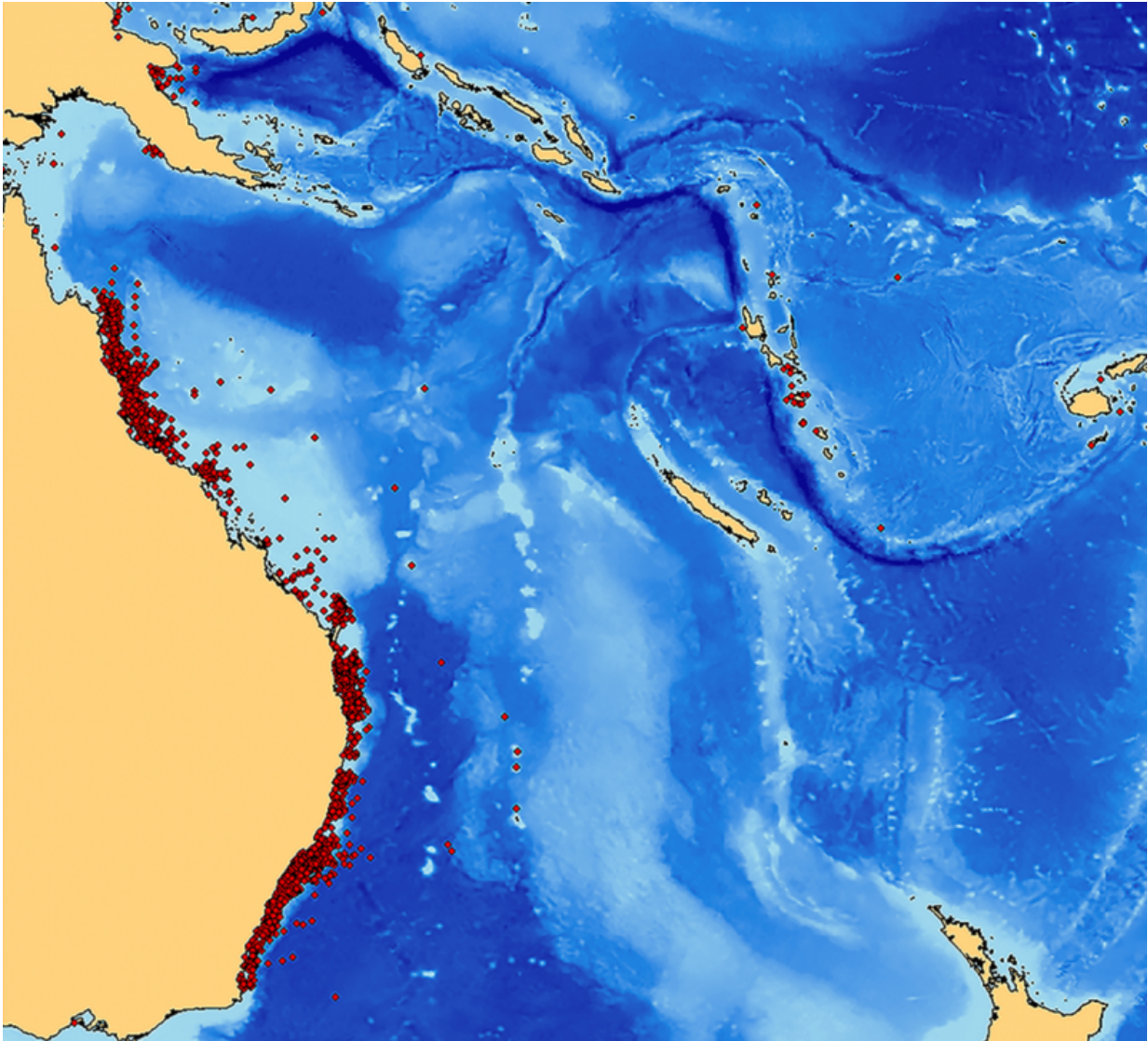
Tagging program

Another successful example of citizen science is the New South Wales state government's [gamefish tagging program](#). This world-leading gamefish tagging program, established in 1974, asks recreational anglers to tag and release gamefish and provide information on the species, size, and release location which is sent back to the Department of Primary Industries ([DPI](#)).

More than 400,000 fish from at least 20 different species have been tagged, and more than 7,000 recaptures recorded.

This has enabled us to investigate whether there had been any geographical shifts in suitable habitat for the highly-mobile black marlin ([Istiopmax indica](#)) in the previous 16 years.

The black marlin is one of the most keenly sought gamefish species targeted by recreational anglers in Australia, with more than 54,000 records of tagged black marlin within the NSW DPI's database.



All black marlin tag release locations recorded in the NSW DPI tagging program within the south-west Pacific Ocean. Authors, Author provided

Big business

An annual aggregation of large adults, some weighing more than 500kg, occurs off the northern Great Barrier Reef each spring, forming the basis of a charter fishery that will [celebrate its 50th year](#) of operation in 2016.

At the other end of the spectrum, juvenile black marlin from 15kg to 40kg undertake an annual migration southward along the east coast in association with the EAC.

Anglers target these juveniles off Cairns and Townsville in late winter, south-east Queensland in late spring, and Port Stephens, NSW, in late summer. Depending on the behaviour of the EAC, juvenile black marlin may even extend as far south as Bermagui, NSW, in some years.

But our research, published in October in [Global Change Biology](#), aims to identify any changes in the distribution of marlin habitat through time. We used the release positions of black marlin in the NSW DPI database and satellite-derived data such as sea surface temperature and current velocity.

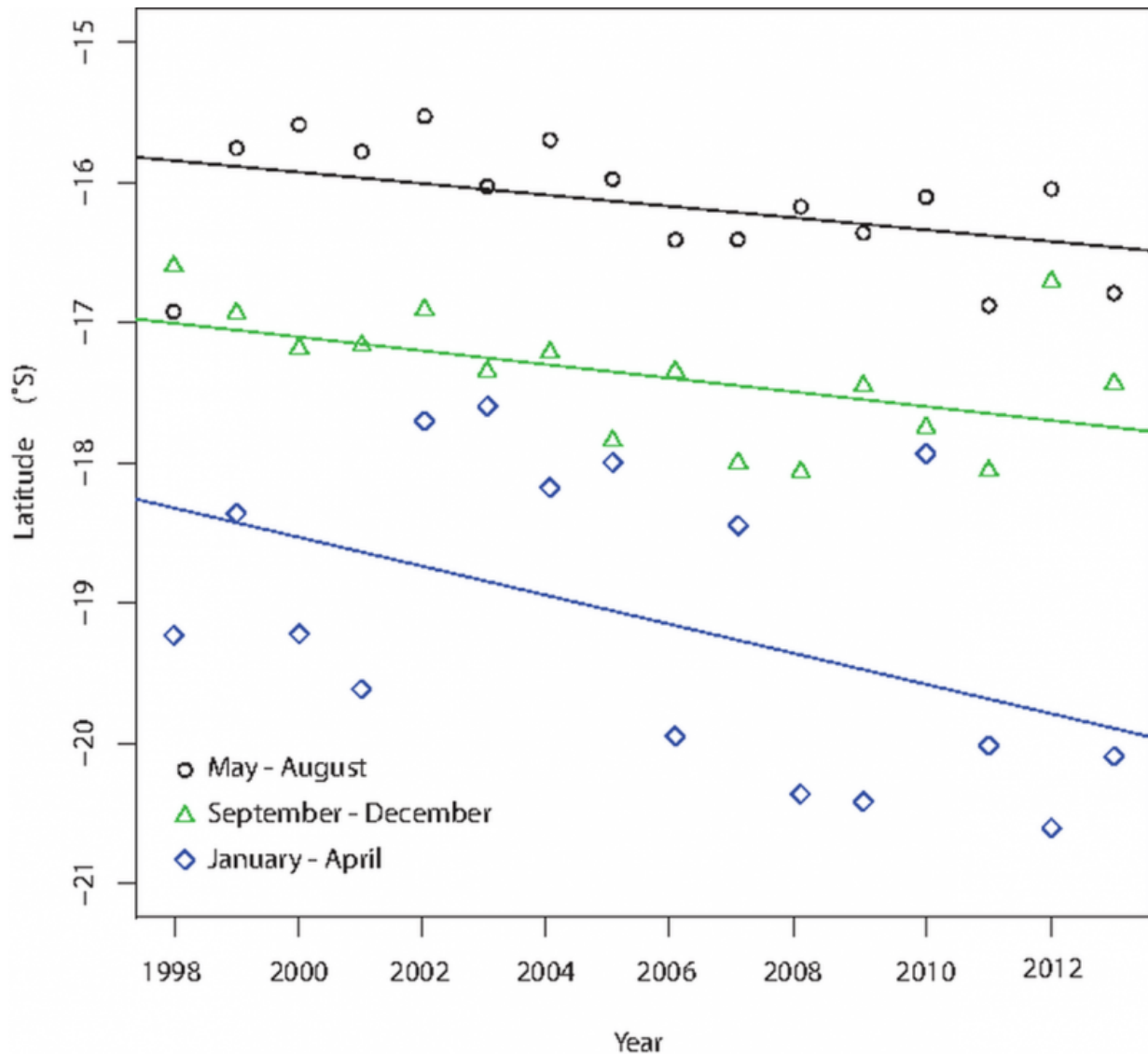
The extensive spatial and temporal coverage of the tagging data allowed us to model the geographic distribution of black marlin habitat in the South-West Pacific for 192 consecutive months from 1998 to 2013.

On the move

We found variability in the location of suitable black marlin habitat across months and years.

On an annual basis, conditions favoured by black marlin occurred off north Queensland at the start of spring and gradually shifted south along

Australia's east coast from October to April. This coincided with the peak availability of black marlin to recreational anglers and also to a seasonal pulse in the EAC.



Poleward shift in the distribution of suitable black marlin habitat across all three seasons from 1998-2013.

From May to August, suitable habitat retreats back towards the equator as cold water currents push north over winter. We also identified a strong effect of El Niño Southern Oscillation (ENSO), with black marlin habitat extending up to 300km further south during La Niña phases.

In addition to the large variability on shorter timescales, we also found that suitable marlin habitat has shifted south at a rate of about 88km per decade across all seasons, independently of the influence of ENSO.

Heading south

We found that habitat is shifting faster during summer months (111km per decade) in contrast to the rest of the year (77km per decade). This suggests that suitable habitat is extending south quicker than it is contracting at its northern edge.

This result adds to the growing body of evidence showing that many species' habitat is shifting polewards in response to climate change.

Considering that all highly mobile tuna and billfish species respond to a similar suite of environmental factors, numerous species are likely responding to climate change.

What does this mean for Australian fishers, black marlin and similar pelagic species? These are questions that still need answering.

What is clear from this study is that mobile fish [species](#) are not immune from the impacts of climate change, and that long term data sets from recreational fishers are valuable tools in discerning such changes.

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