

What happens to a southern bluefin tuna after release?

After years of overfishing by the commercial fleet, strict regulation has led to signs of recovery for southern bluefin tuna. Recreational anglers are now catching – and releasing – more than ever before. But how many actually survive, and where do they go? A major study is under way to determine the answers, as Dr Sean Tracey reports.

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Bluefin tuna are one of the most iconic gamefish species in the world and Australia is lucky to have the southern bluefin tuna (*Thunnus maccoyi*) on our doorstep – one of three bluefin species around the world. The recreational fishery for southern bluefin tuna (SBT) is not particularly new in Australia, however, the development of new technology including GPS, depth sounders and radar, has dramatically changed fishing techniques over the years.

With increasingly reliable trailerboats, more anglers are also venturing further

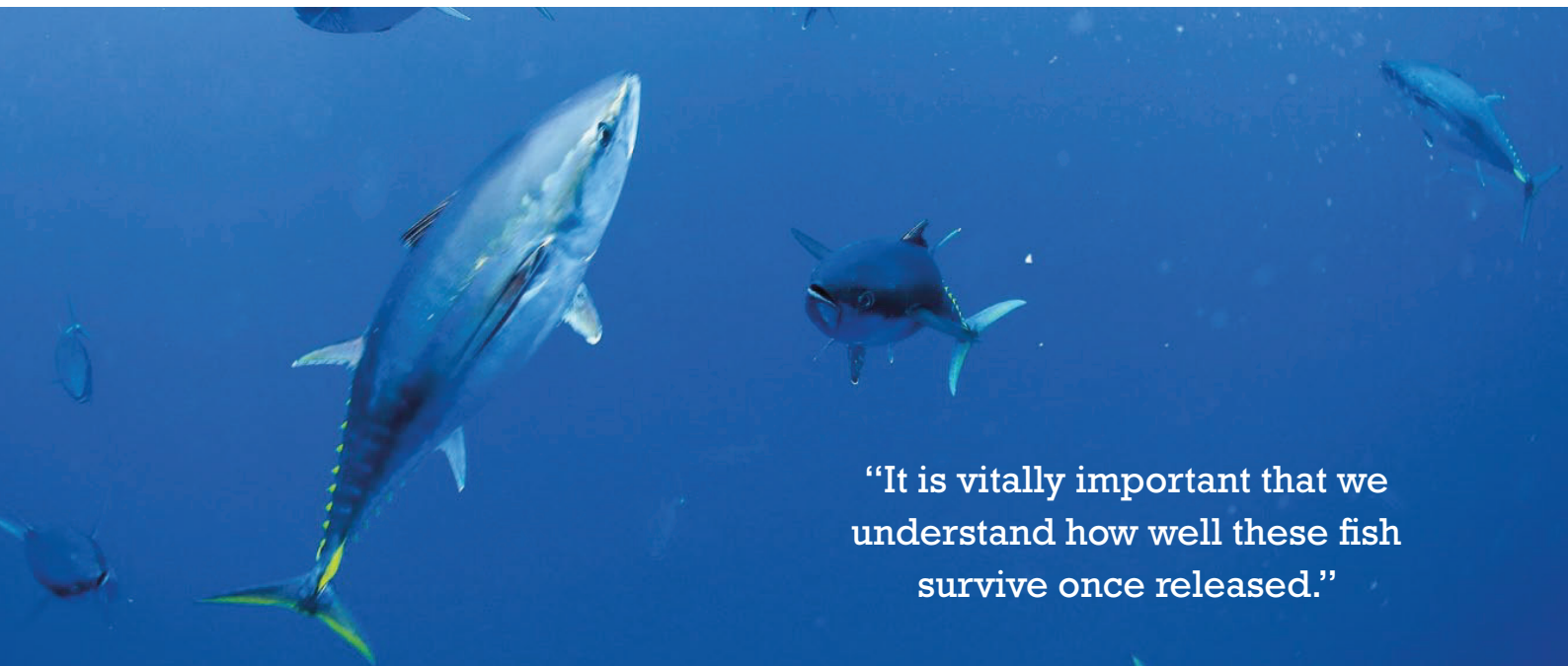
offshore and targeting gamefish in areas that were once only the realm of larger vessels. Southern bluefin are now garnering a lot more attention and fishing pressure, particularly in Victoria, South Australia and New South Wales.

MANAGING THE CATCH

Interestingly, for such an iconic species that is managed to the hilt for the commercial sector, very little is known about the recreational fishery. There remains a lack of reliable data about the amount of fish caught, how many are released, as well as what happens

to the fish that are released. Strict international management of the commercial fishery over the past couple of years has yielded some positive results. There are now signs that SBT stocks are starting to recover from a significantly overfished state. As they continue to increase, we can expect to see more fish become available to the recreational fishery.

Australia is a major player in the Commission for the Conservation of Southern Bluefin Tuna (CCSBT). It is also the country with the largest annual commercial quota allocation as set by



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Fig. 1: Tuna tagged in three States

The tagging location and detachment location for southern bluefin tuna tagged during 2013. The colour of the dots represents the month that the tagging and detachment occurred.

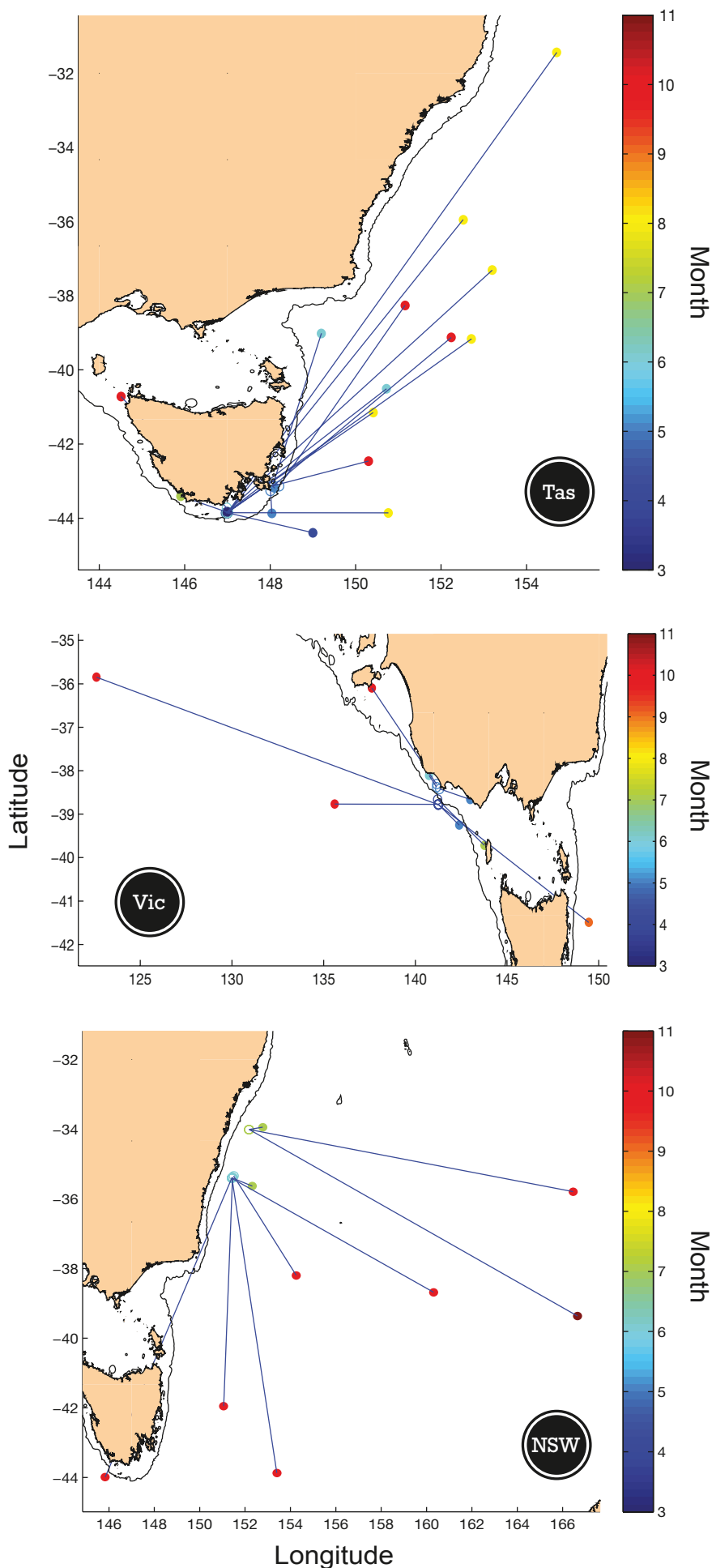
the international fisheries regulatory body. We therefore have an obligation to develop a deeper understanding of our fishery, including the recreational fishery.

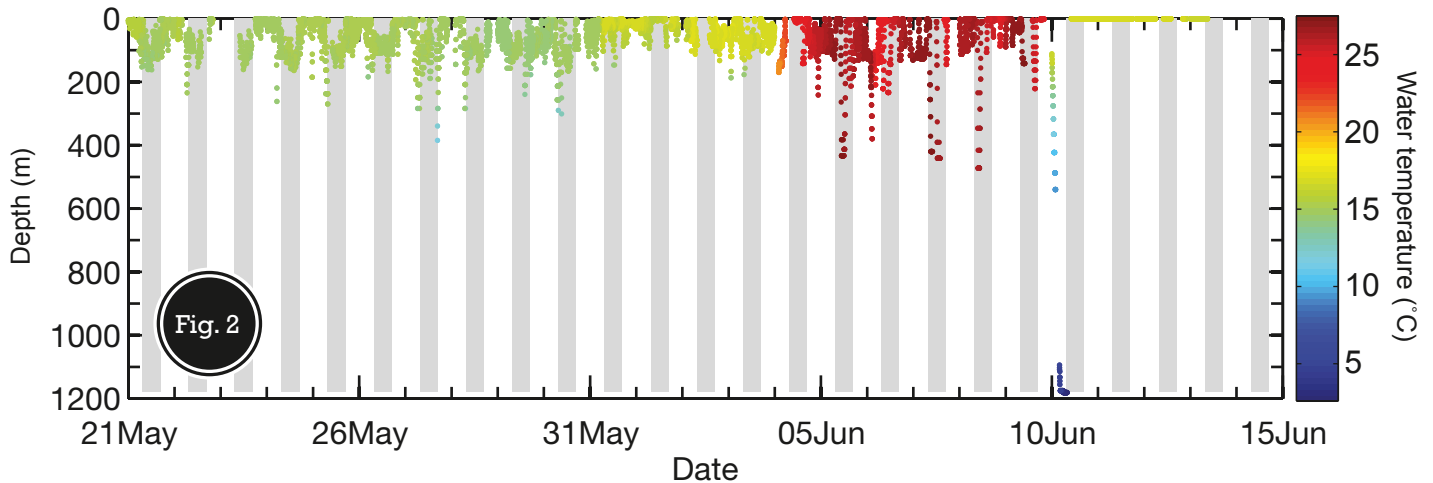
Recent surveys in Victoria and Tasmania have provided robust estimates of the numbers of SBT caught recreationally. However, these are only annual snapshot surveys, with the catch likely to vary widely between years and States. A current study funded by the Fisheries Research and Development Corporation (FRDC), with investigators from each of the States where SBT are caught recreationally, is investigating methods to provide a national harvest estimate of recreationally caught SBT. They will also investigate how to implement ongoing assessments.

CHANGING ATTITUDES

In all States where SBT are caught by recreational anglers, the catch is controlled with bag and/or possession limits. As stocks continue to rebuild, it is inevitable that we will see more fish being released as anglers reach their limit. This reflects an apparent change in mindset, with many anglers now imposing personal limits and choosing to engage in more catch-and-release fishing. SBT are now the most commonly tagged species in Australia's gamefish tagging program. It is therefore vitally important that we understand how well these fish survive once released and what practices we need to follow to ensure more fish continue to survive and contribute to the breeding cycle.

Fish such as SBT are relatively large creatures, able to swim at high speed and cover great distances. The only reliable way to gather accurate information on what happens to a tuna once it is released is to tag it. There are a range of tag options available – from regular gamefish tags to acoustic tags and satellite archival tags, but to estimate the post-release survival rate





The dive depth and temperature recorded by a satellite tag attached to a 90cm southern bluefin tuna tagged in mid-May 2012 adjacent to Cape Pillar on Tasmania's south-east coast. The grey bars indicate daylight hours.



A southern bluefin tuna is measured and prepared for release with a satellite tag.

we need to get a response from each tagged individual to determine whether it survived or not. Satellite archival tagging is by far the most reliable.

The other advantage of using satellite archival tags is the amount of information that is collected on the behaviour and movement of each fish, providing insights that would not otherwise be possible.

GROUNDBREAKING RESEARCH

A limiting factor with satellite tagging technology, however, is that the tags are not cheap. Due to funding restrictions and the high cost involved, many post-release survival studies using this method only tag a handful of fish. For this study, in addition to FRDC funding, we also received support through the Tasmanian Fishwise Community Grants Scheme and the Victorian and NSW recreational fishing trusts. This has provided the project with a total of 60 tags, making it the largest post-release survival project using satellite tags in Australia, and up there as one of the largest of its kind in the world. Recreational anglers have also helped greatly, offering fish for tagging or manpower to locate detached tags washed ashore.

At the time of writing, 45 tags had been deployed, with a further 15 to be deployed during the 2014 SBT season. Most tags were programmed to release from the fish after 180 days, before the batteries run out. While some tags lasted the duration, several came off before the due date. However, researchers were still able to gain some excellent information.

The preliminary findings suggest that SBT survive post-release quite well, with only a small number of released individuals determined to have died. In order to take the study a step further we are looking into other factors such as the length of fight times, hook location and damage, as well as assessing blood samples to determine any physiological stress on the fish. The results will be available late in 2014, and will be used to develop a scientifically based code of practice on the capture and handling techniques for SBT.

To date, tags have been deployed on fish off the south-east coast of Tasmania, off Portland in Victoria and coastal NSW. Since then, tags have popped off anywhere between the south coast of Western Australia and almost as far east as New Zealand.

SIGNS OF RESILIENCE

While the vast majority of fish tagged off south-east Tasmania had moved to the east when their tag detached, two were on the continental shelf along Tasmania's west coast.

It's interesting to see the latitudinal spread of fish that released their tags in August. The fish spread from adjacent to the bottom of Tasmania to adjacent to Port Macquarie in NSW. All were a significant distance from the coast.

With the exception of one fish that released its tag off the east coast of Tasmania, all fish tagged at Portland released their tags to the west of Tasmania.

All of the fish tagged off NSW released their tags to the south-east of their tagging position – some well out into the Tasman Sea. Interestingly, one fish tagged off Jervis Bay was caught two days later by a commercial longliner who kindly sent the tag back so it could be redeployed. This was a really positive sign that the fish had returned to feeding not long after being released, again supporting the theory that these tuna are resilient to catch-and-release fishing.

TARGET FOR PREDATORS?

Some of the most interesting information that has been provided by the tags to date is evidence of

predation on SBT. Data from a couple of the tags indicate that the tuna were eaten several weeks to months after release. Based on the duration post-release, it would be reasonable to say that they had not died as a direct result of being caught and released. It is difficult at this stage, however, to confirm whether these fatalities are a secondary response to being caught due to a weakened physiological condition or if they were just a natural predation mortality. Previous studies have shown that the natural mortality rate of juvenile SBT can be as high as 40 per cent a year.

An example of this natural predation occurred for a fish tagged off south-east Tasmania (Fig. 2). Following its release, the fish displayed typical behaviour, suggesting it had survived being captured and released. However, after 22 days the data from the tag dramatically altered, showing a significant drop in light levels and a 10°C increase in water temperature – up to about 26 degrees. This indicates that the tuna had been eaten. Studies of stomach temperatures tell us that it was not warm enough for a mammal, but was too warm for a small shark. In a mako we would expect an increase

of only three or four degrees above water temperature, so that leaves a white shark as the most likely culprit.

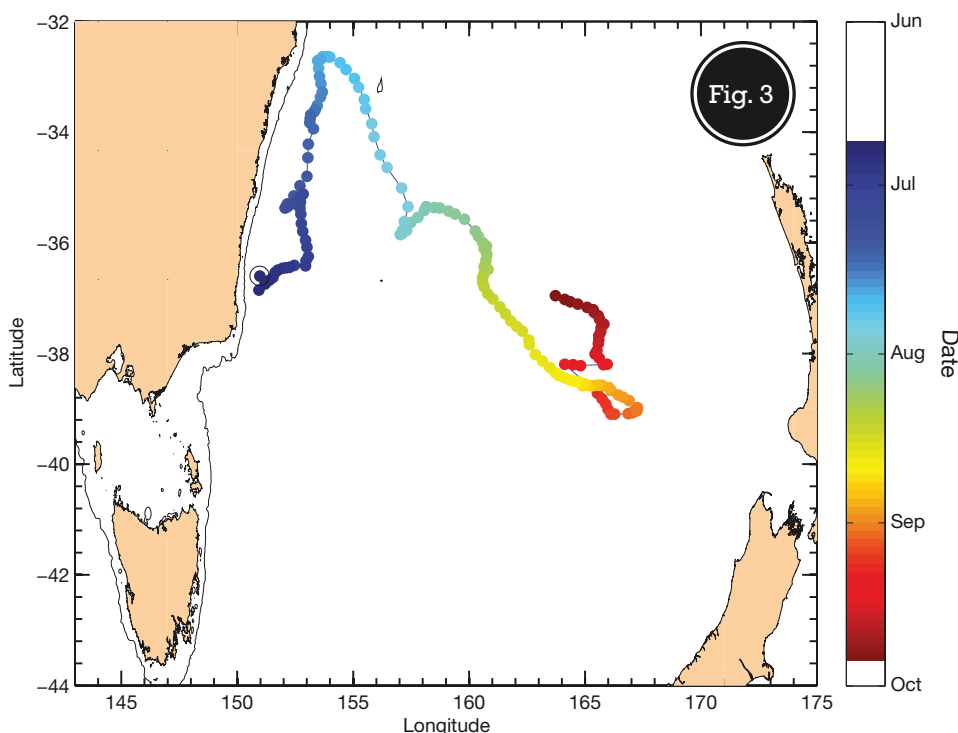
TRACKING MOVEMENTS

It is possible to generate an approximate track of the tuna's movement based on some of the information stored in the tag. The process includes the analysis of light data to determine the approximate latitude and longitude based on the time that the sun rises on a given day at a given location. This position is refined by comparing temperature data recorded at the surface against satellite imagery of sea-surface temperatures for that date. Fig. 3 shows the movements of a fish tagged off NSW in 2012.

NEW INSIGHTS

This study should provide an amazing insight into these iconic fish and the broad range of ocean they inhabit. By determining how well the fish survive post-release, we, as anglers, can help ensure they have the best chance of survival, an outcome vital to protecting the future of this wonderful fishery.

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The estimated migratory path of a southern bluefin tuna tagged off Bermagui in southern New South Wales in late July 2012. The track covers 100 days before the tag detached from the fish in the middle of the Tasman Sea in late September 2012.