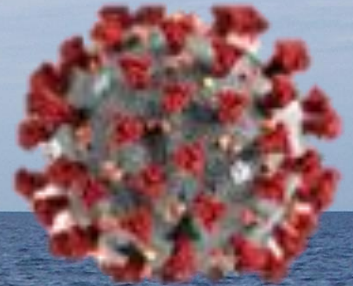
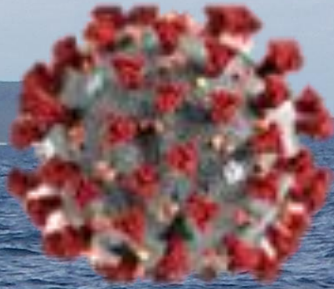


Impact of Covid-19 on recreational fishing



Adam Martin, Stefan Sawynok, Bill Sawynok

2021

FRDC Project No 2019-213



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FRDC project 2019-213
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Researcher Contact Details

Name: Adam Martin
Organisation: Australian Recreational
Fishing Foundation
Address: PO Box 118 Deakin West Act 2600
Phone: 0418 570 131
Email: adam.martin@arff.net.au

FRDC Contact Details

Address: 25 Geils Court
Deakin ACT 2600
Phone: 02 6122 2100
Email: frdc@frdc.com.au
Web: www.frdc.com.au

In submitting this report, the researcher has agreed to FRDC publishing this material in its edited form.

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This project would not have been able to achieve what it has achieved without the data available through the Suntag program. The efforts of over 16,000 fishers that have tagged fish and over 21,000 fishers that have reported recaptures are acknowledged. That database now spans almost 35 years and has around 1.4 million fish records including almost 950,000 tagged fish and 73,000 recaptures.

Over its lifetime it has been used for many purposes beyond the normal growth and movement objectives of tagging programs. When used in conjunction with other data the uses have included monitoring of:

- Catches
- Stocked fish in impoundments
- Fishing competitions
- Fish recruitment
- Fish health
- Crystal Bowl forecasting
- Marine Park planning
- No take fishing areas (green zones)
- Net Free Zones
- Range shift associated with climate change
- Fishing effort and fisher behaviour

The other acknowledgement that needs to be made are all the competitions that have contributed to this project. Again, without that contribution this project would not have been able to achieve what it has achieved.

- ARFF competitions (AUS)
- ABT Bream, Bass and Barra competitions (AUS)
- SCF Australia competitions (AUS)
- Euro Fishing Association competitions (NSW)
- Fishing Freshwater competitions (QLD)
- Salmon Slam (WA)
- Marmion Amateur Angling Club (WA)
- Cobram Barooga Anglers (NSW)
- Barrabasstastics competitions (QLD)
- Swanfish (WA)
- Baffle Creek Fishing Festival (QLD)
- Yak Hunters (AUS)
- Palmerston Game Fishing Club (NT)
- Boyne Tannum Hookup (QLD)
- Twin Rivers Bream Classic (VIC)
- Rainbow Beach Fishing Festival (QLD)
- Women That Fish (QLD)
- Ingham Rod and Reel Club (QLD)
- Rocky Barra Bounty (QLD)
- Exmouth Billfish Bonanza (WA)
- Jervis Bay Shootout (NSW)
- Coast 2 Coast Tuna Catch and Release (AUS)
- Esperance Deep Sea Classic (WA)
- Albany Salmon Spectacular (WA)
- Barra Bash (QLD)
- Mike Carney Fishing competitions (QLD)
- Reel It In competitions (AUS)
- Nicholson Angling Club (VIC)
- Teams Fishing Australia (VIC)
- Avalon Beach RSL Fishing Club (NSW)

Executive Summary

This project examined the impact of Covid-19 on recreational fishing using a citizen science approach. The Australian Recreational Fishing Foundation (ARFF) teamed up with Infish Australia Pty Ltd to use recaptures of tagged fish in Queensland and fishing competitions around Australia in novel ways to assess the impact by comparing data from 2020 with 2019.

The original objectives of the project were to use the Tackle Box app to provide fishers with information about Covid-19 restrictions on fishing, but it quickly became evident that understanding the impact of Covid-19 on recreational fishing should be the focus of the project. Given the short timeframe of the project it was decided to examine existing datasets to see if they could be used to assess the impact.

Recaptures of tagged fish were used to shed light on fishing effort and fisher behaviour. Recaptures are directly related to fishing effort and the number of tagged fish in the water at any time. In theory if the number of tagged fish in the water is the same and fishing effort is the same from year to year then the recapture rate should be roughly the same. An estimate of the number of tagged fish at the end of a year was made using a methodology being reported on in a separate paper in progress. Change in fishing effort is directly related to any change in the number of fish in the water and the number of recaptures.

Statewide fishing effort in 2020 was estimated to be down slightly by 5.6% compared to 2019. Recaptures for the 2 years tracked closely through to October when a surge in 2019 was not matched in 2020. However, at the regional level the fall in effort was variable. For SEQ Bass impoundments a total shutdown of fishing in April contributed to a fall in effort of 25.1% for the year.

Change in the distance to go fishing reflects fisher behaviour and the distance between the fisher's address and the recapture location was used as an approximation. Elements of behaviour that were assessed were average distance travelled between years, distances travelled when there were travel restrictions and the effect of border closures.

For the average distance from the fisher's address to the recapture location at the statewide level there was a fall of 19.4% from 2019 to 2020 however was down 33.5% in the Fitzroy River and up 171.6% at Lake Awoonga (based on a smaller number of recaptures). Both these locations have a significant proportion of effort by travelling fishers from southern regions. Overall, fishers travelled shorter distances to go fishing in 2020.

There were times during March-April when there was a 50 km limit on travel in Queensland as part of the Covid-19 restrictions. The distance travelled was assessed to determine whether fishers were complying with the restriction. During that time in 2019 20.1% trips were over that limit while in 2020 this was 2.4%. This suggests that fishers in Queensland largely conformed to the travel restrictions.

There was a drop in interstate fishers that was largely due to border closures although there was still a contingent of long-term retiree travellers that spent a long time travelling in Queensland. Also, there was a boost in interstate fishers in August when the Queensland border was opened after a lengthy closure.

While recreational fishing went on much as normal working within the restrictions and border closures it was clear that Covid-19 had a significant impact on fishing competitions all around Australia with traditional competitions unable to continue while the restrictions were in place. From March to December at best count there were 84 events that were cancelled with many more scaled down or postponed.

There had already been a shift to photo-based online competitions and the development of alternative formats using Tackle Box, Trackmyfish and other apps, but this was accelerated by the Covid-19 restrictions. In response to the cancellation of events several alternative formats were trialled. These included submitting historic photos, live streaming of events replacing traditional weigh-ins and longform events covering longer time periods where fishers did not have to take part in gatherings.

Most were successful such as the SCF Isolation Fishing Event and the Salmon Slam as they are being repeated in 2021. However not all of the new approaches worked, such as public voting to determine winners, but that is the nature of trying out new things. Overall, the shift to online competition formats has been accelerated and is likely to become the dominant form of future events as this provides a much wider range of options for holding events.

The Gone Fishing Day is a national day that encouraged local gatherings and promoted fishing. However, in 2020 that format would not work due to the Covid-19 restrictions so it moved to an app-based format.

App-based fishing competitions have opened up a number of new ways to engage with recreational fishers. They provide the opportunity to examine elements of the audience in ways not previously possible. Assessment of participants by gender, age groups and geographic distribution as well as providing insights into fisher behaviour are now possible. It is telling that an average of 1,472 fishers checked-in on competition scoreboards every day in 2020. Understanding this is important when designing messages for recreational fishers and the apps provide new avenues in delivering the messages.

Away from competitions two live stream episodes were published on YouTube by guest presenters. These were presentations on Maximum Experiential Yield and on the diversity of recreational fishers in Australia. These had a total reach of around 15,000 indicating that recreational fishers were interested in science content. This also provided the opportunity to profile the viewing audience and their behaviour in relation to viewing time.

A key strength in citizen science models is the ability to quickly detect change in the real world. The “built for purpose” citizen science networks are, longer term, proving to be less successful than citizen science programs that generate broad based datasets that lend themselves to being repurposed as the needs arise. This should provide insights into the development of future monitoring programs. Increased engagement with the scientific and management community on such datasets could help bridge the gap between those collecting the data and those making decisions.

Technology changes, cost pressures and the ever-growing need for data to be timely and relevant to the needs of end users will inevitably change the data landscape for recreational fisheries and citizen science will form part of the new paradigm.

It needs to be remembered that today’s recreational fisher is armed with more technology than existed in entire fisheries agencies just a few short years ago. Sounders, GPS, high tech fishing gear, apps and the internet mean that fishers have instant information at their fingertips, even when out on the water. That is the paradigm that is driving information delivery now and will only increase into the future.

Given that understanding changes in fishing effort and fisher behaviour will still be issues when Covid-19 no longer disrupts society the way it does now this work will continue through 2021 and 2022 and will likely evolve along the way to be more relevant to understanding what is changing in the recreational fishing world.

Keywords

Recreational fishing, Covid-19, impact, tagging, recaptures, fishing competitions, Tackle Box, Trackmyfish

Introduction

When Covid-19 emerged in Australia in early 2020 there was considerable uncertainty about how it would evolve and how it would impact on various parts of the community. In responding State Governments relied on community lockdowns and border closures as their tools of choice in trying to contain the spread of the virus while waiting for the development of vaccines. This resulted in extensive job losses and changes to work practices such as working from home. To cushion the effect on the economy the Federal Government introduced Jobkeeper and Jobseeker.

What that created was considerable disruption and uncertainty in the community and different sectors of the community were affected in different ways. Hardest hit were the airlines, tourism, the arts, recreation and universities. But little was heard or known about the impact on the fishing industry, and in this case the recreational sector. Unlike other industries there were few ways of measuring the impact on recreational fishing.

Initially this project was an extension project focused around getting information out to fishers through Tackle Box to help them understand the constraints on fishing and what alternatives may be available to them in terms of fishing activities. Delays in getting the project underway along with the rapid changes in governments responding to dealing with the virus meant that circumstances required the project to change focus and it morphed into three different elements which built on the original project objectives but were designed to obtain an insight into the impact of Covid-19 on recreational fishing.

Those elements were:

1. Determining how Covid-19 impacted on the recreational fishing industry in a broad sense as well as seeing if that could be measured,
2. Assisting the recreational fishing sector in finding alternative activities that could be undertaken under the constraints of Covid-19, and
3. As originally intended using Tackle Box as a tool for engagement and extension to recreational fishers.

What has emerged are new ways of looking at monitoring into the future, the role of citizen science and in the engagement of recreational fishers.

Objectives

The original objectives of the project were:

1. To further develop the Tackle Box project/application (funded by Parks Australia) to connect recreational fishers during the COVID-19 situation.
2. To use the extended platform to educate recreational fishers on the relevance of government measures to recreational fishing, ensuring those that should not be fishing don't and those that can know under what conditions they can.
3. To extend FRDC information through the new platform including advertising of the current national social and economic survey and extending the results and information relevant as they become available. Extend other relevant project information in this time such as Tuna Champions, fish handling practices, habitat rehabilitation, safety etc.

Just as the understanding of the virus changed rapidly along with the Federal and State governments responses the understanding of what this project needed to deliver also changed. The original objectives were largely centred around extension of information about Covid-19 and other relevant information through Tackle Box.

While this remained integral to the project the objectives evolved into:

1. Examine existing datasets to see if there could be objective measures to determine the impact of Covid-19 on recreational fishing.
2. Work with recreational fishers to develop alternative fishing activities that could be undertaken under the constraints of Covid-19 restrictions.
3. As with the original objectives use Tackle Box as a key tool for the engagement of recreational fishers and deliver relevant information about Covid-19 and other relevant subjects to recreational fishers.

Method

1. Assessing the impact of Covid-19 on recreational fishing

From the time that the project was conceived to its final approval a lot changed with almost daily changes in responses from governments resulting in complete disruption of “normal” community functioning. It quickly became clear that what was lacking was any understanding of the impact of these changes on recreational fishing.

It also became clear that the widespread messaging from the various governments was getting through to fishers and adding another layer of information distribution was no longer a priority. It was considered that understanding if fishers were adhering to the messaging had greater relevance.

It was unrealistic to develop an approach that would address the gaps in a timeframe that would make it relevant. Therefore, it was decided the project should look at existing datasets that may provide some insight into the impact as this would be the lowest cost option and within the budget of the project. There were two datasets identified that could potentially provide objective data and they were the recaptures of tagged fish and fishing competitions.

It was considered that recaptures of tagged fish was one of the few datasets that provided close to a random sample of the fishing population and also had historic data that could be used to examine changes over time. A review of existing tagging programs was undertaken to determine if they were suitable for use in this case. To be useful they would need to meet 3 criteria:

1. They had to have sufficient recaptures each year to provide a realistic sample
2. They had to have a historic timeline of data so that comparisons could be made over time
3. They had to have addresses or postcodes of fishers recapturing fish

While a number of programs met criteria 2 and 3 only the Suntag program in Queensland met criterion 1 with over 1,000 recaptures a year by recreational fishers for the past decade.

There were two aspects of recaptured fish data that were considered relevant:

1. Fishing effort – a change in the number of recaptures is likely a reflection of fishing effort as recaptures are closely related to effort and would be impacted by lockdowns and restrictions
2. Fisher behaviour – a change in the distance travelled to go fishing is a reflection of fisher behaviour and would be impacted by restrictions on travel and border closures

Fishing competitions are an important element of recreational fishing activities around Australia with events almost every weekend and often during the week. It was considered that two elements of fishing competitions that could be examined to determine any impact on fisher behaviour by restrictions associated with Covid-19. These were:

1. Cancellation of fishing competitions
2. Changes in participation in events

Infotish has the only large-scale dataset on fishing competitions covering all states of Australia and New Zealand. Data were collected on a wide range of competitions in 2019-2020 in Australia that included offshore, estuary and impoundment events using the Tackle Box and Trackmyfish phone apps. It also maintains records of events that were cancelled. A social media search was undertaken to gather further data on events that were cancelled or rescheduled.

As well as looking at competitions broadly it was considered that an assessment of competitions that were held regularly would provide further insight into the impact of Covid-19. The ABT series of fishing events covering a range of species and in most states provided that opportunity.

1.1 Impact on fishing effort

The number of recaptures of tagged fish is closely related to fishing effort and the number of tagged fish in the water at any time. Changes in fishing effort can be estimated by changes in the recapture rate however this is also dependent on the number of tagged fish in the water at any time.

The number of tagged fish in the water at any time is dependent on many factors however can be estimated by the “survival” rate of tags. The survival rate is the rate of reduction of tags each year and was used to estimate the number of tags in the water at the end of each year. The survival rate varies based on the environment of the fish and the species and a model has been developed that estimates the number of tags in the water at the end of a year. Another paper is being prepared to provide the detail of this approach.

As Queensland is a large state with diverse fishing opportunities there were a number of assessments made to determine regional differences where there were sufficient data. These were:

1. Statewide (all of Queensland)
2. South East Queensland estuaries (Sunshine Coast to Gold Coast)
3. Central Queensland estuaries (Fitzroy River to Curtis island)
4. North Queensland estuaries (Townsville to Cardwell)
5. South East Queensland Bass impoundments (Advancetown, Maroon, Moogerah, Wivenhoe, Somerset and Borumba)
6. Central Queensland Barramundi impoundment (Awoonga)

To determine if there were changes in fishing effort recaptures from 2019 (before the impact of the virus) were compared with 2020 (impact of the virus). To provide some further context comparisons were also made using recaptures during the period prior to and during the Global Financial Crisis (GFC) at the statewide level to see if there were any changes during that time.

1.2 Impact on fisher behaviour

Recaptures of tagged fish provided data on fisher behaviour in 3 ways:

2. The distance fishers travelled to go fishing
2. The adherence to travel limits imposed at various lockdown stages
2. The impact of border closures

The distance travelled to go fishing is normally the distance between the fisher’s address and the fishing location however this was unknown as there are many routes that could be taken, and long-distance travellers may be staying locally as part of extended travel. To provide a measure of behaviour the distance from the fisher’s address to the recapture location was used and calculated using Google Earth. Where the address was not available the centroid of the postcode was used.

Data collected on fishing competitions through Tackle Box and Trackmyfish is photo based and results are posted on online scoreboards so that results can be tracked by participants and anyone interested in the events. As well as data on the fish the database includes registration of participants and address details for some competitions.

Tackle Box and Trackmyfish data included:

1. Competition dates
2. Participant’s name and address
3. Location of the competition

A calendar or timeline of events is maintained and if a competition was held or cancelled that was noted. Many competitions are repeated regularly, annually or a number of times a year. This enabled a review of events that were cancelled or rescheduled. A social media search through Facebook added to that. The database was examined to determine competitions that were cancelled during the times restrictions were in place in response to Covid-19.

Some fishing competitions that were held on a regular basis that had addresses of participants were also examined to determine if there were changes in participation or the geographic distribution of participants.

The ABT series of competitions held monthly in 2019 and 2020 targeted Bream, Bass and Barramundi and were run in QLD, NSW, VIC, TAS and WA provided a cross section of events around Australia, across species and across timeframes. This provided the opportunity to see what changed.

2. Alternative Fishing Activities

From March 2020 fishing competitions were mostly cancelled due to restrictions and border closures imposed in response to Covid-19. This left a significant gap in recreational fishing activities, so some innovative events were trialled to determine if there was interest in alternative formats that did not involve physical contact by participants or otherwise complied with Covid-19 restrictions.

There were 3 alternative formats that were trialled. These were:

1. At home events using photos of historic catches
2. Using live streaming as an alternative to weigh-ins, presentations and gatherings
3. Longform online events over extended timeframes

The use of historic photos was a novel format that fitted with the restrictions imposed due to Covid-19. The concept was a virtual event that allowed photos to be submitted from home. That conformed with the requirements of staying at home, social distancing and the number of people that could be together at events.

The initial event that trialled the use of existing photos was called "Back to the Future" through the Trackmyfish app and was held in April centred around freshwater impoundments in the South Burnett in Queensland. This involved the submission of a single photo in 3 categories being scenic, saltwater and freshwater. An innovation was allowing the public to vote on the best entries.

The next event that tried this approach was SCF Isolation Fishing 2020 that was held over a 2-week period in June-July and involved the use of the Trackmyfish app and required participants to submit historic photos from the photos on their phones from their home. There were a number of categories for event winners including the most species and the longest fish of a species.

The Gone Fishing Day is an event that has been held for a number of years and involved local organised gatherings of fishers all around Australia and the promotion of going fishing. That format would not meet the requirements of Covid-19 restrictions and was moved to an app-based event using a Gone Fishing Day specific app. The 2020 event was held in October and there were 4 categories with prizes for the best photos. This allowed participants to still go fishing and take part in the event within the constraints of the Covid-19 restrictions.

ABT events are held regularly and in 2020 there were 10 of the 20 events cancelled and 1 was rescheduled to a later date. This resulted in the events moving from a live weigh-in to an app-based format with daily live streaming.

The Salmon Slam was the first large-scale longform event in WA to go app-based using Trackmyfish and targeting Australian Salmon. It was a new concept and was developed prior to Covid-19 but was introduced just prior to the initial Covid-19 restrictions being implemented. It was intended to run for 3 months from March-May but was cancelled at the end of March due to the restrictions.

3. Engaging and informing recreational fishers

The original objective of the project was to use Tackle Box to inform fishers about Covid-19 and provide information on subjects of relevance to recreational fishers.

Due to the prolonged delay in having the project approved and subsequent delayed funding this negatively impacted the original objectives and timeline for the project. In addition, due to a worldwide shortage of live streaming equipment, as a result of the pandemic and people staying at home this further delayed the acquisition of the entry level production equipment needed to undertake the live streaming at an acceptable professional level.

While these delays impacted the original project timeline, the delay in delivery of the live streams until December also meant that the original live stream content was no longer relevant as the main social distancing lockdowns had passed and people were no longer confined to their homes. Therefore, the content was modified to a science communication delivery approach.

The other form of communication with fishers was through app driven interactions during events. This allowed direct engagement with fishers taking part in those events and allowed profiles of the audience to be developed. Data from 3 activities were assessed these being:

1. ABT Lockdown Live and ABT Live streams of ABT events
2. Salmon Slam daily check-ins during the event
3. Daily scoreboard views of all events

Along with the changes in the objectives of the project it was considered necessary that the engagement mechanisms needed to be expanded. This was brought about as the tracking of recaptures of tagged fish was considered to be time relevant and important to key organisations and individuals. Data on that was updated daily and a dashboard was distributed monthly to key agencies such as FRDC and Fisheries Queensland, fishing organisations, fishing businesses and individuals and was posted on the Suntag website. This was possibly the only data-based assessment that was available on a regular basis.

As Covid-19 was politically front and centre for all of 2020 it was important that the Qld Minister for Primary Industries and Fisheries was provided with some factual based information on the impact of Covid-19 on recreational fishing and the Minister's office was provided the monthly updates. While for most of the year this showed little difference between 2019 and 2020 it meant that there was one less thing to concern the Minister.

Results

1. Impact on fishing effort

The impact on fishing effort was assessed based on the numbers of recaptured fish in the Suntag program. Table 1 shows the number of fish tagged each year from 2007-2020, the estimated number of tags (ESTtags) in the water at the end of each year, the number of recaptures by recreational fishers (Rec recaps), the percentage of recaptures compared to the estimated number of tags and the number of recaptures with addresses or postcodes.

Table 1: Summary of Suntag tagged and recaptured fish from 2007-2020

YEAR	TAGGED	ESTTAGS	REC RECAPS	% RECAP	ADDRESSES
2007	35753	53685	1657	3.1	
2008	34866	53131	1708	3.2	
2009	35452	53150	1725	3.2	
2010	37469	54371	1327	2.4	
2011	27786	49294	1255	2.5	
2012	19790	41450	1374	3.3	
2013	17512	35377	1113	3.1	
2014	22165	34525	1282	3.7	
2015	28277	37680	1218	3.2	
2016	22205	35931	1750	4.9	
2017	21029	34175	1569	4.6	
2018	23029	34322	1760	5.1	
2019	19723	32426	1682	5.2	1545
2020	16816	29545	1455	4.9	1364

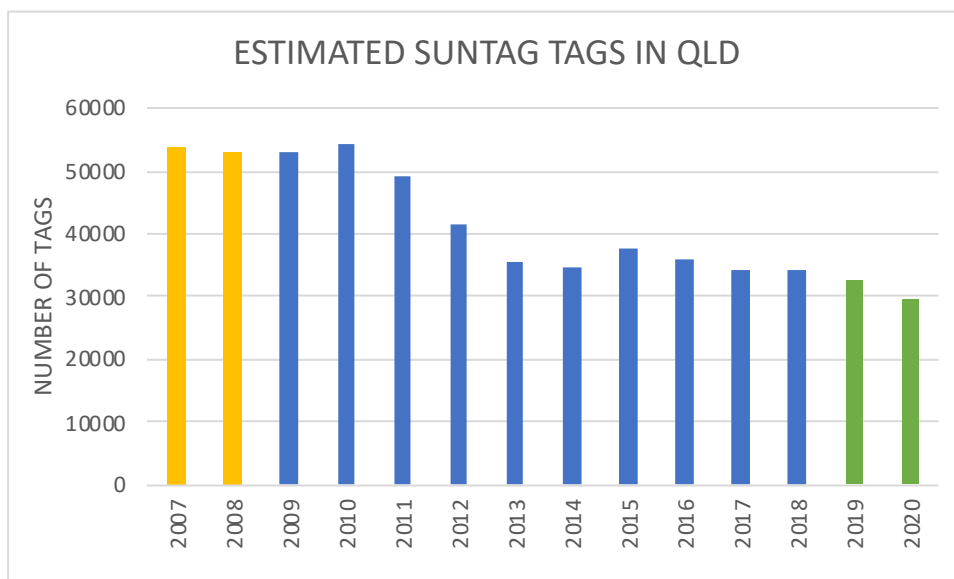


Figure 1: Estimated number of tags in the water at the end of each year from 2007-2020

Highlighted are the two periods under review with 2019-2020 before and during the Covid-19 outbreak and 2007-2008 being before and during the GFC. Figure 1 shows the estimated number of tags in the water at the end of each year.

Table 1 shows that in 2019 there were 19,723 fish tagged and based on a tag survival rate of 0.6/year there was an estimated 32,426 tags in the water at the end of the year and there were 1,682 recaptures made by recreational fishers. That equated to a recapture rate of 5.2% of the estimated tags. In 2020 there were 16,816 fish tagged, an estimated 29,545 tags in the water at the end of the year and there were 1,455 recaptures by recreational fishers. The recapture rate was 4.9%.

There was a fall of 14.7% in the number of fish tagged and an 8.9% fall in the estimated number of tags in the water from 2019-2020. This is likely to be an impact of Covid-19 however other factors may have also contributed.

Figure 2 shows the statewide cumulative recaptures for the 2 years. There was little difference in the number of recaptures through to October when recaptures surged in 2019 but maintained a steady track in 2020. This resulted in 227 (14.5%) fewer recaptures in 2020. However, the statewide picture does not show the differences in the various regions.

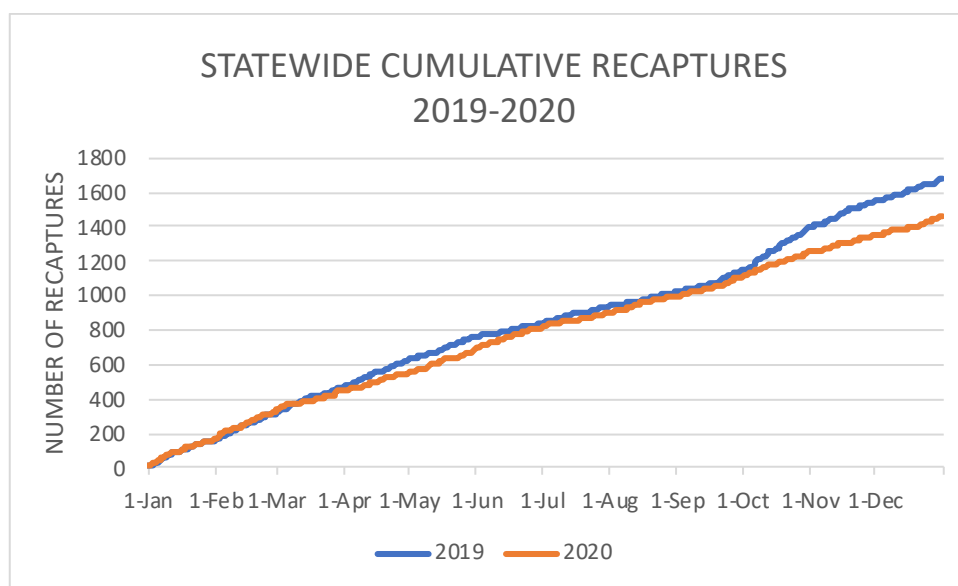


Figure 2: Statewide cumulative recaptures in 2019 and 2020

The estuaries in South East Queensland from Noosa on the Sunshine Coast in the north to the Queensland border on the Gold Coast, including Moreton Bay, is where the greatest part of the state's population resides and was the area most impacted by several lockdowns and restrictions in 2020.

There were 2,246 fish tagged in 2019 and an estimated 1,626 in the water at the end of the year based on a tag survival rate of 0.4/year while in 2020 there were 2,595 fish tagged and an estimated 1,688 in the water at the end of the year, so the number of tagged fish were up 3.8%.

In 2019 there were 209 recaptures compared with 185 in 2020. This was down 24 recaptures or 11.5%. Figure 3 shows the cumulative recaptures each year which shows a similar trend to that statewide. Recaptures followed an almost identical trajectory for most of the year however from October there were fewer recaptures in 2020.

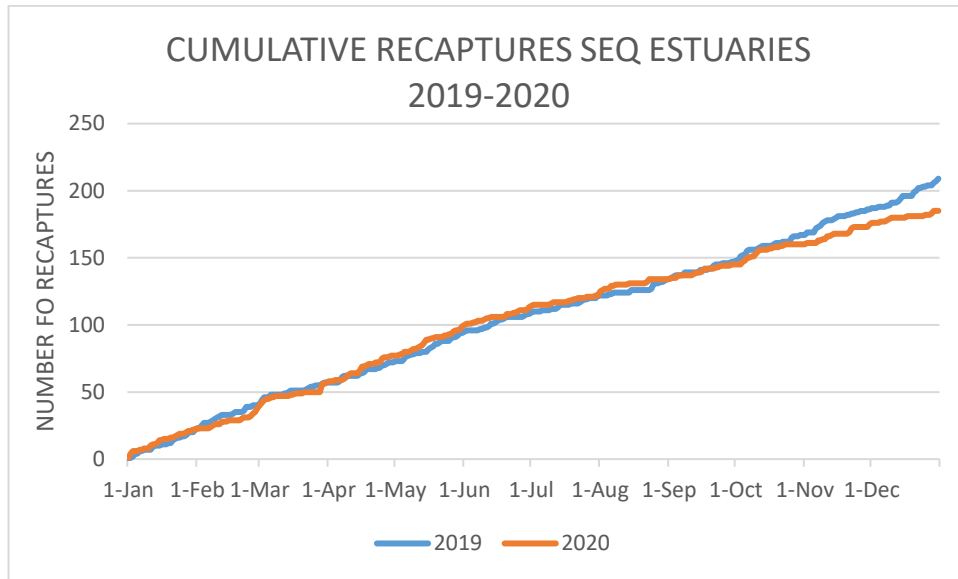


Figure 3: Cumulative recaptures in South East Queensland (SEQ) estuaries from the Sunshine Coast to the Gold Coast in 2019 and 2020

In Central Queensland the Fitzroy River estuary at Rockhampton was assessed as there was a long history of monitoring there through tagging. This area was less impacted by lockdowns however had a significant proportion of visitor fishers that went there mainly to catch Barramundi and King Threadfin that were impacted.

There were 1,314 fish tagged in 2019 and an estimated 1,734 in the water at the end of the year based on a tag survival rate of 0.5/year while in 2020 there were 824 fish tagged and an estimated 1,279 in the water at the end of the year, which was a 26.3% drop in the estimated number of tagged fish.

In 2019 there were 234 recaptures compared with 141 in 2020. This was down 93 recaptures or 39.7% which was more than the reduction in the estimated tags. Figure 4 shows the cumulative recaptures each year.

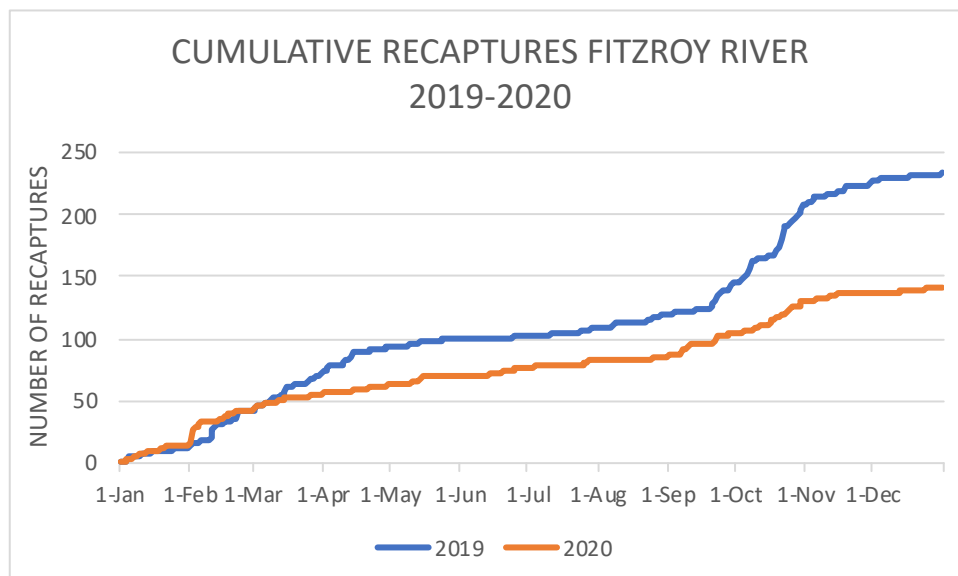


Figure 4: Cumulative recaptures in the Fitzroy River estuary in 2019 and 2020

The trajectory was similar through to March and then fell away as restrictions on travel were imposed. In the Fitzroy River the open season for Barramundi runs from February to October so there it a boost in fishing effort and recaptures at the start and end of the season. The boost was stronger in 2020 before the restrictions commenced but much weaker in October before the end of the season.

In North Queensland the estuaries from Townsville to Cardwell were assessed. This area was not significantly impacted by lockdowns and restrictions however the Hinchinbrook area relies to some extent on visiting fishers.

There were 1,529 fish tagged in 2019 and an estimated 1,685 in the water at the end of the year based on a tag survival rate of 0.5/year while in 2020 there were 1,812 fish tagged and an estimated 1,748 in the water at the end of the year, which was a 3.7% increase in the estimated number of tagged fish.

In 2019 there were 168 recaptures compared with 186 in 2020. This was up 18 recaptures or 10.7% which was slightly higher than the increase in tagged fish in the water and suggests that there was very little impact from Covid-19. Figure 5 shows the cumulative recaptures each year.

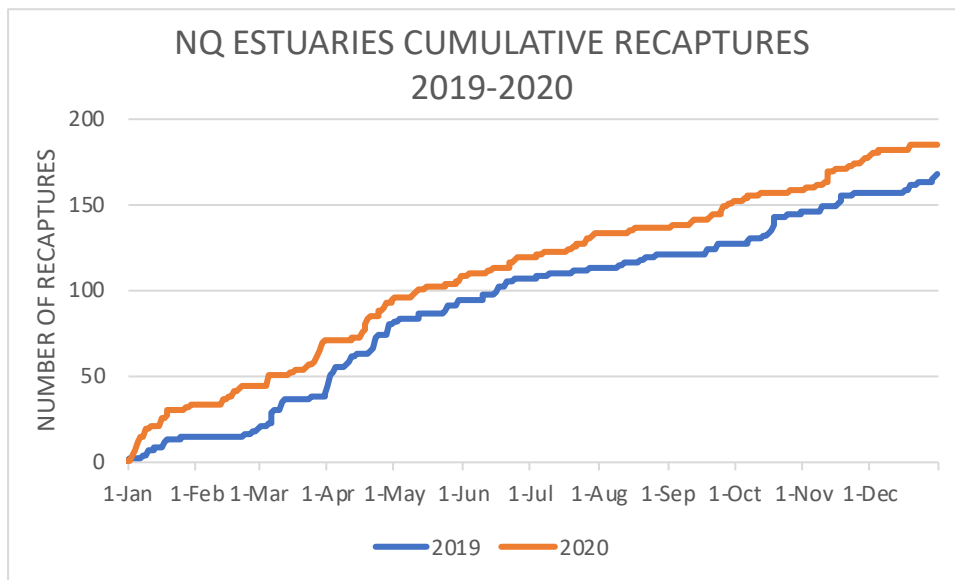


Figure 5: Cumulative recaptures in North Queensland estuaries from 2019 to 2020

As well as estuaries stocked impoundments are an important part of recreational fishing in Queensland. A number of impoundments stocked with Australian Bass were assessed. These form a ring around South East Queensland from the Gold Coast to the Sunshine Coast and were collectively assessed.

There were 1,345 fish tagged in 2019 and an estimated 2,853 in the water at the end of the year based on a tag survival rate of 0.7/year while in 2020 there were 2,479 fish tagged and an estimated 3,732 in the water at the end of the year, which was a 30.8% increase in the estimated number of tagged fish.

In 2019 there were 158 recaptures compared with 167 in 2020. This was up 9 recaptures or 5.7% which was lower than the increase in tagged fish in the water. Impoundments were closed to fishing in April so there were no recaptures that month (see flat line on graph) so overall there was little impact from Covid-19. Figure 6 shows the cumulative recaptures each year.

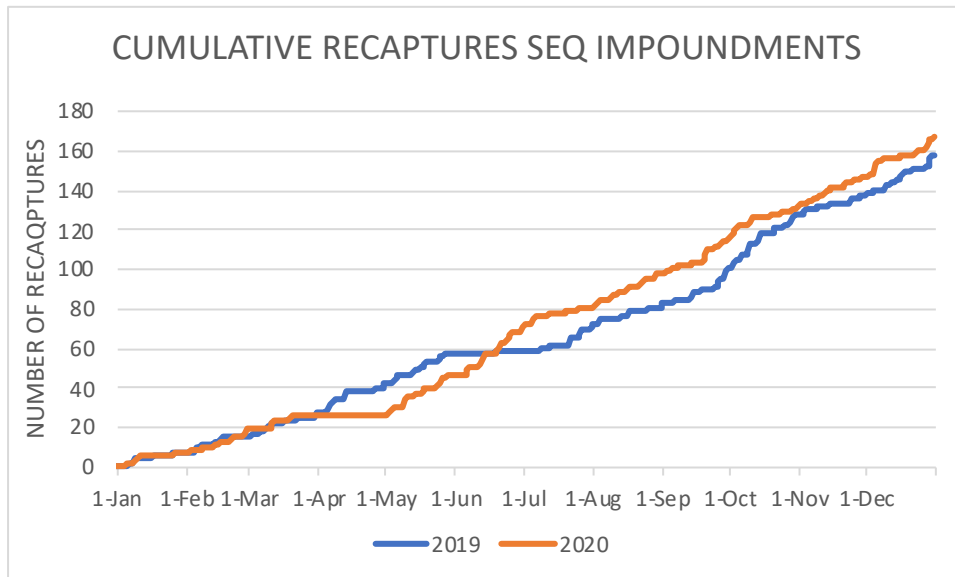


Figure 6: Cumulative recaptures in South East Queensland (SEQ) Bass impoundments in 2019- 2020

Central and North Queensland impoundments are stocked with Barramundi but only Lake Awoonga had limited but sufficient data to make an assessment of recaptures. Unlike other locations there is little tagging by taggers that occurs there. In this case most tags were deployed when fish were stocked at sizes where they could be tagged. Batches of tagged fish were released in 2016, 2017 and 2019.

It was estimated that there were 2,840 tagged fish in Lake Awoonga in 2019 and 2,012 in 2020 based on a tag survival rate of 0.7/year resulting in 29.2% fewer fish in the water.

In 2019 there were 51 recaptures compared with 33 in 2020. This was down 18 recaptures or 35.3% which was lower than the increase in tagged fish in the water. The impoundment was closed to fishing in April so there were no recaptures that month however there were few recaptures over the winter period in both years. The trend here was similar to the statewide trend which was boosted from October in 2019 but not to the same extent in 2020. Figure 7 shows the cumulative recaptures each year.

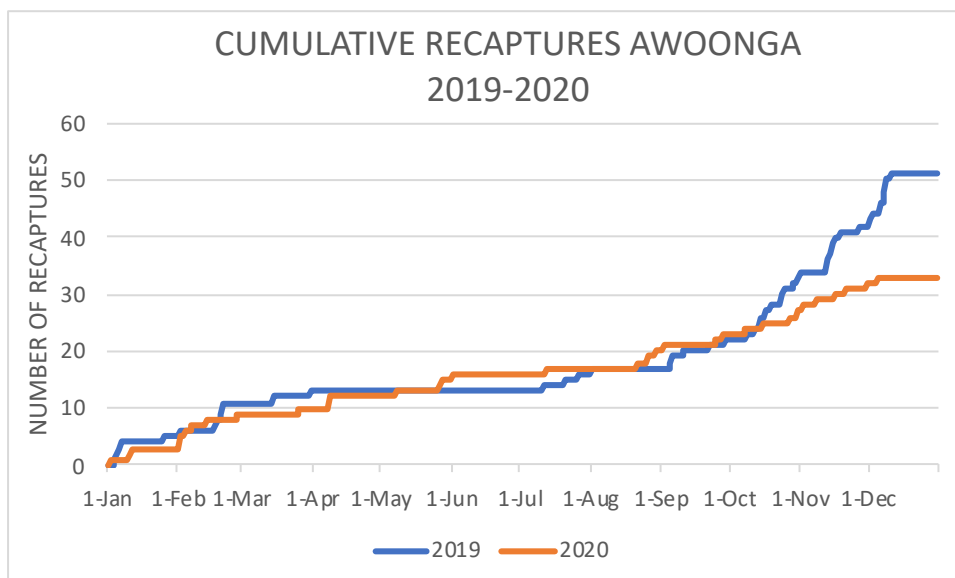


Figure 7: Cumulative recaptures in Lake Awoonga in 2019-2020

Table 2 provides a summary of the estimated change in fishing effort from 2019-2020 for all of Queensland and each of the regions assessed. The estimated change in effort is the difference between the change in the estimated number of tags in the water and the change in the number of recaptures. In theory if the

number of tags in the water were the same and the effort was the same then recaptures should roughly be the same.

Table 2: Estimated change in effort from 2019-2020 based on the change in the estimated number of tags in the water and the change in the number of recaptures

	QLD	SEQ EST	CQ EST	NQ EST	SEQ IMP	CQ IMP
ESTTAGS	-8.9%	+3.8%	-26.3%	+3.8%	+30.8%	-29.2%
RECAPTURES	-14.5%	-11.5%	-39.7%	+10.7%	+5.7%	-35.3%
EFFORT CHANGE	-5.6%	-15.3%	-13.4%	+6.9%	-25.1%	-6.1%

The GFC was the only other period of significant disruption to society in recent decades although Australia was less impacted than many other areas of the world. The impact of the GFC ran from mid-2007 through to early 2009. It was considered that there could have been an impact on recreational fishing.

The number of fish tagged, and the estimated number of tags were similar in 2007 and 2008 as shown in Table 1. Figure 8 shows the daily cumulative recaptures each year. For most of the year the recaptures followed a fairly similar track and at the end of the year recaptures in 2008 were 3.1% higher than in 2007. This suggests that there was little impact due to the GFC on recreational fishing in Queensland.

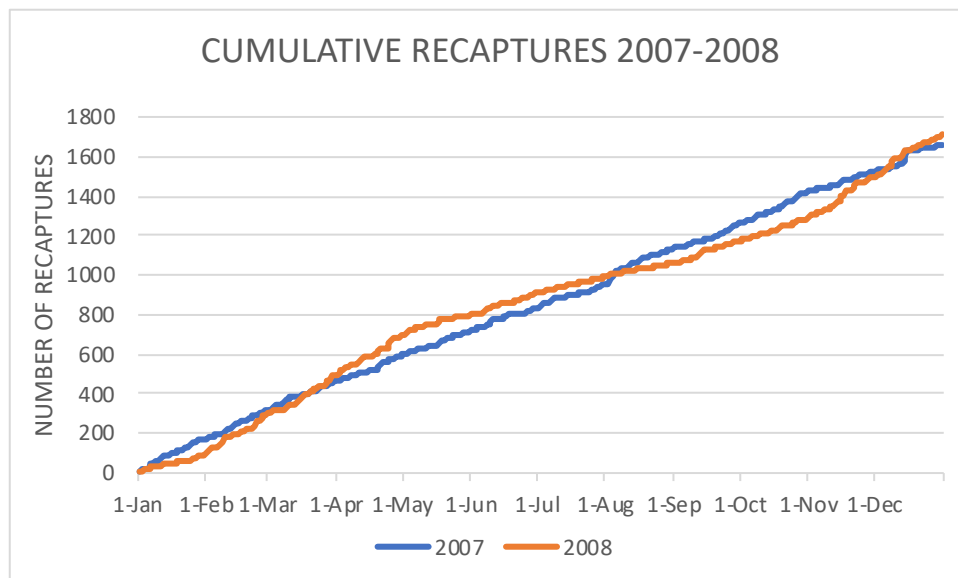


Figure 8: Cumulative recaptures in all of Queensland around the Global Financial Crisis from 2007-2008

2. Impact on fisher behaviour

There were a number of ways in which behaviour was assessed. Recapture data from 2019-2020 was assessed for the distance between the fisher’s address and the recapture location as a reflection of the distance to go fishing. This was undertaken at the state and regional levels.

Table 3 and Figure 9 show the average distance from the fisher’s address or postcode to the recapture location. The average distance was lowest in SEQ estuaries at 21 km in both years while it was greatest in

CQ estuaries at 155 km in 2019 and 103 km in 2020 and in CQ impoundment at 102 km in 2019 and 277 km in 2020.

Table 3: Average distance address to recapture locations in each of the regions 2019-2020

	QLD	SEQ EST	CQ EST	NQ EST	SEQ IMP	CQ IMP
2019	98	21	155	80	72	102
2020	79	21	103	72	67	277
DIFFERENCE	-19.4%	+1.6%	-33.5%	-10.0%	-6.9%	+171.6%

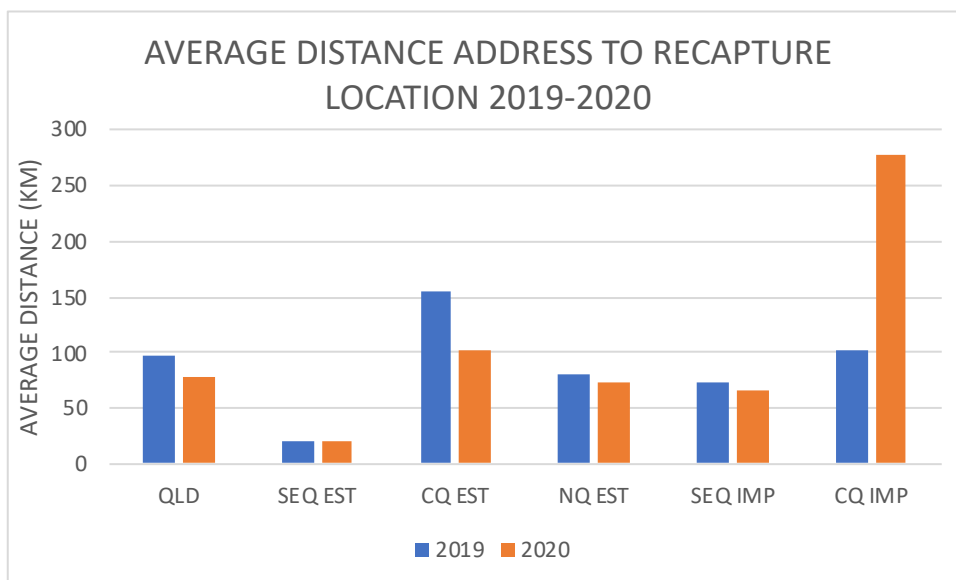


Figure 9: Average distance address to recapture location 2019-2020

Statewide in 2019 of the 1,682 recaptures there were 1,544 (91.8%) where the distance could be calculated and in 2020 of the 1,455 recaptures there were 1,378 (94.7%) where the distance could be calculated.

In 2019 there was a total distance of 147,057 km or an average of 98 km per recapture while in 2020 there was a total distance of 108,654 km for an average of 79 km which was a 19.4% reduction. Figure 10 shows the cumulative distance for 2019-2020. As with the number of recaptures the trajectory for both years was similar through to March when the first restrictions were put in place. While the number of recaptures tracked closely through to October for the distance it fell away markedly through to August when it picked up but then kept on the same trajectory while it surged in 2019. In August the Queensland border was reopened after a long period of closure that allowed interstate fishers back in boosting the cumulative distance.

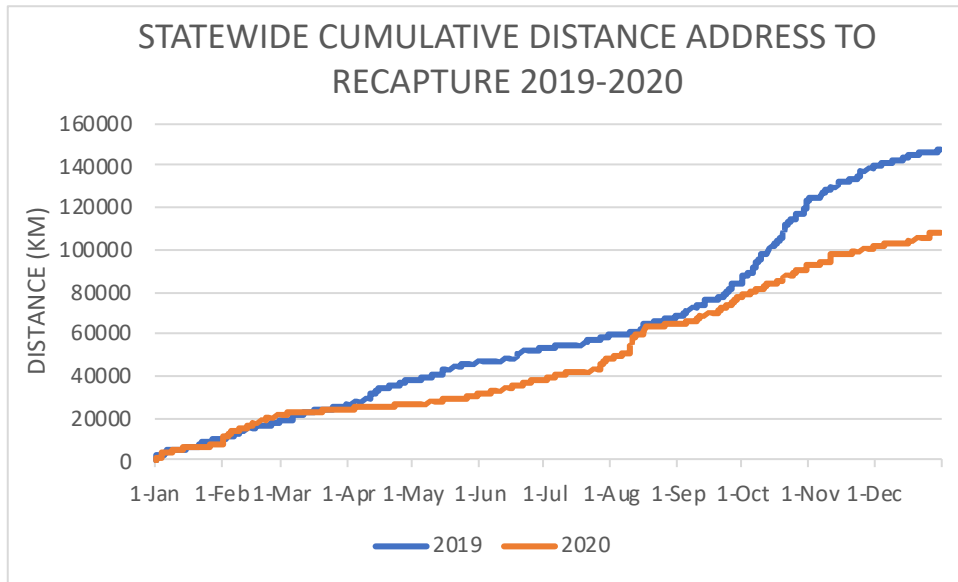


Figure 10: Statewide cumulative distance fisher’s address to recapture location 2019-2020

For SEQ estuaries in 2019 of the 209 recaptures there were 174 (83.3%) where the distance could be calculated and in 2020 of the 185 recaptures there were 166 (89.7%) where the distance could be calculated.

In 2019 there was a total distance of 3,565 km or an average of 21 km per recapture while in 2020 there was a total distance of 3,507 km for an average of 21 km which was the same for both years. Figure 11 shows the cumulative distance for 2019-2020. While the number of recaptures with distance were fewer by 4.6% the distance was much the same (down 1.6%).

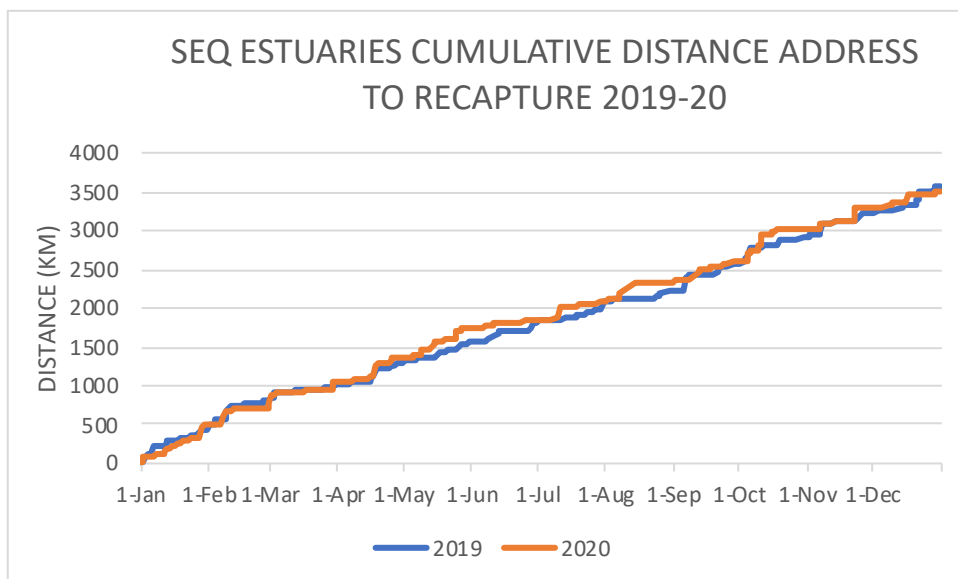


Figure 11: SEQ estuaries cumulative distance fisher’s address to recapture location 2019-2020

For the Fitzroy River in 2019 of the 234 recaptures there were 224 (95.7%) where the distance could be calculated and in 2020 of the 141 recaptures there were 140 (99.3%) where the distance could be calculated.

In 2019 there was a total distance of 34,620 km or an average of 155 km per recapture while in 2020 there was a total distance of 14,379 km for an average of 103 km with the average distance down by 33.5%. Figure 12 shows the cumulative distance for 2019-2020.

In 2020 the distance jumped substantially in February at the start of the Barramundi season and then when the restrictions were imposed in March it flatlined through to October just before the end of the Barramundi season. In 2019 the distance was more typical with a boost at the start of the Barramundi season, much quieter over the winter months and then a surge towards the end of the Barramundi season.

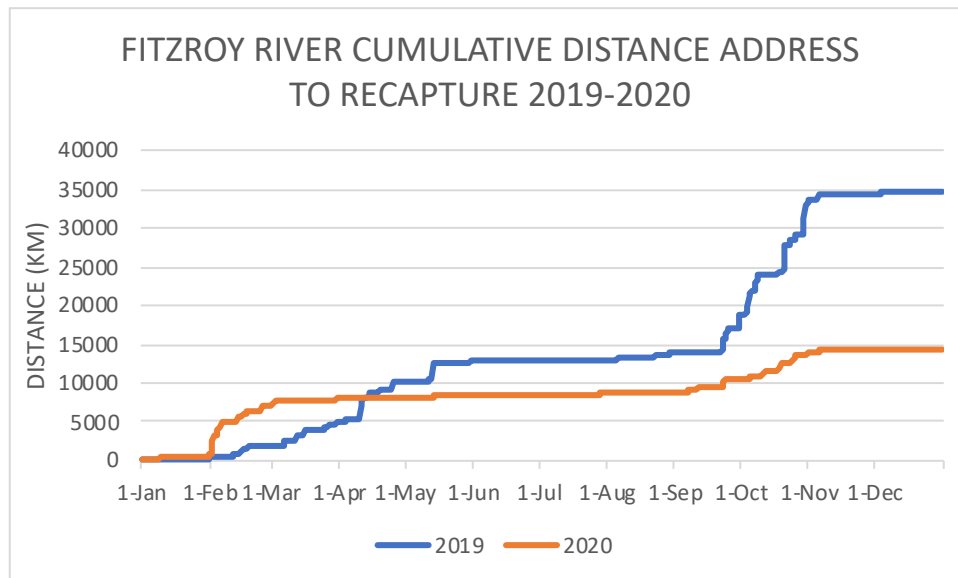


Figure 12: Fitzroy River cumulative distance fisher's address to recapture location 2019-2020

For NQ estuaries in 2019 of the 168 recaptures there were 151 (89.9%) where the distance could be calculated and in 2020 of the 186 recaptures there were 185 (99.5%) where the distance could be calculated.

In 2019 there was a total distance of 12,111 km or an average of 80 km per recapture while in 2020 there was a total distance of 13,365 km for an average of 72 km with the average distance down by 10.0%. Figure 13 shows the cumulative distance for 2019-2020.

The NQ estuaries are mostly a local fishery except for the Hinchinbrook area that mostly attracts southern visiting fishers in the second half of the year after the wet season and winter. At that time there were few restrictions due to Covid-19 so there was a similar pattern both years.

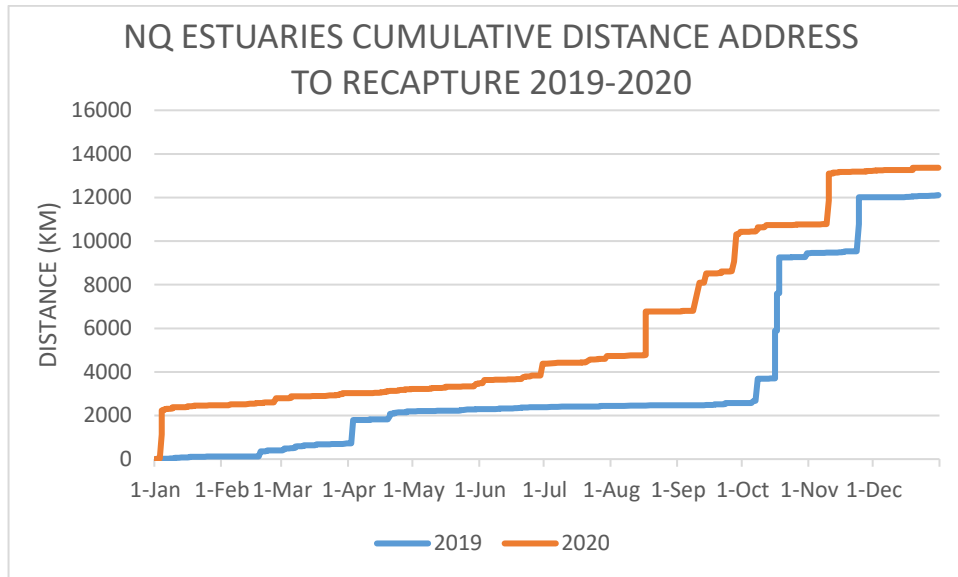


Figure 13: NQ estuaries cumulative distance fisher’s address to recapture location 2019-2020

For SEQ impoundments in 2019 of the 158 recaptures there were 149 (94.3%) where the distance could be calculated and in 2020 of the 167 recaptures there were 157 (94.0%) where the distance could be calculated.

In 2019 there was a total distance of 10,713 km or an average of 72 km per recapture while in 2020 there was a total distance of 10,572 km for an average of 67 km with the average distance down by 6.9%. Figure 14 shows the cumulative distance for 2019-2020.

In 2020 the distance flatlined during April when the impoundments were closed to fishing but then fluctuated for the rest of the before ending up much the same even though there were slightly fewer recaptures in 2020.

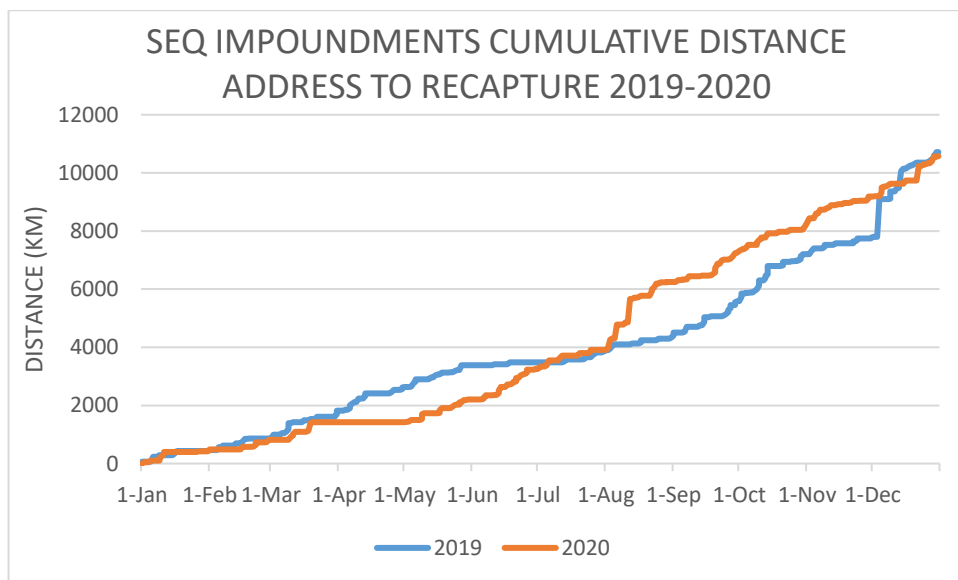


Figure 14: SEQ impoundments cumulative distance fisher’s address to recapture location 2019-2020

For Lake Awoonga in 2019 of the 51 recaptures there were 43 (94.3%) where the distance could be calculated and in 2020 of the 33 recaptures there were 33 (100%).

In 2019 there was a total distance of 5,203 km or an average of 102 km per recapture while in 2020 there was a total distance of 9,146 km for an average of 277 km with the average distance up by 171.6%. Figure 15 shows the cumulative distance for 2019-2020.

Lake Awoonga is a stocked Barramundi fishery however there is no closed season as there is for wild stocks. It is both fished by local and travelling fishers as it is less than a day's drive from the population centres in SEQ. The fishing is strongest in the warmer months with limited fishing over winter. The distance is strongly influenced by visiting fishers. In 2020 there were a number of travelling fishers in the early part of the year before the impoundment was closed to fishing during April. The distance showed a similar pattern at the end of both years that was dominated by travelling fishers.

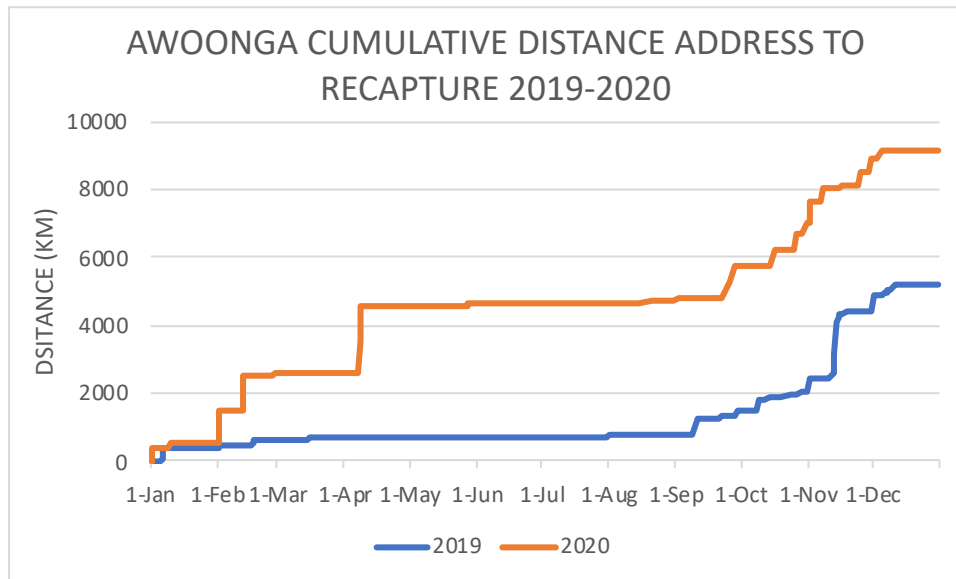


Figure 15: Lake Awoonga cumulative distance fisher's address to recapture location 2019-2020

Another element of behaviour that was assessed was the adherence to travel restrictions. In Queensland during March and April there was a restriction on travel to less than 50km. The actual route travelled to the boat ramp or fishing location was unknown so the distance from the address to the fishing location was used. As the fishing location may have been some distance from the boat ramp a leeway was allowed and trips under 55 km were assessed as being within the restrictions. A comparison was also made with 2019. Figure 16 shows the distance from the fisher's address to the recapture location in March-April 2019-2020.

In 2019 there were 283 recaptures with 57 (20.1%) where the distance from the fisher's address to the recapture location was over 55 km while in 2020 there were 209 recaptures with 13 where the distance was over 55 km. However, of those 13 there were 8 where the fishers were staying locally, mostly at impoundments, and only travelling locally to go fishing so complied with the travel restrictions. There were 5 (2.4%) recaptures where the distance was over 55 km with the furthest distance being 112km. The average distance in 2019 was 69 km while in 2020 it was 23 km. Figure 17 shows the comparison between 2019 and 2020. This suggests that fishers largely adhered to the travel restrictions.

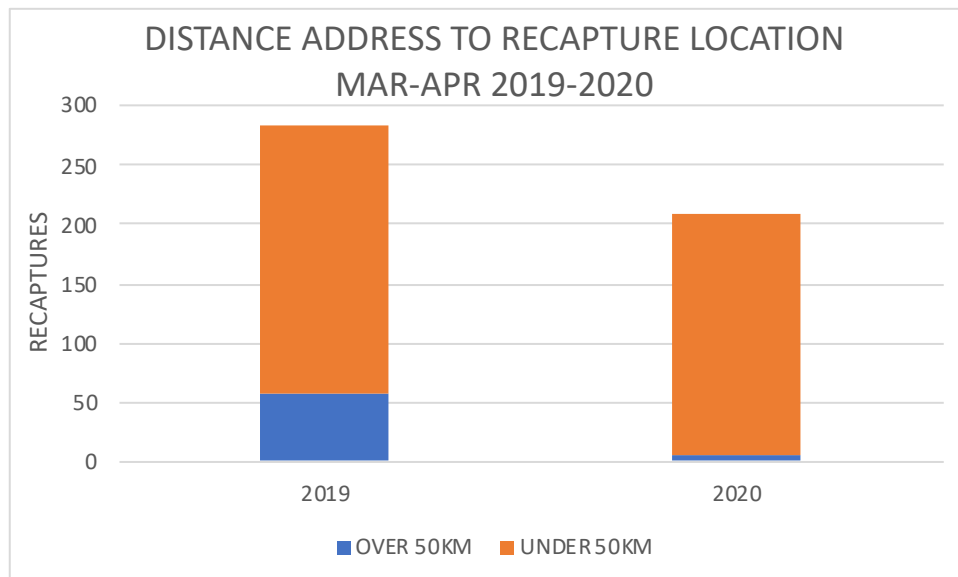


Figure 16: Distance fisher’s address to recapture location March-April 2019-2020

The other element of fisher behaviour that was examined was the impact of border closures. Interstate fishers were those with a postcode starting with other than 4(...).

In 2019 there were 39 recaptures by interstate fishers while in 2020 there were 28 which was down 28.2%. In 2019 25 (64.1%) interstate fishers were from NSW and 10 (25.6%) were from Victoria and 4 from other states while in 2020 27 (96.4%) were from NSW and 1 (3.6%) was from Victoria and none from other states. Figure 18 shows the breakdown of interstate fishers. Interstate fishers from NSW was much the same in both years and the difference was in the lack of fishers from other states, particularly Victoria, which was in lockdown for extended periods.

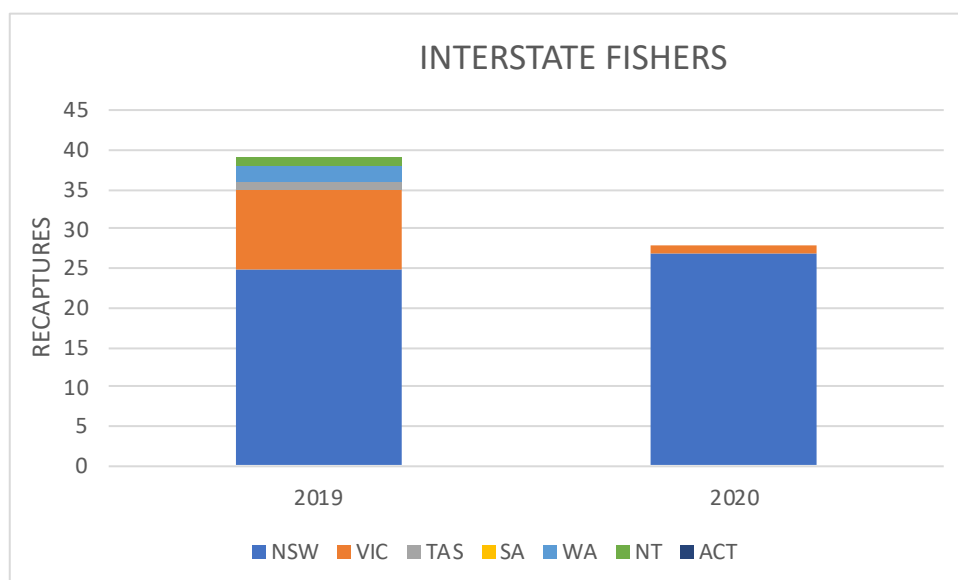


Figure 17: Breakdown of interstate visiting fishers

The Queensland-NSW border was closed from March to July. It was briefly reopened from mid-July to early August. From August to December there were restrictions on visitors from Sydney while those from regional NSW could still enter Queensland.

There were low numbers of recaptures over much of 2020 except in May-June when the border was closed. Recaptures in March and April were made by fishers on extended travel during retirement. There was a surge in August after the reopening of the border. The surge in 2019 from August-November was partly due to interstate fishers travelling to Queensland to fish before the closure of the Barramundi season. The

impact of the border closure was short lived and was limited to the tightest closure period from March-July. Figure 18 shows the number of recaptures by interstate fishers each month in 2019-2020.

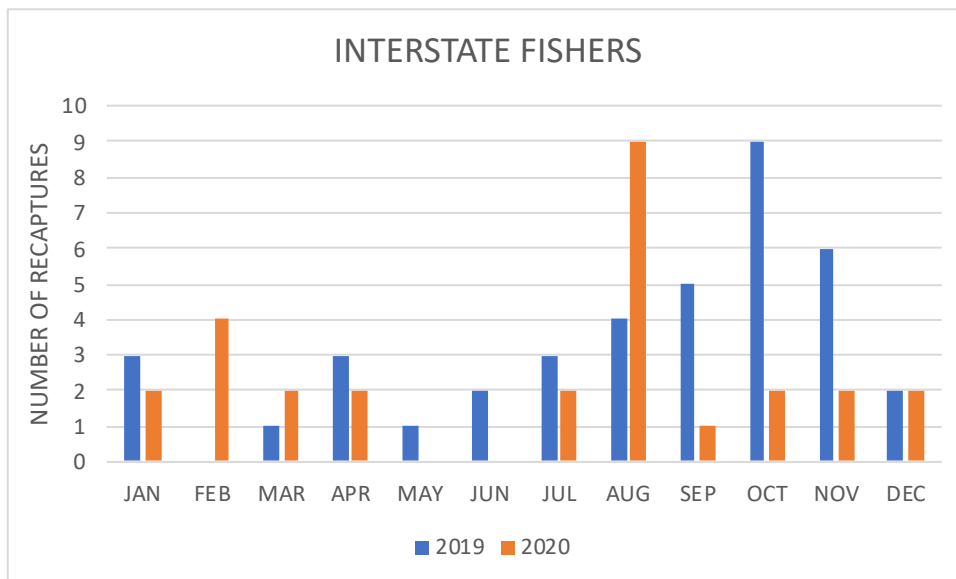


Figure 18: Recaptures by interstate fishers each month 2019-2020

Fishing competitions, like many other events and activities, were impacted by Covid-19 restrictions and border closures. This applied to all states and territories at various times depending on restrictions and border closures.

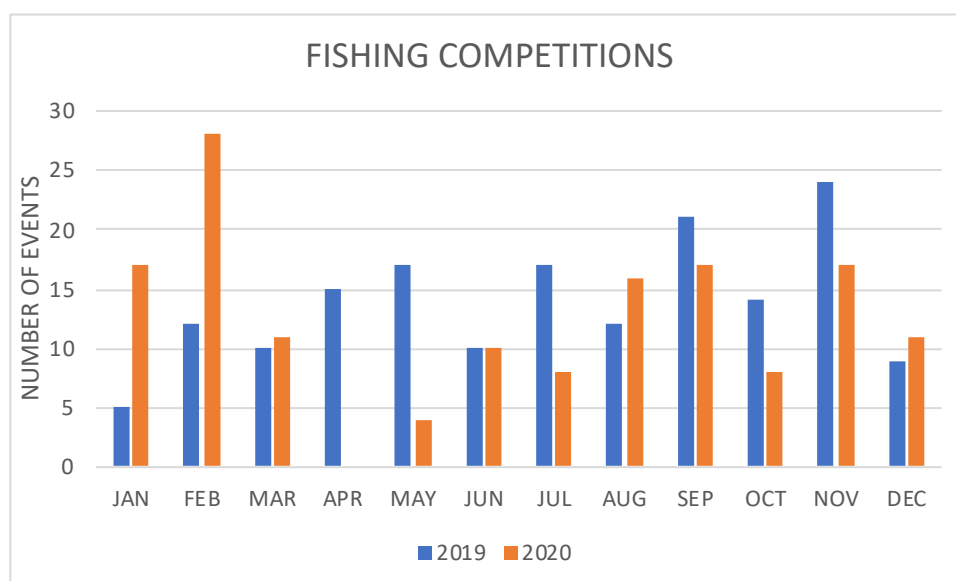


Figure 19: Number of fishing competitions each month that used Trackmyfish apps 2019-2020

Trackmyfish apps have been used around Australia by competitions since 2016 and were used by 166 events in 2019 with total registrations of participants of 29,329 while in 2020 this was 147 events with 19,304 participants. Figure 19 shows the number of events each month for 2019-2020 and Figure 20 shows the number of registrations each month. In 2020 there were no Trackmyfish competitions in April as they were all cancelled. Events were again down in May then down a further 20 for the rest of the year.

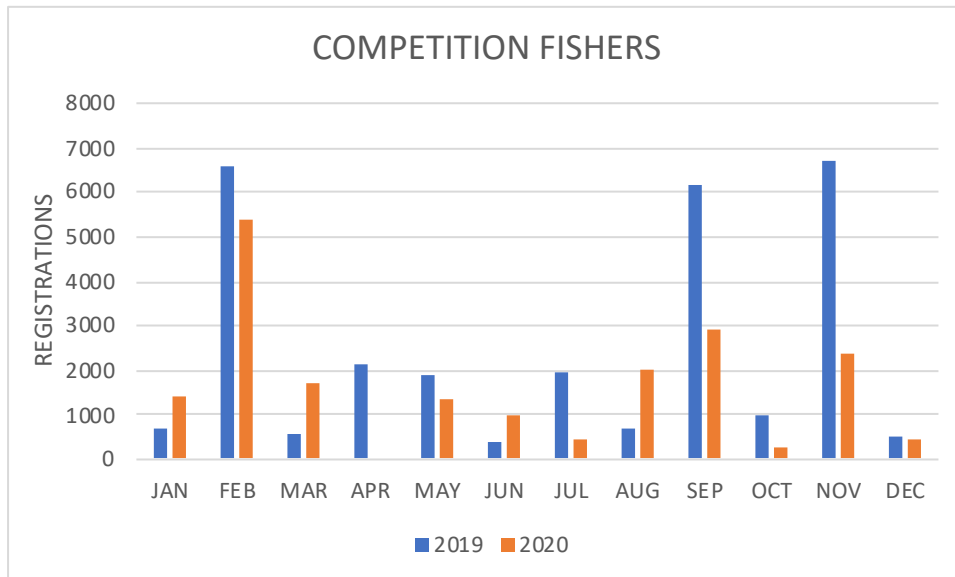


Figure 20: Number of registered participants in fishing competitions each month in 2019-2020

Figure 21 shows the number of competitions that were cancelled each month in 2020. This includes Trackmyfish events and others found using a Facebook search. Events started to be cancelled in March and peaked in April when most events were cancelled. Cancellation of events continued right throughout the year due to continuing and variable restrictions. A total of 84 events were identified as being cancelled however the actual numbers are likely to be higher as not all cancelled events were able to be identified.

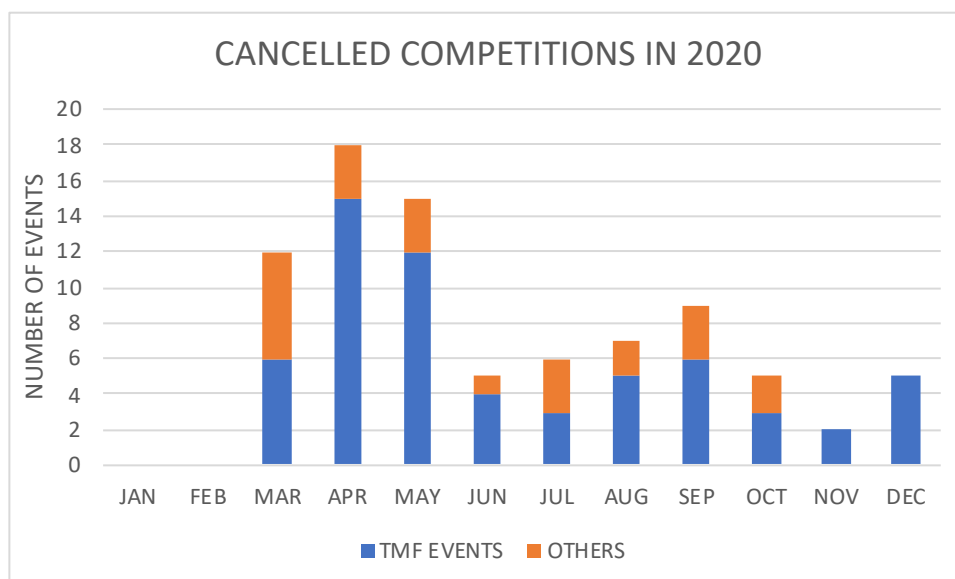


Figure 21: Number of fishing competitions that were cancelled each month in 2020

The ABT series of competitions were held in 2019-2020. Figure 22 shows the timeline for the events and which events were cancelled. There were 19 events held in 2019 and 20 were scheduled for 2020, however 10 (50%) of those were cancelled and 1 was rescheduled. There were 6 events from March to July in Qld, NSW and WA that were cancelled when restrictions and border closures were in place. A further 2 events were cancelled and 1 rescheduled in Qld and NSW during August and September when there were restrictions and a border closure between Qld and NSW. A further event in NSW was cancelled in November when there was a lockdown and restrictions in Sydney.

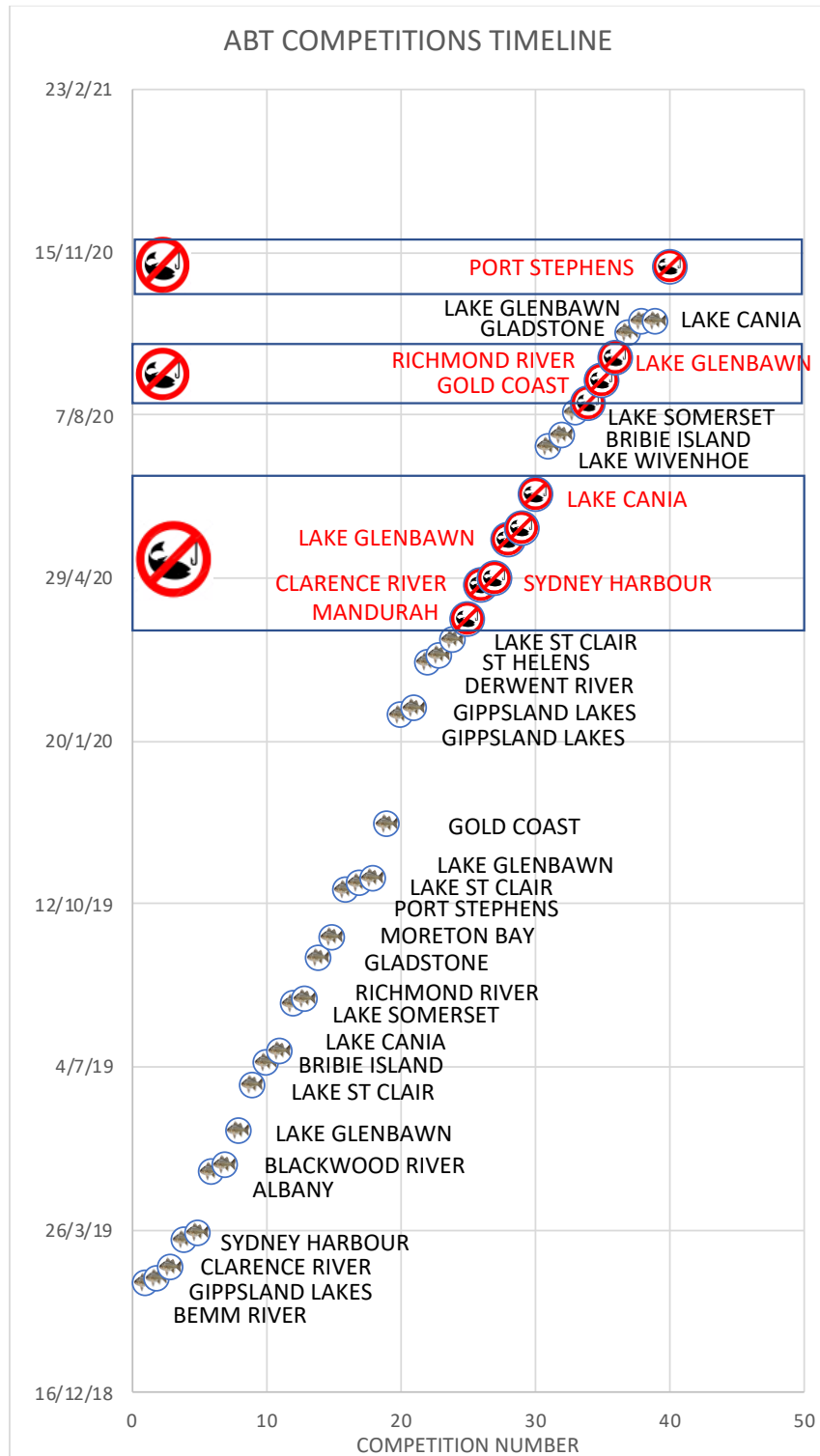


Figure 22: Timeline of ABT fishing competitions around Australia in 2019-2020

There were 6 events that were held in 2019 and 2020. The events were held mostly at the same time however some events in 2020 were held during periods when restrictions were such that they were able to proceed. The events were:

1. Lake St Clair NSW (22-23/6/2019 and 8-9/8/2020)
2. Lake Somerset QLD (10-11/8/2019 and 26-27/9/2020)
3. Gladstone QLD (7-8/9/2019 and 26-27/9/2020)
4. Lake Glenbawn NSW (25-26/5/2019 and 3-4/10/2020)
5. Bribie Island QLD (6-7/7/2019 and 25-26/7/2020)
6. Lake Cania QLD 13-14/7/2019 and 3-4/10/2020)

Table 4: Summary of ABT events held in 2019 and 2020

	ST CLAIR		SOMERSET		GLADSTONE	
	2019	2020	2019	2020	2019	2020
FISHERS	103	82	102	76	28	19
AVERAGE DISTANCE	258	255	326	237	835	494
TOTAL DISTANCE	26555	20870	33260	17976	23369	9394
	GLENBAWN		BRIBIE ISLAND		CANIA	
	2019	2020	2019	2020	2019	2020
FISHERS	135	27	54	37	64	21
AVERAGE DISTANCE	322	158	426	261	516	375
TOTAL DISTANCE	43476	4255	22995	9671	33036	7885

Table 4 provides a summary of the number of fishers that participated in each event, the average distance from the fisher's address to the competition location and the total distance for all the event's participants. Figure 23 shows the percentage decrease from 2019-2020 in the number of fishers taking part in each event and the decrease in the average distance from the fisher's address to the competition's location. Note that the Lake St Clair event in 2020 was just prior to the initial restrictions.

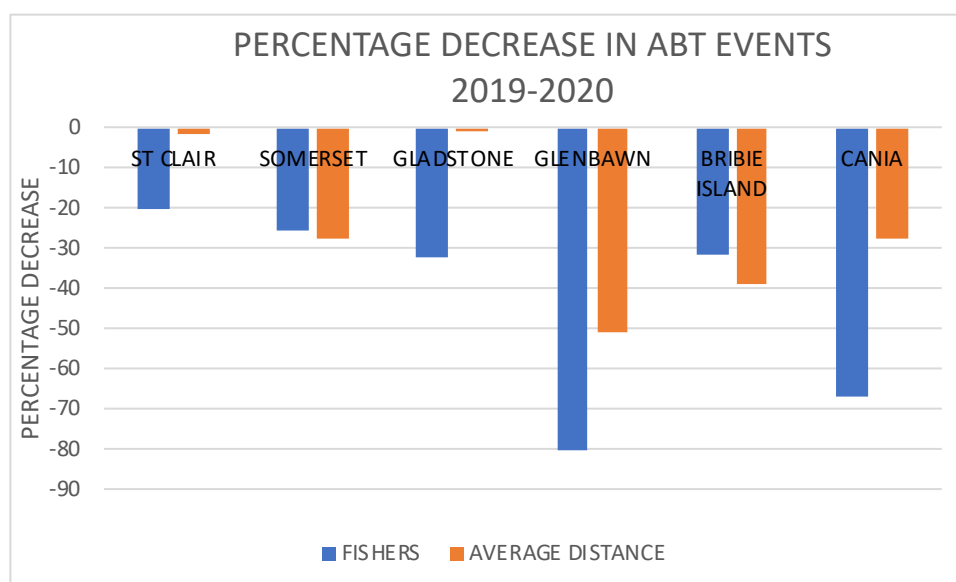


Figure 23: Percentage decrease from 2019-2020 in participation and average distance in ABT events

2. Alternative Fishing Activities

The lockdowns and border closures had a significant impact on fishing competitions with many cancelled or postponed and rescheduled during 2020. This led to the trailing of alternative formats of events.

The Back to the Future event trialed the submission of existing photos through the Trackmyfish app with the winners being voted on by the public. This event attracted 28 entrants that submitted 58 photos and was considered a modest success. However, even with that small number of photos the voting by the public did not work and the winners were ultimately drawn out a hat. For such a process to work there would need to be some sort of filter applied to reduce the number of choices to vote on. The website for the event is at <https://www.fishingfreshwater.com.au/backtothefuture>. Figure 24 shows the webpage for the event.



Figure 24: Webpage for the Back to the Future fishing event

The SCF Isolation Fishing 2020 event was based on the Sunshine Coast in Queensland and was considerably more successful with 483 participants that submitted 1,040 photos covering 153 different species of fish. Figure 25 is the promotional banner for the 2021 event. Results are available at <https://tournaments.trackmy.fish/reports/208/scf.isolation.2021.html>



Figure 25: Promotional banner for the SCF Isolation Fishing event in 2021

The Gone Fishing Day in 2020 was considered a success given that participation was somewhat constrained by the Covid-19 restrictions, which deterred fishers from going fishing. There were 513 registered entries for 1,002 reported catches. Figure 26 shows part of the webpage for the 2020 Gone Fishing Day event. Results are available at <http://tournaments.trackmy.fish/reports/239/gfd.2020.html> and <http://tournaments.trackmy.fish/reports/239/gfd.2020.content.html>

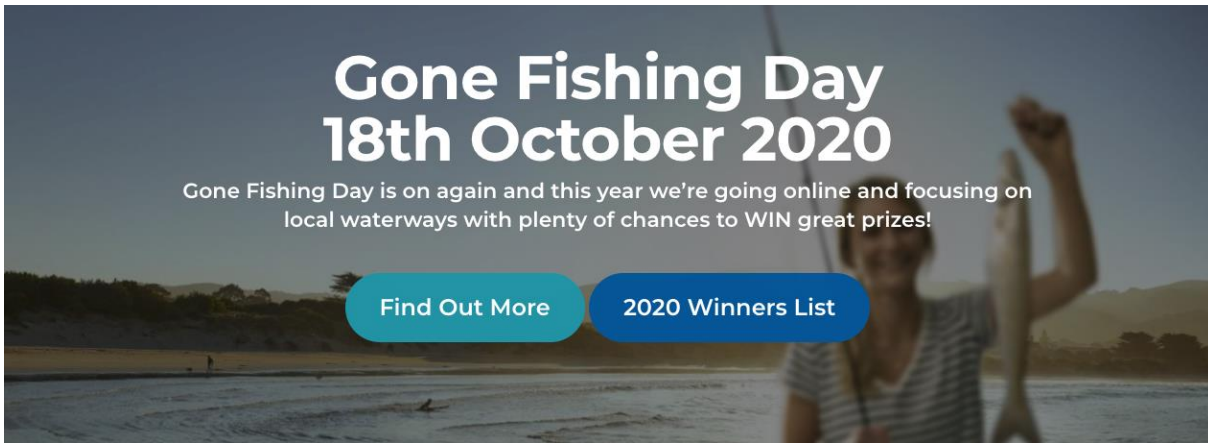


Figure 26: Part of the webpage promoting the 2020 Gone Fishing Day

The Salmon Slam event was impacted by Covid-19 as it was to run for 3 months from March-May but was cut short due to the restrictions imposed as a response to Covid-19. However, it was considered to be a success with 1,045 registered entries for a reported catch of 229 fish. The catch was limited due to the event being cut short. Figure 27 shows part of the app used for the 2020 Salmon Slam. Results are available at <http://tournaments.trackmy.fish/reports/234/salmon.slam.2020.html>

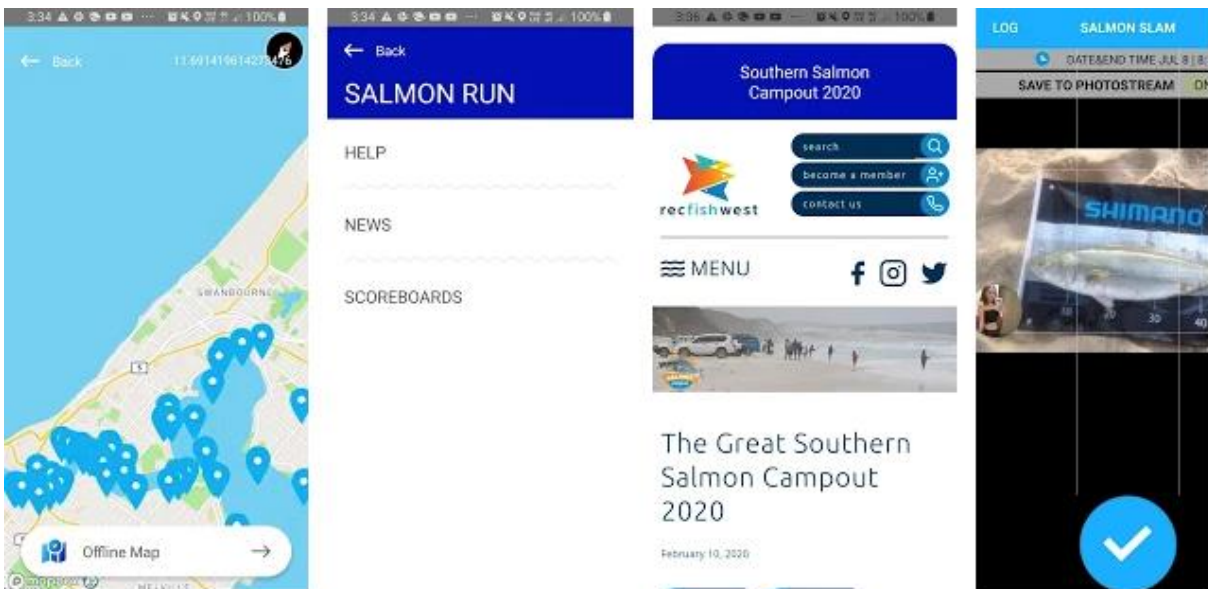


Figure 27: Part of the app used for the Salmon Slam event in 2020

3. Engaging and informing recreational fishers

Live streams were originally intended to provide information to fishers on Covid-19 however due to delays in the project and the delivery of equipment live streams did not commence until December.

Two live stream episodes were published during the height of the Christmas period by guest presenters. These were:

1. Frank Prokop speaking about Maximum Experiential Yield
https://www.facebook.com/watch/live/?v=1321218181577135&ref=watch_permalink

- Owen Li discussing the diversity of recreational fishers in Australia (Figure 28)
https://www.facebook.com/watch/live/?v=703174347259181&ref=watch_permalink

An additional five live stream episodes in total were published in early 2021. Delivering a total of seven episodes.

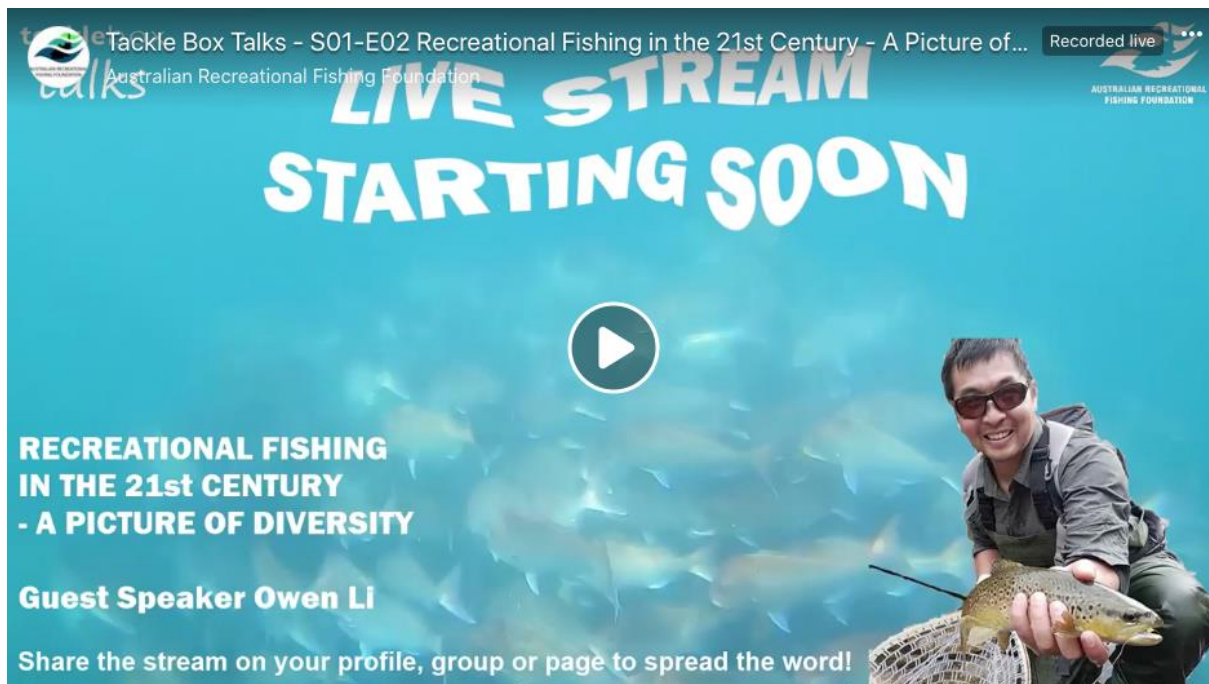


Figure 28: Tackle Box Talks – Recreational fishing in the 21st century – a picture of diversity with guest speaker Owen Li

Considering the time of year and the level of anticipated engagement the 2 episodes, according to Facebook analytics, calculated an estimated 15,000 people combined were exposed to the live streams. Statistical data on these episodes is available at https://1drv.ms/x/s!Ao7HNZBYVqBLg_J|4iHsuimMYSyT3Q?e=O9n1fh

Even though there were only 2 episodes the viewing statistics provided useful insights in the audience. For the Prokop presentation the reach was estimated at 6,400 with a total viewing time of 3,244 minutes (54.1 hours). Figure 29 shows the breakdown of the audience by age group and gender with the most viewing being by males from 35-44 years.

Figure 30 shows the geographic breakdown by states of the audience for the Prokop presentation. The greatest audience was from NSW at 56% followed by VIC at 16% and SA at 15%. The other states accounted for the remaining 13%.

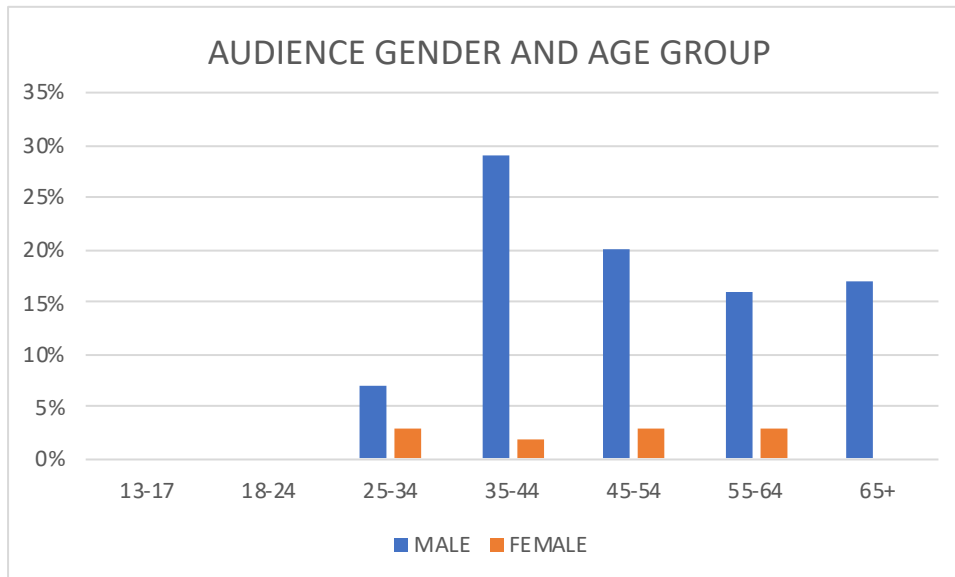


Figure 29: Gender and age group breakdown for the Prokop presentation

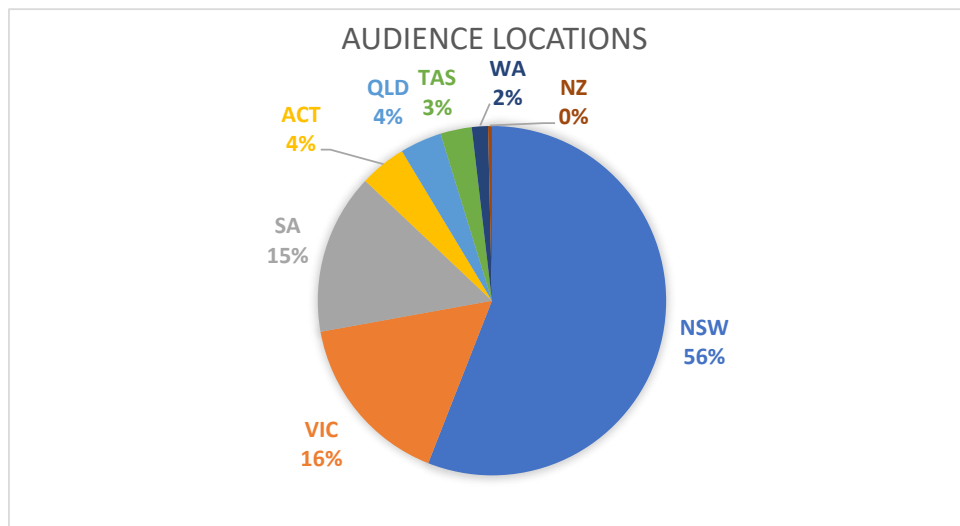


Figure 30: Locations of audience for the Prokop presentation

The Li presentation had a reach of 8,700 with a total viewing time of 3,704 minutes (61.7 hours). Figure 31 shows the breakdown of the audience by age group and gender with the most viewing being by males from 35-44 years.

Figure 32 shows the geographic breakdown by states of the audience for the Li presentation. The greatest audience was from NSW at 56% followed by VIC at 16% and SA at 15%. The other states accounted for the remaining 13%.

These presentations show that the live streaming of science-based information is of interest to recreational fishers.

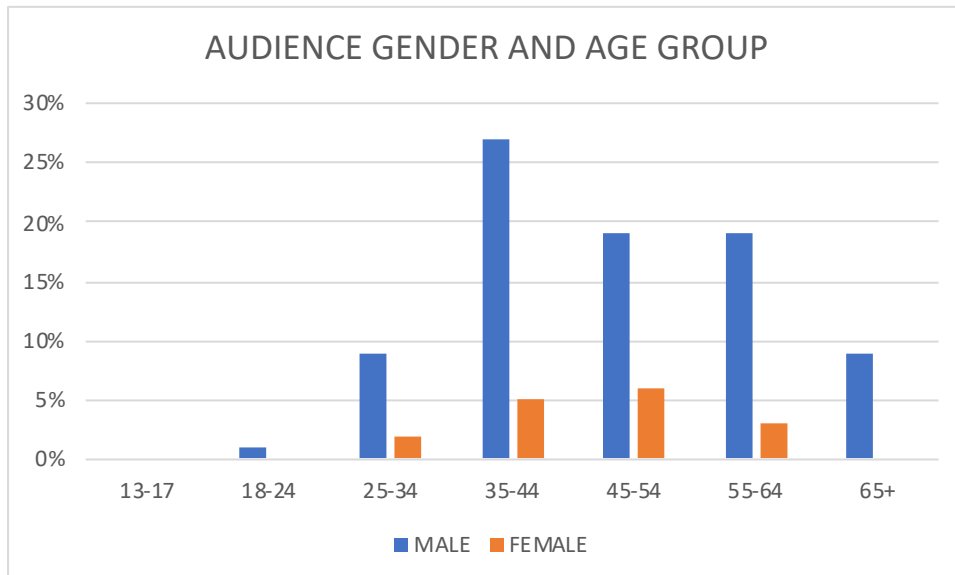


Figure 31: Audience gender and age group breakdown for the Li presentation

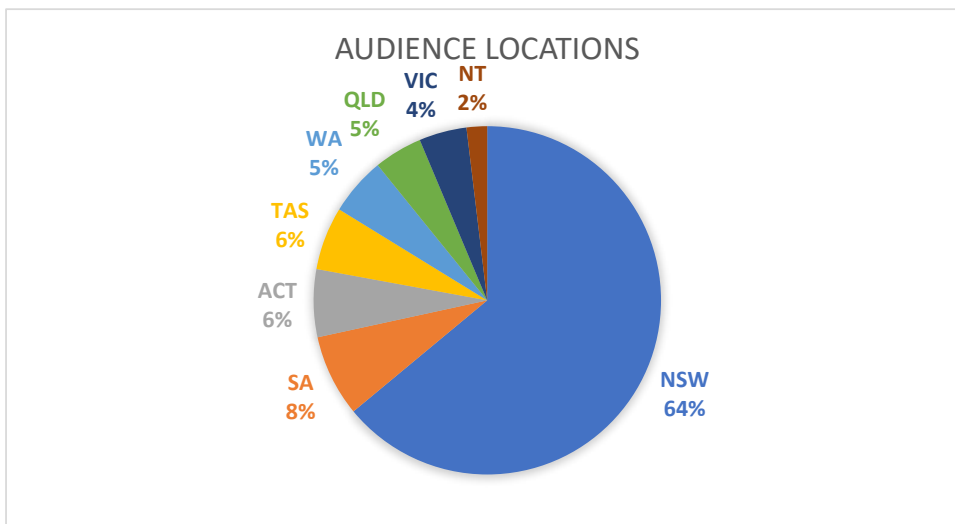


Figure 32: Locations of audience for the Li presentation

From March-December 2020 there were 16 episodes of ABT Live and ABT Lockdown Live streams direct from the ABT fishing competitions that were held around Australia. The streams were available through YouTube and Facebook. Episodes 1-12 were during the main lockdown period from March to July. Figure 33 shows the number of views of each episode and the average watch time on YouTube while statistics were not available from Facebook.

This shows that the number of views ranged from 633 for episode 3 in April at the height of the lockdown period to 216 for episode 14 in September. There was a tapering off of viewing as the lockdowns eased.

The average watch time ranged from 14.5 mins for episode 1 to 24.0 mins for episode 6 while the overall average watch time was 17.9 mins.

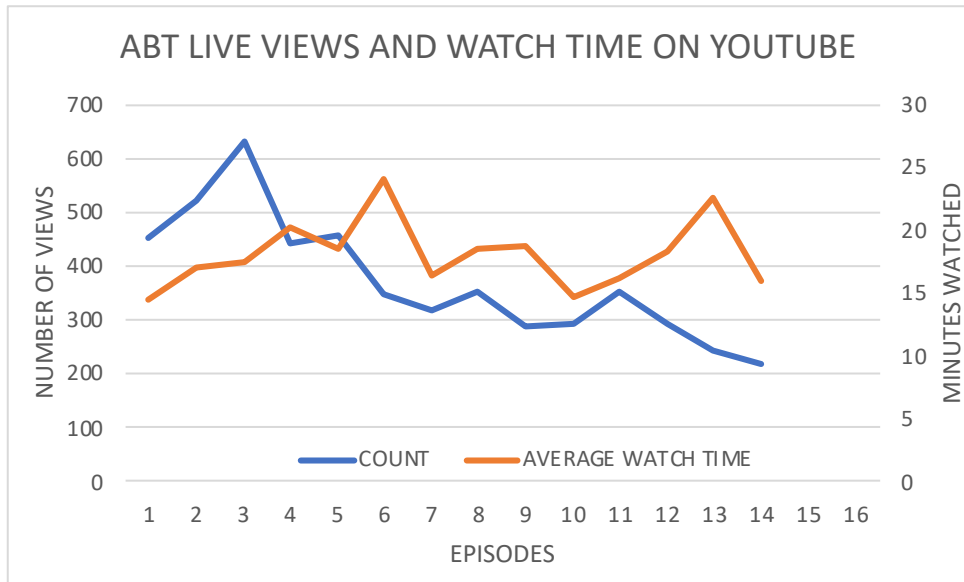


Figure 33: Number of views of ABT Lockdown Live and ABT Live and watch time on YouTube

The Salmon Slam event in WA in 2020 was scheduled to run from 1 March to 31 May however was cancelled at the end of March due to the lockdown. Daily check-ins during the event involved competitors using the app to lodge catches, check the scoreboard and look at the lodged photos. The cumulative daily check-in count reached 2,517 by the end of March when the event was cancelled. Figure 34 shows the cumulative check-in counts for the event.

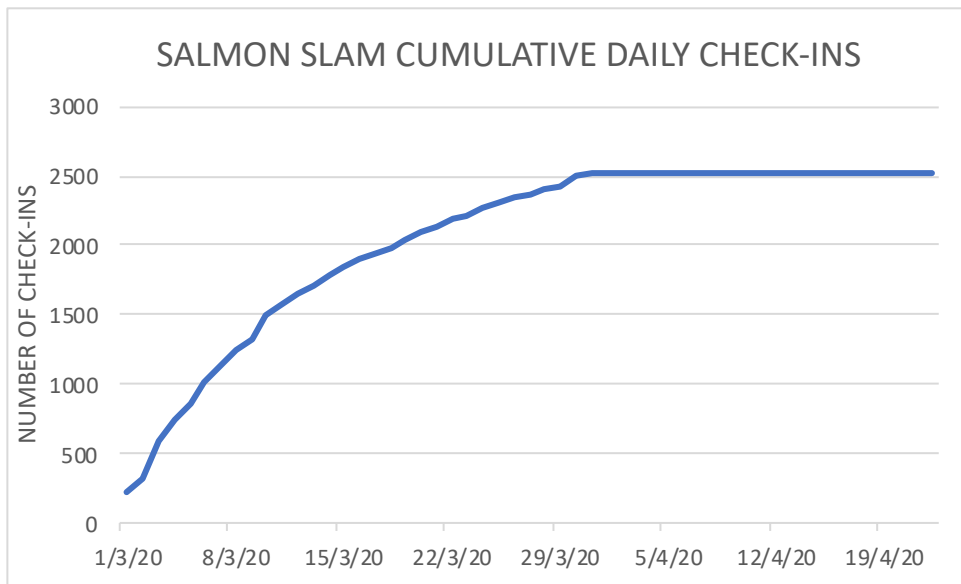


Figure 34: Cumulative daily check-in counts for the 2020 Salmon Slam event in WA

The daily viewing of scoreboards for all Tackle Box and Trackmyfish events in Australia in 2020 provides one of the best statistics on the impact of Covid-19 on fishing competitions as shown in Figure 35. There was a total of 537,228 views of the scoreboards or 1,472 views per day.

It shows a steady viewing of scoreboards from the start of the year followed by a near flatlining of views during April before picking up in May. The large peak in September was due to the SCF Research and Sustainability event.

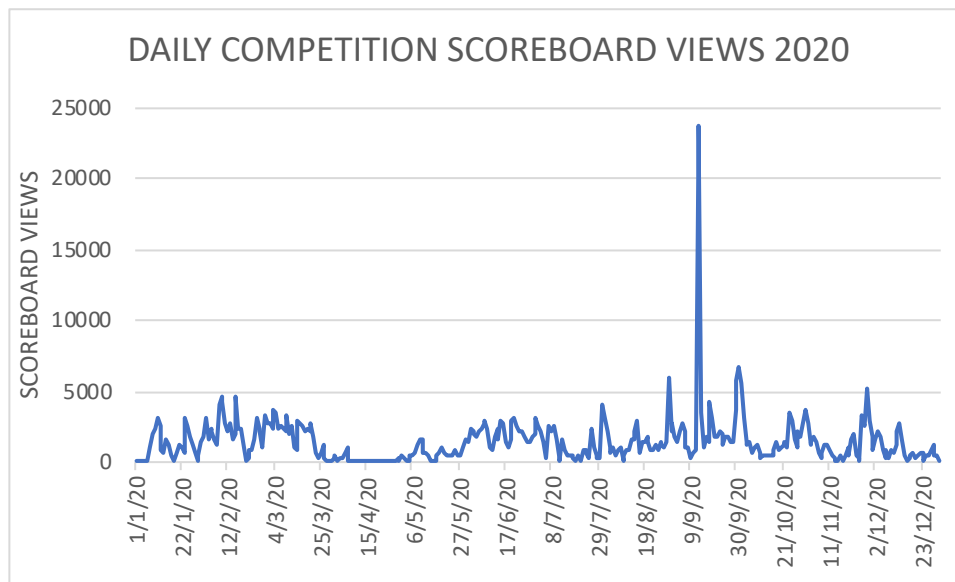


Figure 35: Daily views of competition scoreboard for all Tackle Box and Trackmyfish events around Australia in 2020

The monitoring of the impact of Covid-19 on recreational fishers in QLD was presented through dashboards with data updated daily and distributed monthly to the Fisheries Minister’s office, fisheries managers (Queensland Fisheries), fisheries researchers, fishing organisations, fishing businesses, local authorities and fishers and was available from the Suntag website www.suntag.org.au.

The target audience included key people in the regions being monitored as they needed to understand the impact of Covid-19 and whether there was a need for a response. The feedback from recipients was all positive and led to the expansion of the regions that were monitored. Figure 36 shows part of the dashboard for the statewide perspective at the end of 2020 showing the comparison with 2019. Further details are provided under the section on **Project Materials Developed**.

MEASURE	ACTUAL	GRAPH																		
QUEENSLAND																				
STATEWIDE PERSPECTIVE																				
Number of recaptures 2020-2019	<table border="1"> <thead> <tr> <th></th> <th>2020</th> <th>2019</th> </tr> </thead> <tbody> <tr> <td>Oct</td> <td>144</td> <td>248</td> </tr> <tr> <td>Nov</td> <td>97</td> <td>151</td> </tr> <tr> <td>Dec</td> <td>98</td> <td>142</td> </tr> <tr> <td>Q4</td> <td>339</td> <td>541</td> </tr> <tr> <td></td> <td colspan="2" style="text-align: center;">-37.4%</td> </tr> </tbody> </table>		2020	2019	Oct	144	248	Nov	97	151	Dec	98	142	Q4	339	541		-37.4%		
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Oct	144	248																		
Nov	97	151																		
Dec	98	142																		
Q4	339	541																		
	-37.4%																			
Cumulative recaptures 2020-2019 Dots show recaptures by interstate fishers	<table border="1"> <thead> <tr> <th></th> <th>2020</th> <th>2019</th> </tr> </thead> <tbody> <tr> <td>Recaptures</td> <td>1453</td> <td>1686</td> </tr> <tr> <td></td> <td colspan="2" style="text-align: center;">-13.8%</td> </tr> <tr> <td>Interstate fishers</td> <td>29</td> <td>39</td> </tr> <tr> <td></td> <td colspan="2" style="text-align: center;">-25.6%</td> </tr> </tbody> </table>		2020	2019	Recaptures	1453	1686		-13.8%		Interstate fishers	29	39		-25.6%					
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Average distance (km) address or postcode to recapture location 2020-2019	<table border="1"> <thead> <tr> <th></th> <th>2020</th> <th>2019</th> </tr> </thead> <tbody> <tr> <td>Average distance</td> <td>81</td> <td>98</td> </tr> <tr> <td></td> <td colspan="2" style="text-align: center;">-17.3%</td> </tr> </tbody> </table>		2020	2019	Average distance	81	98		-17.3%											
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Cumulative distance (km) address or postcode to recapture location 2020-2019	<table border="1"> <thead> <tr> <th></th> <th>2020</th> <th>2019</th> </tr> </thead> <tbody> <tr> <td>Distance</td> <td>109.5K</td> <td>146.9K</td> </tr> <tr> <td></td> <td colspan="2" style="text-align: center;">-25.5%</td> </tr> </tbody> </table>		2020	2019	Distance	109.5K	146.9K		-25.5%											
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Distance	109.5K	146.9K																		
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Distance from address to recapture location Percentage trips 2020-2019	<table border="1"> <thead> <tr> <th></th> <th>2020</th> <th>2019</th> </tr> </thead> <tbody> <tr> <td>Distance 0-50km</td> <td>69.5%</td> <td>70.3%</td> </tr> </tbody> </table>		2020	2019	Distance 0-50km	69.5%	70.3%													
	2020	2019																		
Distance 0-50km	69.5%	70.3%																		

Figure 36: Part of the dashboard showing the Queensland statewide perspective at the end of 2020

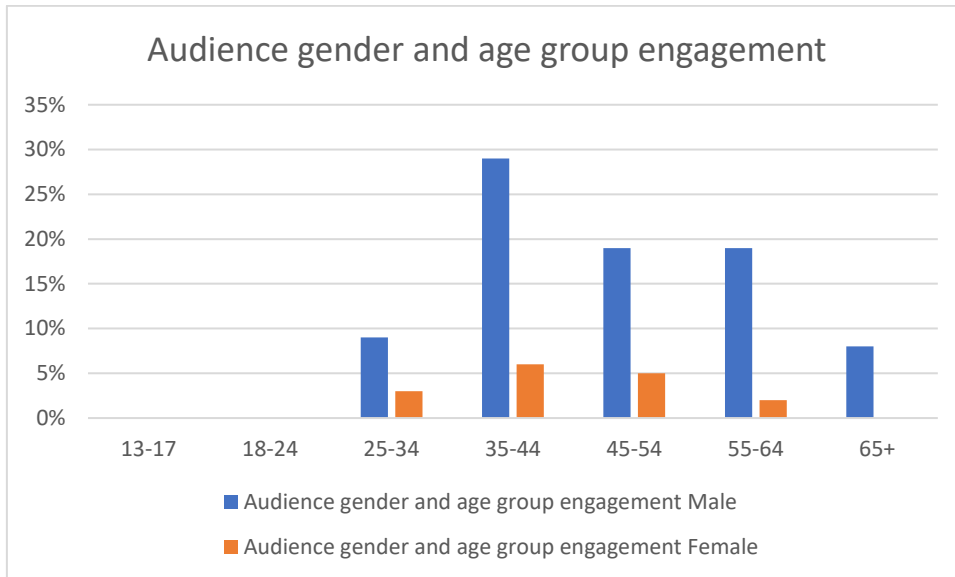


Figure 37: Audience gender and age group breakdown for 2021 – Episode 3 Adam Martin Why you should really engage in recreational fishing citizen science.

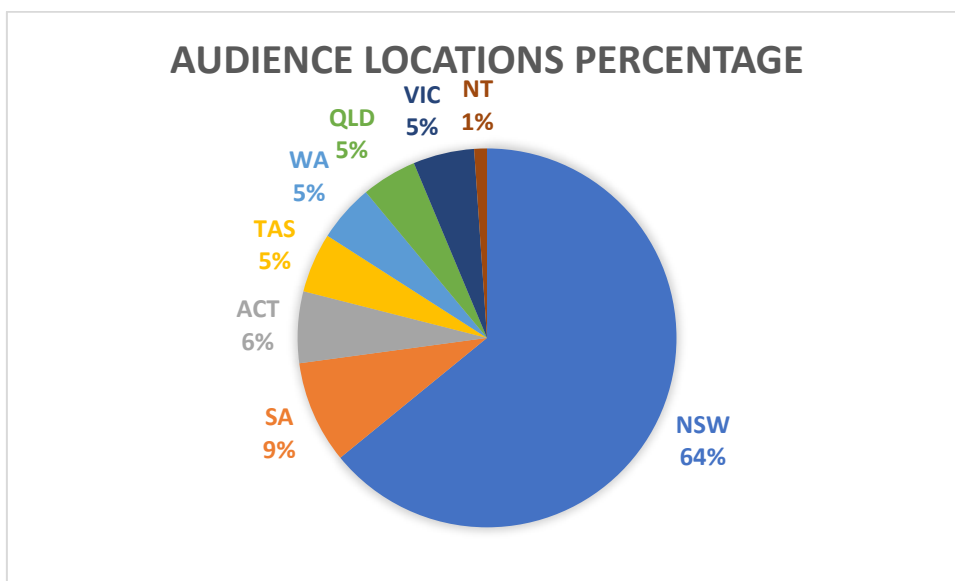


Figure 38: Locations of audience for 2021 – Episode 3 Adam Martin Why you should really engage in recreational fishing citizen science.

Tackle Box Talks - Episode S01E03 - Adam Martin Why you should really engage in recreational fishing citizen science. <https://www.facebook.com/438119056279995/videos/209235940844328>

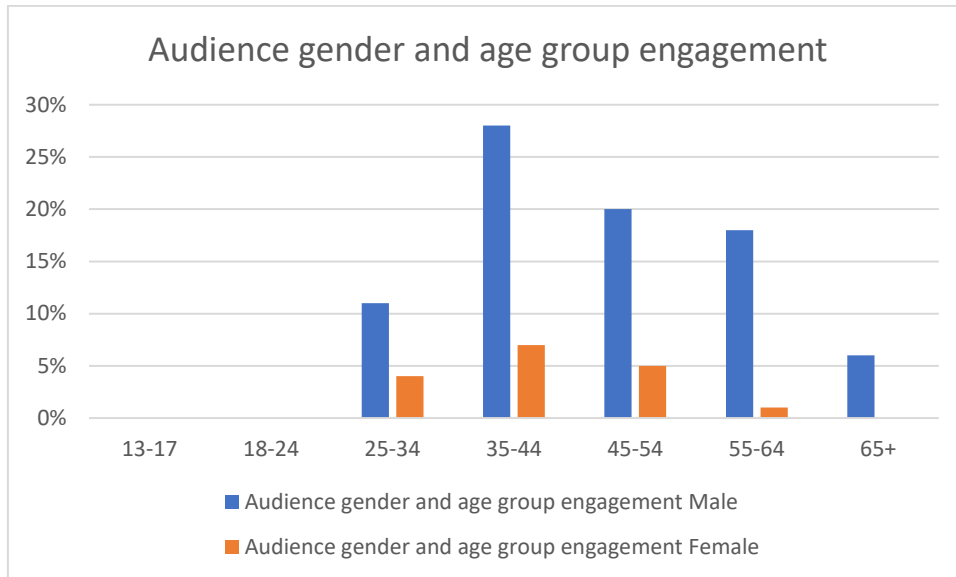


Figure 39: Audience gender and age group breakdown for 2021 – Episode 4 Matt Barwick What might the future of fishing look like in Australia?

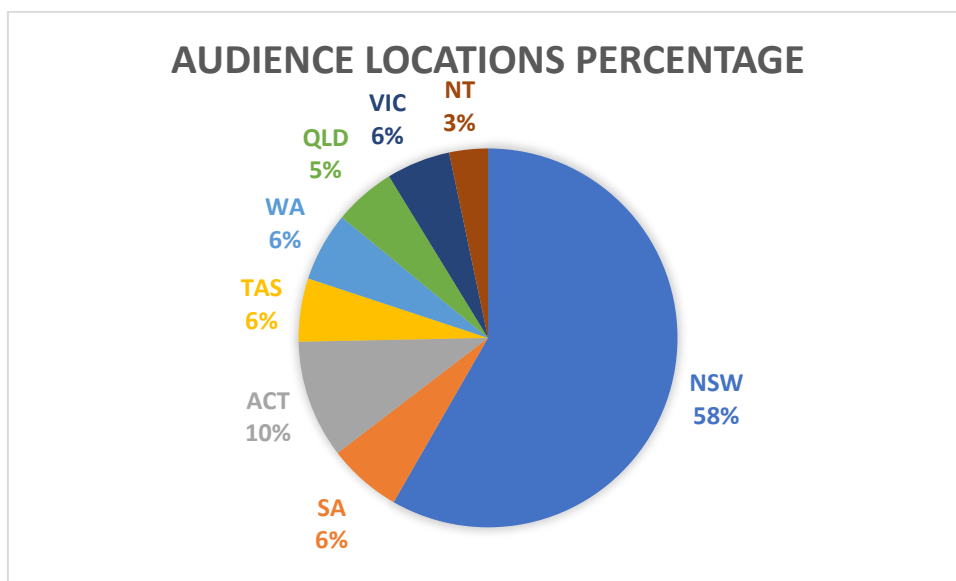


Figure 40: Locations of audience for 2021 – Episode 4 Matt Barwick What might the future of fishing look like in Australia?

Tackle Box Talks - Episode S01E04 - Matt Barwick What might the future of fishing look like in Australia?
<https://www.facebook.com/438119056279995/videos/164449888783461>

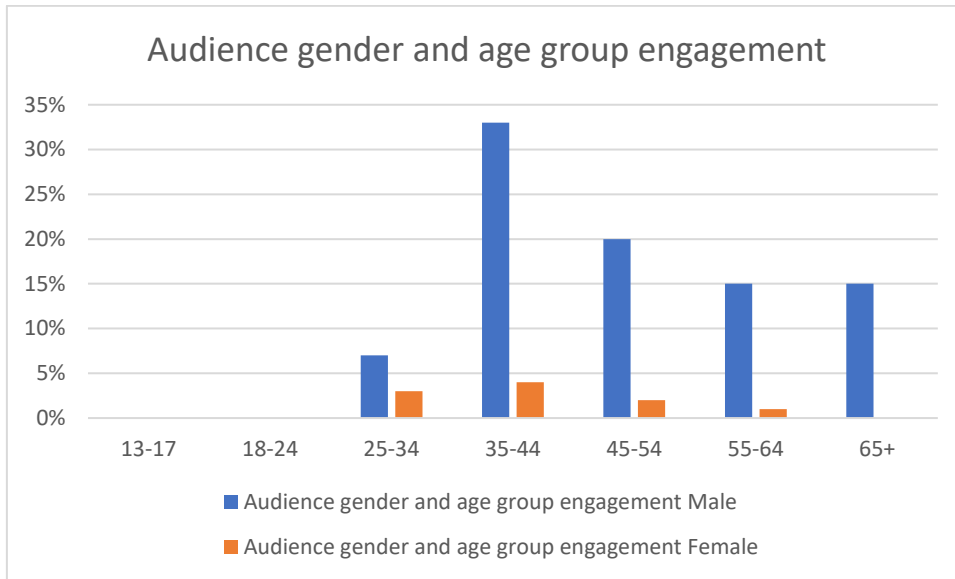


Figure 41: Audience gender and age group breakdown for 2021 – Episode 5 Lee Baumgartner, what can we do to improve fishing in the Murray Darling Basin?

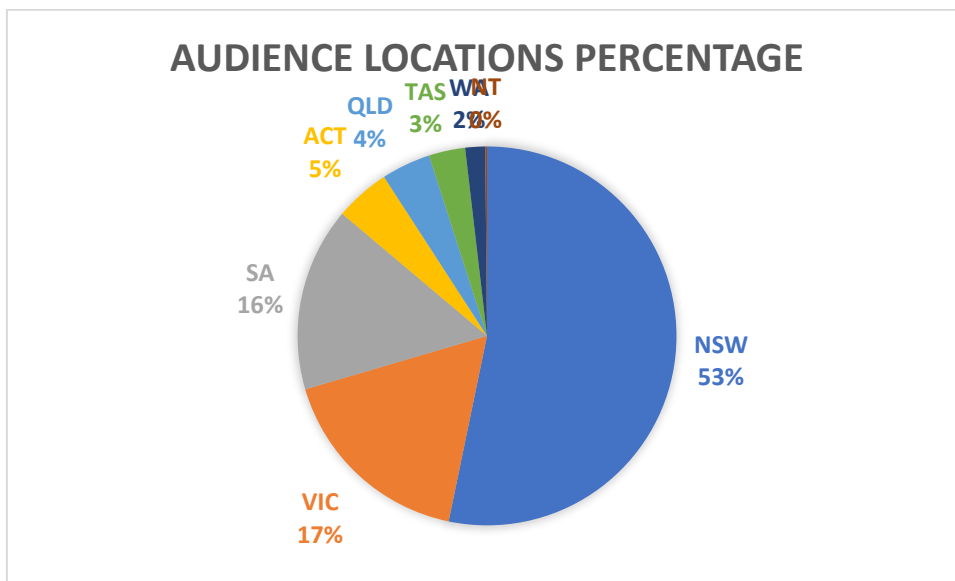


Figure 42: Locations of audience for 2021 – Episode 5 Lee Baumgartner, what can we do to improve fishing in the Murray Darling Basin?

Tackle Box Talks - Episode S01E05 - Lee Baumgartner, what can we do to improve fishing in the Murray Darling Basin? <https://www.facebook.com/438119056279995/videos/480861386241141>

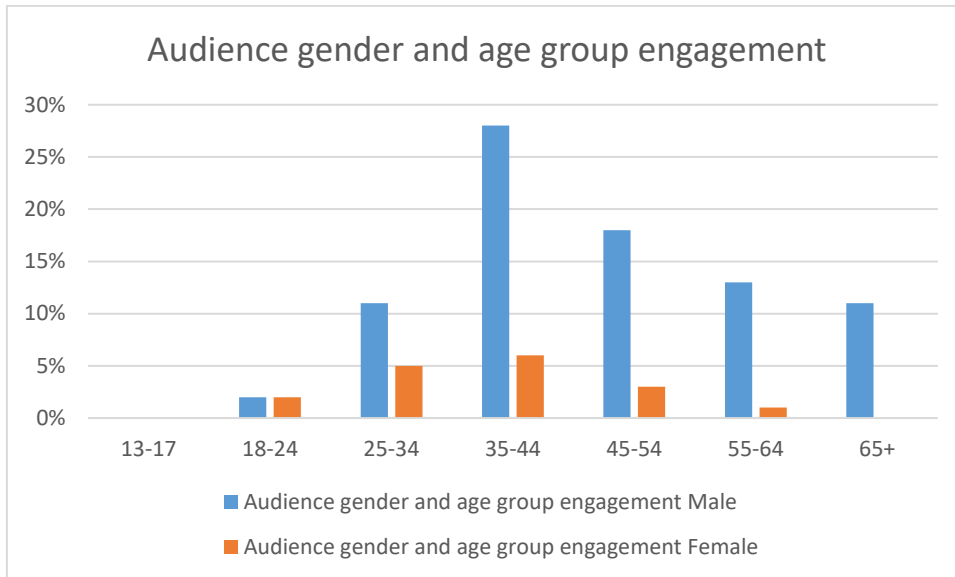


Figure 43: Audience gender and age group breakdown for 2021 – Episode 6 Catching up with Scott Thomas, Editor of Fishing World Magazine.

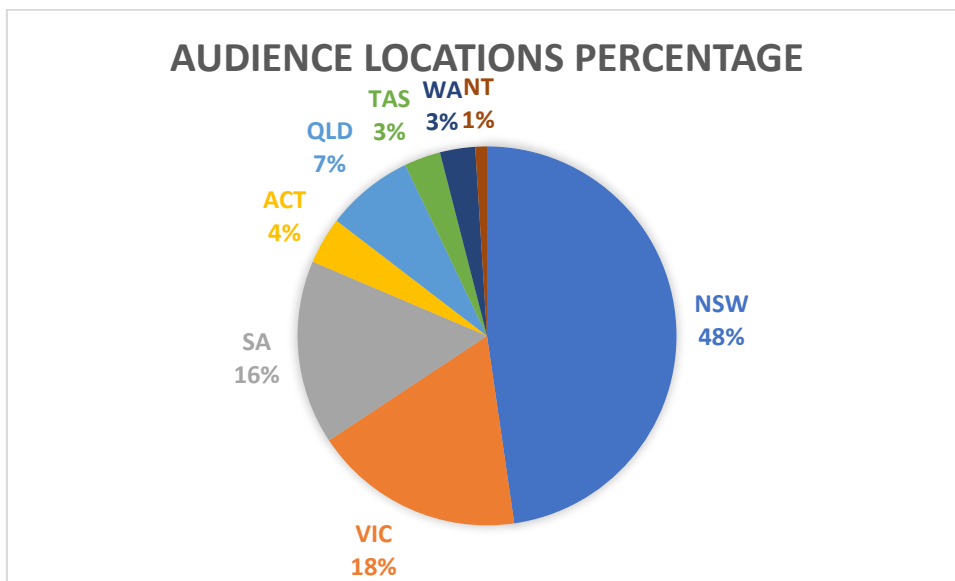


Figure 44: Locations of audience for 2021 – Episode 6 Catching up with Scott Thomas, Editor of Fishing World Magazine.

Tackle Box Talks - Episode S01E06 - Catching up with Scott Thomas, Editor of Fishing World Magazine.
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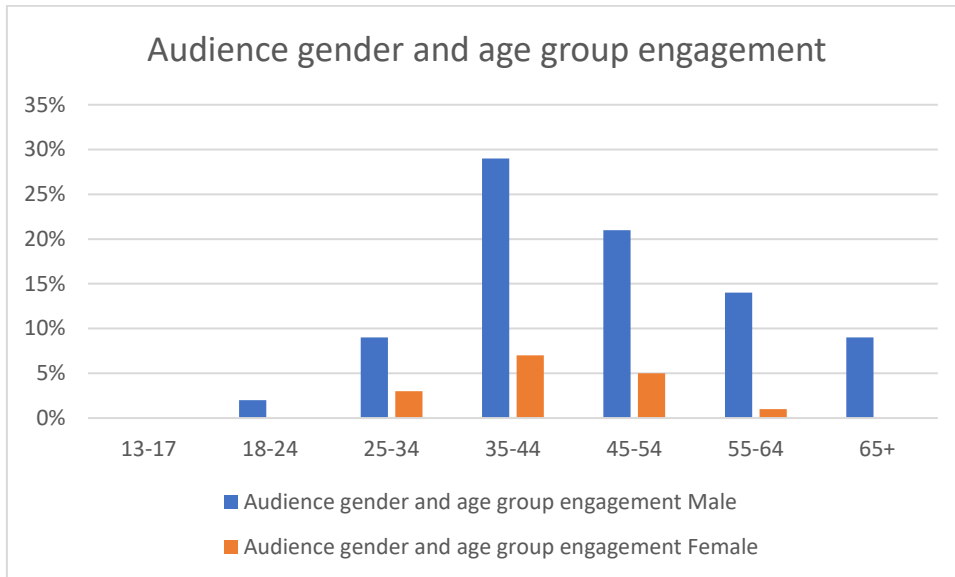


Figure 45: Audience gender and age group breakdown for 2021 – Episode 7 Catching up with fishing icon Michael Guest.

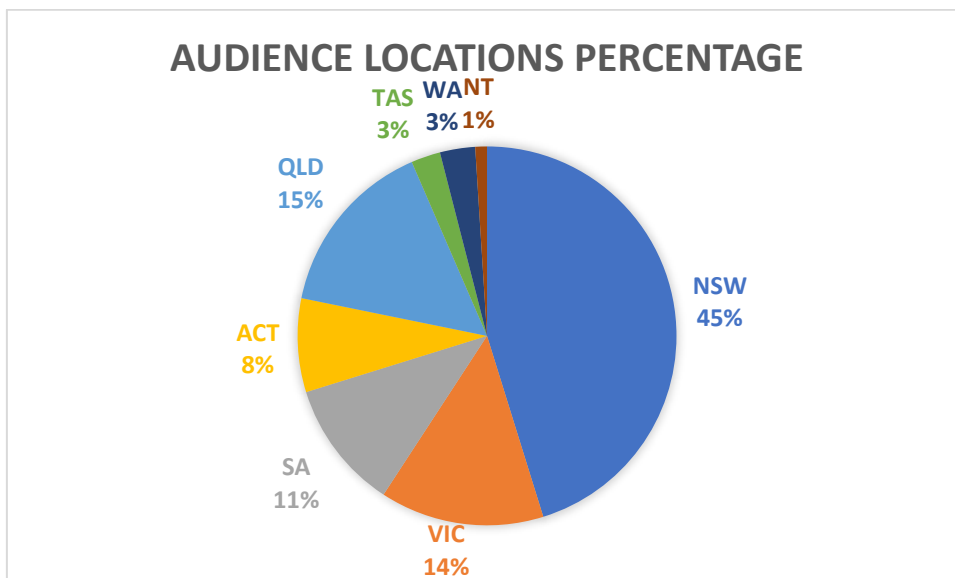


Figure 46: Locations of audience for 2021 – Episode 7 Catching up with fishing icon Michael Guest.

Tackle Box Talks - Episode S01E07 - Catching up with fishing icon Michael Guest.

<https://www.facebook.com/438119056279995/videos/270130781160199>

Discussion

This project went well beyond the original objectives in that they were focused on extension of information about Covid-19 becoming a much more useful project. It used existing citizen science data to obtain an insight into the impacts of Covid-19 on recreational fishing. Traditionally tag and recapture data have been used to examine elements of the fish population but here the equation was reversed to look at elements of the fisher population. The specific elements that were examined were fishing effort through the number of recaptures and fisher behaviour through the distance travelled to go fishing using data from the Queensland Suntag program.

There were comparisons made between the data for 2019 and 2020 which showed that, at the statewide level, there was little change in the overall level of recaptures except at the end of the year when a surge in recaptures in 2019 was not matched in 2020. There was an estimated fall in fishing effort of 5.6%. Allowing for uncertainties in the data it suggest that there was a slight reduction in fishing effort in 2020 however factors other than Covid-19 may have also been involved. However, when the data are viewed at the regional level there were some differences.

There was a fall in estimated effort of 15.3% in SEQ estuaries, 13.4% in the Fitzroy River, 25.1% in SEQ Bass impoundments and 6.1% in Lake Awoonga. The closure of impoundments to fishing for all of April would have contributed to the estimated fall in effort there. NQ estuaries had an actual rise in effort as it was the least affected by Covid-19 restrictions and lockdowns.

The distance from the fisher's address to the fishing location showed that recreational fishers in QLD largely conformed with the travel restrictions imposed and that resulted in a fall in the average distance travelled in all the regions assessed except in CQ impoundments where travelling fishers significantly boosted the average distance travelled and in SEQ estuaries where the average distance did not change.

There was a drop in interstate fishers that was largely due to border closures although there was still a contingent of long-term retiree travellers that spent a long time travelling in QLD. Also, there was boost in interstate fishers in August when the QLD border was opened after a lengthy closure. Based on the distance from the fisher's address to the recapture location this suggests that when there were restrictions on the travel distance allowed this was largely conformed to by recreational fishers.

The ABT events in 2019 and 2020 showed that they conformed with the restrictions and lockdowns imposed in response to Covid-19. For events that were held in both 2019 and 2020 there was a marked reduction in 2020 in participation and the average distance from the fisher's address and the event location. The largest reduction was at Lake Glenbawn where there was an 80% reduction in participation and a 51.1% reduction in the average distance. This was due to participation restricted to NSW fishers.

The shift from conventional competition formats to online formats has opened up a raft of new options on how to run events. A number of new formats that conformed with the Covid-19 restrictions were trialled with most being successful. This move to online events started prior to Covid-19 however has been accelerated by the pandemic and more diverse formats for events are likely to emerge.

The use of apps in fishing competitions has opened up a number of new ways to engage with recreational fishers and to examine the profile of the audience. It also offers new ways of getting information out to fishers.

Conclusion

The initial revised objective of this project was to determine if existing datasets could be used to provide an assessment of the impact of Covid-19 on recreational fishing. Recaptures of tagged fish as a proxy for a random sample of the recreational fishing population provided objective data on changes in fishing effort and fisher behaviour that were able to be measured, at least in QLD. It was also able to show that there were regional differences, and that the impact was not uniform throughout the state.

This showed that the impact of Covid-19 on recreational fishing in QLD was a slight overall reduction in fishing effort and a reduction in the distance to go fishing. There was a larger impact in the Fitzroy River where there is a significant visitor fishery that targets Barramundi (during the open season) and King Threadfin and little impact in NQ estuaries where the restrictions had less direct affect and other factors also played a part.

The data also showed that there was a high level of compliance to travel distance restrictions when those were imposed. It also showed that there was fall in interstate fishers due to border closures but that there were still interstate visitors catching tagged fish for much of the year.

On the other hand, fishing competitions were severely impacted all around Australia as the restrictions, lockdowns and border closures led to the mass cancellation or rescheduling of events. Particularly in the period from March to July and to a lesser extent towards the end of the year. Again, this was able to be measured through the extensive use of the Tackle Box and Trackmyfish apps by competitions. This now forms the most extensive register of fishing competitions in Australia and New Zealand making an analysis of those events possible.

While recreational fishing went on much as normal working within the restrictions and border closures it was clear that Covid-19 had a significant impact on fishing competitions all around Australia and that the traditional model of holding an event with a weigh-in and gathering of participants at the end to announce winners etc could not continue while restrictions were in place. There had already been a shift to photo-based online competitions and the development of alternative formats using Tackle Box, Trackmyfish and other apps, but this was accelerated by the Covid-19 restrictions.

A number of new format events were trialed to gauge fisher acceptance. Most were successful such as the SCF Isolation Fishing Event and the Salmon Slam as they are being repeated in 2021. However not all of the new approaches worked, such as public voting to determine winners, but that is the nature of trying out new things. Overall, the shift to online competition formats has been accelerated and is likely to become the dominant form of future events as this provides a much wider range of options on holding events.

App-based competitions also provide the opportunity to examine elements of the audience in ways not previously possible. This allows an assessment of participants by gender, age groups and geographic distribution as well as providing insights into fisher behaviour. This is important when designing messages for recreational fishers and the apps provide a new avenue in delivering the messages.

Implications

Like almost every other part of society recreational fishing is changing through a combination of changing participation (eg more women and younger participants), changing technology (GPS, sonar and phone

apps) and a changing climate (impacting on fish resources). All are currently having impacts in many different ways.

Understanding those changes and their implications for management, resource sharing and industry development has become more and more reliant on having reliable data on which to make decisions. At the same time governments are reluctant to invest in recreational fishing while there are much higher priorities to deal with. The enormous outlays of money to deal with the consequences of Covid-19 will mean that lower priorities of government will be squeezed for many years to come.

At the same time the traditional tools for collecting data on recreational fishing such as national surveys, diaries and boat ramp surveys are becoming less useful due to changes in technology (eg the loss of a telephone registry as a sampling framework). Also, these methods are cost intensive, have long timeframes and often the results are outdated by the time they are delivered and don't necessarily answer the right questions.

Unlike in other areas such as astronomy, where citizen science stands alongside traditional science, in the fisheries sphere citizen science is not being well embraced by fisheries scientists and managers. And yet this report would not have been possible if not for citizen science.

The use of existing data such as tagging and fishing competition data can be repurposed to provide new insights into how complex questions can be addressed. For example, the recaptures of tagged fish were used to track fishing effort and fisher behaviour. This was updated daily and distributed monthly to those that were interested. That included the QLD Minister's office as it was felt that his office needed to be aware that recreational fishing under Covid-19 was one less thing to concern the Minister.

An advantage of citizen science is the ability to detect change in near real time. This should provide insights into the development of future monitoring programs.

Technology changes, cost pressures and the ever-growing need for data to be timely and relevant to the needs of end users will inevitably change the data landscape for recreational fisheries and citizen science will form part of the new paradigm.

It needs to be remembered that today's recreational fisher is armed with more technology than existed in entire fisheries agencies just a few short years ago. Sounders, GPS, high tech fishing gear, apps and the internet mean that fishers have instant information at their fingertips, even when out on the water. That is the paradigm that is driving information delivery now and will only increase into the future.

Recommendations

Monitoring

1. Continue monitoring changes in traffic ongoing into 2022.
2. The key strength in citizen science models that keeps arising is their ability to detect changes in the real world. This is something that needs to be better explained to the scientific community.
3. At a regional level a reporting framework that makes its way to tourism bodies would be high value (in terms of competitions/citizen science data).
4. The Covid-19 period saw the development of a number of novel approaches to using data. These should be published in some paper form to engage a higher level of peer review into the process.
5. The “built for purpose” citizen science networks are longer term proving far less successful than citizen science programs that generate broad based datasets that lend themselves to being repurposed as the need arises. Increased engagement with the scientific/management community on such datasets could help bridge the gap between those collecting data and those making decisions.
6. Monitoring during Covid-19 demonstrates that existing initiatives are useful in providing important insights on such issues.

Communications

1. Participation in events and scoreboard traffic shows there is an interested/invested audience for fishing competitions.
2. Adhoc communications or repurposing communication channels that are not fit for purpose on key public news (eg magazines/blogs) are used largely as a tool of convenience when an issue arises. This approach is hard to collate real datasets on, and while convenient is no substitute for long term investment in a proper industry communication channel.
3. The lack of an actual “news” outlet in the fishing industry means messages get fragmented, delivered in a piecemeal way. Like the ABC, there is a case for a cost-efficient public service provider (eg longer term regular YouTube channel).
4. App based channels are still being largely ignored as a delivery mechanism. This needs to be assessed at some point.
5. The fishing event/competition market is largely perceived as a single channel, this perception is not accurate. Events like the Salmon Slam for example have higher educational/ community engagement value than the ABT as they are designed to be easy to enter/share catches/content over professional sport.
6. A lot of traffic on the TMF network is short timeframe (ie during events), there is a gap between events in terms of engagement that provides an opportunity to fill, something ABT is recognizing with the Lockdown Live/ABT Live series.
7. The ABT is providing industry leadership on content standards and production quality on a low budget, that should be taken note of.

Further development

During the project there was constant refinement of the approach, both in terms of the data used, examined and in presentation. A commitment has been made to continue data collection in 2021 as the impacts of Covid-19 are likely to persist or present new challenges. It is also possible that this will continue in 2022 as impacts on fishing effort and fisher behaviour are not confined to Covid-19.

Fishing effort is also impacted by changes in the demographics of fishers, natural disasters such as cyclones, fires and floods (events forecast to become more severe) and recaptures of tagged fish can be used to monitor that change in a cost-effective way.

Fishing competitions offer the opportunity to have a rolling snapshot of the status of recreational fishing around Australia as they are held right throughout a year and right around the country. This could be done close to a real time basis.

The advantage of these approaches is that much of the data is provided voluntarily. In the case of tagging this can be self-recruiting in a well-structured program such as Suntag. In the case of fishing competitions, the data can now be easily collected and maintained through the use of apps making it possible to analyse and monitor changes in the fisheries in near real time. Again, the costs of such approaches are much lower than conventional data collection programs as much of the time required to collect the data is provided voluntarily. If done correctly it will considerably improve relations between fishers and researchers and managers.

However, there is resistance to such approaches as “citizen science” is not “real science” and poses challenges to traditional fisheries data collection. However, fisheries researchers and fisheries managers are missing a great opportunity to better engage with fishers and work in partnership with them.

Extension and Adoption

Extension was an integral part of this project however due to delays in getting the project underway and its short timeframe this has been limited. See 3. Engaging and Informing Recreational Fishers under Results for details.

However, the most important form of extension has been through the direct interaction with fishers through the use of apps during competitions. The apps provide the ability to get messages out to all participants and to receive feedback as well. For example, during the Gone Fishing Day there were 5,988 check-ins during the event. Also, the Salmon Slam in WA required daily check-ins for updates providing direct engagement with participants. There was an average of 1,472 views per day of competition scoreboards which indicates a high level of engagement.

Adoption of alternative formats for competitions using apps based on photos has been accelerated by Covid-19. A bit like rooftop solar this will become the norm into the future with the traditional competition formats gradually fading away.

Adoption of citizen science as an integral part of the suite of future tools needed to inform management and fishers will take longer but is inevitable due to the constraints on conventional tools that are becoming obsolete. It is currently constrained by the inertia of fisheries agencies however that is changing.

Project coverage

Given the short timeframe for this project there was no media coverage.

Project materials developed

Innovation on monitoring the impact of Covid-19 on recreational fishing through the recaptures of tagged fish resulted in monthly dashboards distributed to key interested agencies and fishers. In 2020 there were 7 monthly reports from July-November and a 2020 review that are available at:

- July <https://suntag.org.au/wp-content/uploads/2021/01/Gofish-20-July.pdf>
- August <https://suntag.org.au/wp-content/uploads/2021/01/Gofish-20-August.pdf>
- September <https://suntag.org.au/wp-content/uploads/2021/01/Gofish-20-September.pdf>
- October <https://suntag.org.au/wp-content/uploads/2021/01/Gofish-20-October.pdf>
- November <https://suntag.org.au/wp-content/uploads/2021/01/Gofish-20-November.pdf>
- 2020 Review <https://suntag.org.au/wp-content/uploads/2021/01/Gofish-20-2020-review.pdf>

Monthly reviews are continuing through 2021 and are available from the Suntag website.

There were 7 live stream episodes as reported under 3. Engaging and informing recreational fishers.

1. Frank Prokop speaking about Maximum Experiential Yield
https://www.facebook.com/watch/live/?v=1321218181577135&ref=watch_permalink
2. Owen Li discussing the diversity of recreational fishers in Australia (Figure 28)
https://www.facebook.com/watch/live/?v=703174347259181&ref=watch_permalink
3. Tackle Box Talks - Episode S01E03 - Adam Martin Why you should really engage in recreational fishing citizen science.
<https://www.facebook.com/438119056279995/videos/209235940844328>
4. Tackle Box Talks - Episode S01E04 - Matt Barwick What might the future of fishing look like in Australia? <https://www.facebook.com/438119056279995/videos/164449888783461>
5. Tackle Box Talks - Episode S01E05 - Lee Baumgartner, what can we do to improve fishing in the Murray Darling Basin?
<https://www.facebook.com/438119056279995/videos/480861386241141>
6. Tackle Box Talks - Episode S01E06 - Catching up with Scott Thomas, Editor of Fishing World Magazine. <https://www.facebook.com/438119056279995/videos/333484454750715>
7. Tackle Box Talks - Episode S01E07 - Catching up with fishing icon Michael Guest.
<https://www.facebook.com/438119056279995/videos/270130781160199>

There are currently 3 scientific papers in progress that emanate from this project:

1. Methodology for using tagging and recapture data to track fisher behaviour (Bill Sawynok and David Hall)
2. Mathematical paper on the modelling process for using tag recaptures as a random population sample (Bill Sawynok and Stefan Sawynok)
3. Methodology for using app-based technology to collect historical data in a recreational fishery (Stefan Sawynok, Adam Martin and Owen Li)

Appendices

Research team

Principal Investigator: Adam Martin
Australian Recreational Fishing Foundation
PO Box 118
Deakin West ACT 2600

Co-Investigator: Stefan Sawynok
Infofish Australia Pty Ltd
2/11 Knobel Court
Shailer Park Qld 4128

Co-Investigator: Bill Sawynok
Infofish Australia Pty Ltd
2/11 Knobel Court
Shailer Park Qld 4128

Trackmyfish Manager: Tracy Chelepy
Infofish Australia Pty Ltd
Rockhampton Qld 4700