NSW DPI GAME FISH TAGGING PROGRAM

REPORT 2019-2020

Recreational Fishing Trusts

NSW GOVERNMENT

Pepperell Research
Marine Science & Recreational Fisheries

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Cover image: Sandy Gorecki of the Jervis Bay Game Fishing Club with a previously tagged striped marlin caught due east of Beecroft Peninsula. The fish had been tagged 85 days earlier by Dean Caletti off Swansea Canyons, 130 nm to the north. After noting the tag number, the marlin was re-released.

INTRODUCTION

The New South Wales Department of Primary Industries (NSW DPI) Game Fish Tagging Program was officially launched in December 1973 and has been in continuous operation since then. Similar cooperative tagging Programs operate in other countries including the United States, New Zealand, South Africa and Kenya but in terms of numbers of pelagic fish tagged, the NSW Program is the largest in the world.

Since the origins of the Program, more than 60,000 anglers have tagged at least one fish, members of 950 fishing clubs have participated and fish have been tagged and released from over 11,500 boats.

During 2019/20 a total of 9,996 fish were tagged under the Program – an increase on the previous year's total of 8,972. The number of recaptures reported in 2019/20 was 401 the second highest on record, just below the total in 1990/91. As was the case last year, this was primarily due to increasing numbers of yellowtail kingfish tagged, and therefore recaptured in both South Australia and NSW.

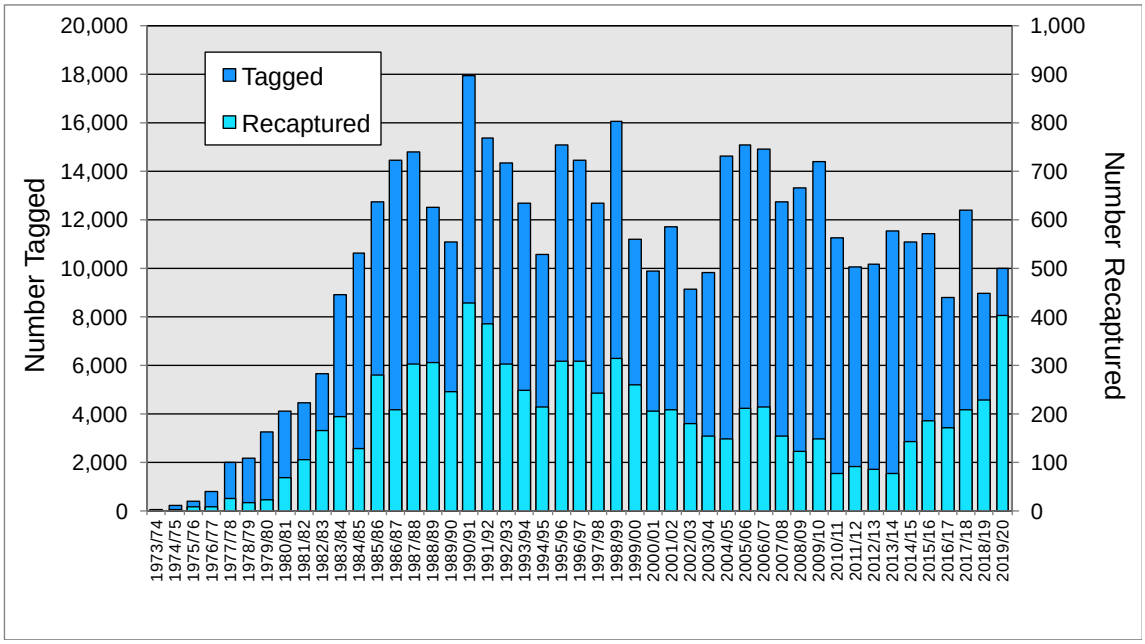
Figure 1 shows the number of fish tagged and recaptured each year since the origin of the Program to 30 June 2020. Following a rapid increase in tagging during the late 1970s and 1980s, numbers of fish tagged have fluctuated around an annual average of about 12,500, made up of varying proportions of species of fish tagged in different years. The total numbers of fish tagged each year vary for many reasons, not least the availability of certain species of highly mobile pelagic fish at different times and locations. For example, the Program's two peak tagging years of 1990/91 and 1997/98 coincided with strong La Nina conditions on the east coast of Australia (as did the 2017/18 season), resulting in higher than usual numbers of some pelagic species becoming available to anglers in those years.

In terms of total numbers of fish tagged, the 2019/20 game fishing season was somewhat below the long-term average, although fishing effort over the last three months was likely to have been adversely affected by Covid-19 in different regions. The main species tagged in below average numbers were southern bluefin tuna, black marlin, dolphinfish and mako sharks, although these were somewhat compensated by higher than average numbers tagged of yellowtail kingfish and sailfish.

Even though the Program has such a long history, significant recaptures, new records and surprises occur each year. In 2019/20, these included:

- First time a tagged striped marlin has been recaptured twice
- Smallest striped marlin tagged and recaptured (20 kg)
- First recaptures (2) of tagged southern bluefin tuna in excess of 100 kg
- Longest time at liberty for a tagged southern bluefin tuna (9 years)
- Longest time at liberty for a Samsonfish (10 years 1 month)
- Second longest distance travelled by an Australian-tagged sailfish (538 nautical miles)
- Highest number of yellowtail kingfish tagged in 14 years – second highest on record
- Four kingfish tagged in Sydney Harbour recaptured on the same reef in Victoria

FIGURE 1. NO. OF FISH TAGGED AND RECAPTURED EACH YEAR SINCE THE ORIGIN OF THE PROGRAM



THE PROGRAM TO DATE

As at the end of June 2019, the grand totals of fish tagged and recaptured on the Program stood at 479,933 and 8,437 respectively (Table 1), continuing the Program's status as the largest of its kind in the world. The table summarises releases and recaptures of the main species or species groups tagged, with the remainder tallied as 'other species combined'.

The single species tagged in the highest numbers continues to be black marlin with 74,417 tagged (15.2% of all releases). Yellowtail kingfish continue to exceed yellowfin tuna as the second most tagged species followed by sailfish, striped marlin, southern bluefin tuna and dolphinfish. Other prominent key species are albacore, whaler sharks (as a group – *Carcharhinus* spp.), blue marlin, Spanish mackerel (narrow-barred) and shortfin mako sharks. Striped (skipjack) tuna, mackerel tuna and bonito are also prominent, although the majority of those totals were contributed in the earlier years of the tagging Program and are now discouraged as eligible tagging species.

TABLE 1. TOTAL NUMBERS OF FISH TAGGED AND RECAPTURED 1974-2020

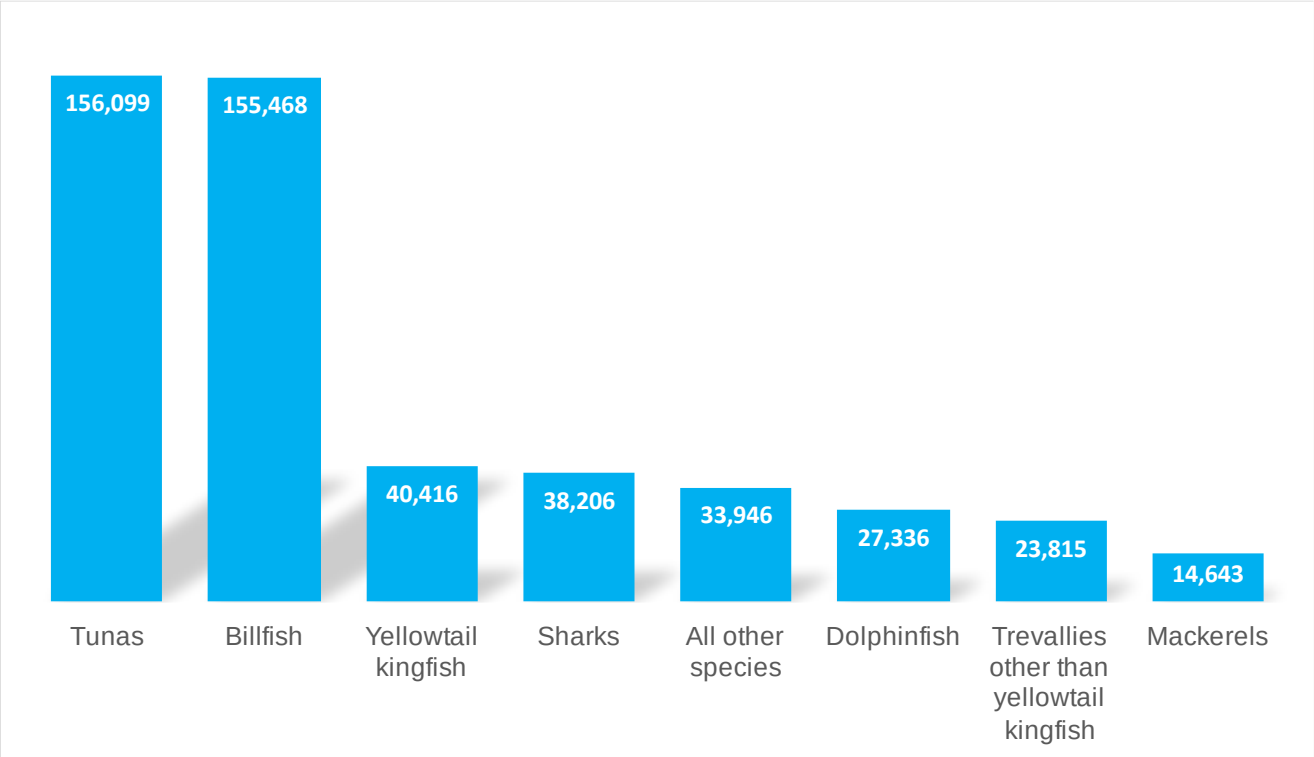
Species	Total Tagged	Total Recaptured	% Recapt
BLACK MARLIN	74,417	586	0.79
YELLOWTAIL KINGFISH	40,416	2,949	7.30
YELLOWFIN TUNA	38,394	709	1.85
SAILFISH	35,566	363	1.02
STRIPED MARLIN	31,579	273	0.86
SOUTHERN BLUEFIN TUNA	28,652	261	0.91
DOLPHINFISH	27,336	255	0.93
ALBACORE	22,409	171	0.76
STRIPED TUNA	21,618	68	0.31
MACKEREL TUNA	20,901	62	0.30
WHALER SHARKS*	14,743	299	2.03
BONITO	13,254	219	1.65
BLUE MARLIN	13,079	43	0.33
AUSTRALIAN SALMON**	10,529	636	6.04
SPANISH MACKEREL	9,690	98	1.01
MAKO SHARK	8,692	194	2.23
SILVER TREVALLY**	7,192	201	2.79
HAMMERHEAD SHARKS	5,896	62	1.05
BLUE SHARK	5,251	79	1.50
LONGTAIL TUNA	5,194	60	1.16
TAILOR**	4,033	122	3.03
QUEENFISH	3,613	10	0.28
SAMSON FISH	3,560	150	4.21
BARRACUDA	3,425	6	0.18
TREVALLY	3,418	31	0.91
GIANT TREVALLY	2,786	37	1.33
OTHER SPECIES COMBINED	34,286	894	2.61
TOTAL	**489,929**	**8,838**	**1.80**

*'Whaler sharks' include the following tag card entries: Whaler, bronze whaler, bull shark, black tip whaler, white tip shark, oceanic white tip shark and Galapagos shark.

**Some species, such as tailor, silver trevally and Australian salmon, were tagged in large numbers in the past, but have since been removed from the list of desirable species to tag.

Combining the main species or species groups together over the history of the Program, Figure 2 shows that tunas combined only just maintain the lead as the group tagged in the largest numbers – 156,099 tagged, or 31.9% of the total, closely followed by billfish combined – 155,468 – 31.7% of all fish tagged. A single species, yellowtail kingfish, with 40,416 tagged, accounts for 8.2% of all releases while the total numbers of sharks combined (38,206) constitute 7.8% of the total number of fish tagged in the Program.

FIGURE 2. TOTAL NUMBERS OF FISH TAGGED AS SPECIES GROUPINGS, 1974-2020



SUMMARY OF TAGGING ACTIVITY FOR 2019/20

A total of 9,996 fish were tagged between 1 July 2019 and 30 June 2020. Table 2 shows the breakdown of species or species groups tagged and recaptured during this period. As has been the case for some time, the six species tagged in highest numbers each year continue to be black marlin, yellowtail kingfish, southern bluefin tuna, sailfish, striped marlin and blue marlin, not always in that order. For example, dolphinfish usually rank around seventh, but this year samsonfish leapfrogged that species with 452 releases. Of course, positions on the 'leaderboard' may change from year to year depending on the relative abundance of species as well as avidity of anglers tagging them in different areas.

Billfish as a group continued to be tagged in the largest numbers. Total billfish tagged and released in 2019/20 tallied 4,827 – an increase on the previous year's total of 4,566 but still well short of the all time record of 7,491 billfish tagged in 2017/18.

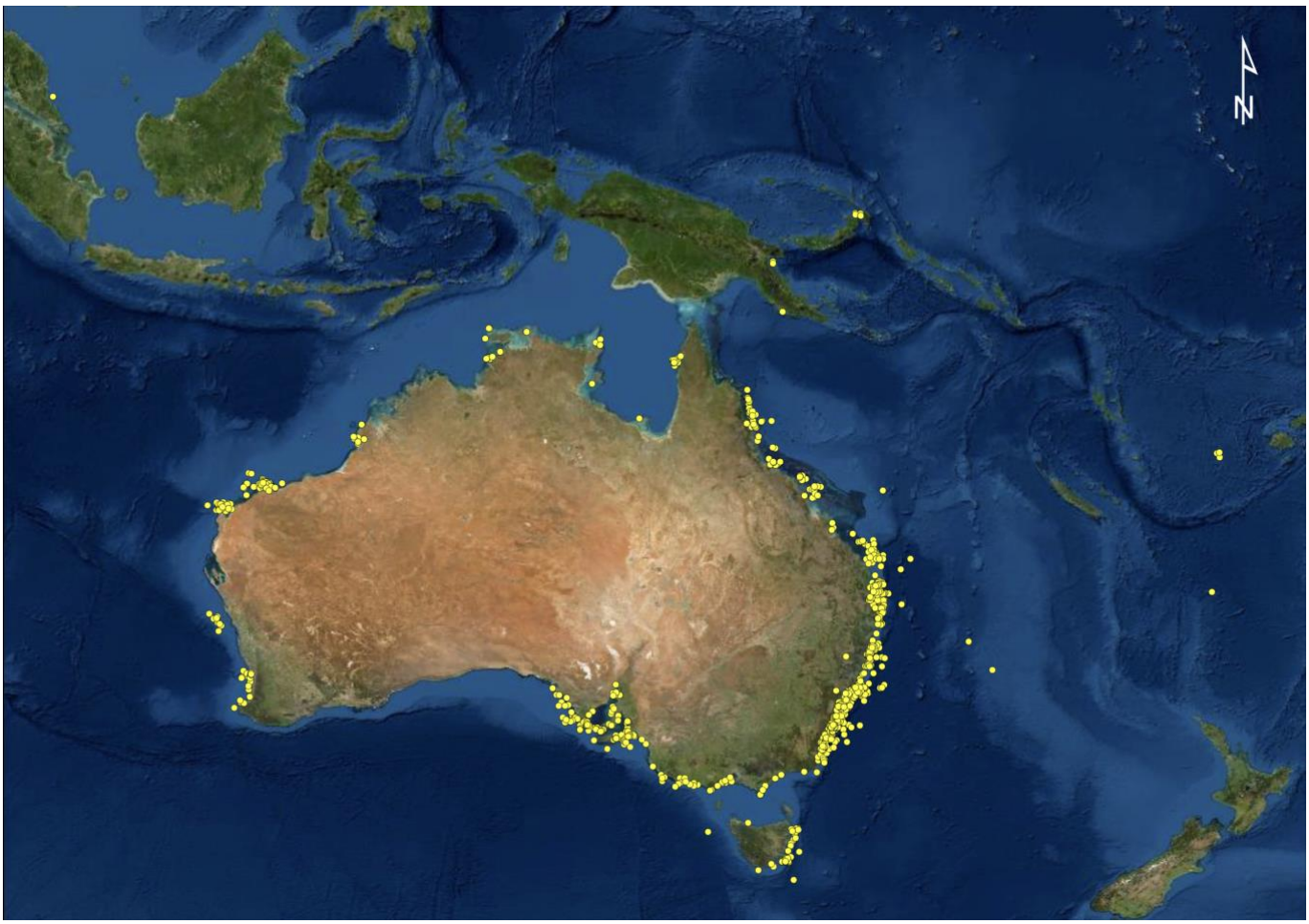
TABLE 2. NUMBERS OF ALL SPECIES / SPECIES GROUPS TAGGED AND RECAPTURED DURING 2019/20

Species	Total Tagged	Total Recapt
BLACK MARLIN	1,787	17
YELLOWTAIL KINGFISH	1,644	272
SOUTHERN BLUEFIN TUNA	1,354	35
SAILFISH	1,243	17
STRIPED MARLIN	1,152	11
BLUE MARLIN	669	3
SAMSON FISH	452	29
DOLPHINFISH	191	4
BRONZE WHALER	175	2
WHALER SHARK	124	1
SPANISH MACKEREL	91	1
AUSTRALIAN SALMON	89	2
YELLOWFIN TUNA	84	
SPOTTED MACKEREL	81	
GOLDEN TREVALLY	73	
QUEENFISH	71	
BULL SHARK	69	2
MAKO SHARK	61	
TIGER SHARK	60	4
HAMMERHEAD SHARK	47	
LONGTAIL TUNA	43	
GUMMY SHARK	40	
SHARK MACKEREL	34	
STRIPED TUNA	34	
SCHOOL SHARK	28	
ALBACORE	27	
MACKEREL TUNA	39	
COBIA	24	
BLUE SHARK	23	
BROAD BARRED MACKEREL	23	
EAGLE RAY	23	
SILVER TREVALLY	22	1
BARRACUDA	19	
AMBERJACK	18	
GIANT TREVALLY	14	
GOLD SPOTTED TREVALLY	14	
SHORTBILL SPEARFISH	12	
OTHER SPECIES	42	
TOTAL	**9,996**	**401**

DISTRIBUTION OF TAGGING EFFORT IN 2019/20

The map below (Figure 3) plots the locations of all 9,996 fish tagged in 2019/20. Note though that each point may represent many releases at the same coordinates. While the Program is primarily conducted around the Australian coast, it has historically also extended to neighbouring Pacific island countries, with obvious benefits in accruing knowledge of the pelagic fishes of our general region. The map for 2019/20 shows similar distribution of tagging activity to recent years, with clustering of releases around known 'hot spots' – for example Exmouth and Dampier in WA, but also a broad spread of activity right around the Australian east coast, especially from southern Queensland to Victoria on the east coast. Positions of releases for each of the main species tagged are shown in the relevant sections below.

FIGURE 3. POSITIONS OF RELEASES OF ALL GAMEFISH TAGGED DURING 2019/20



BLACK MARLIN

Locations of all black marlin tagged during the past season are shown in Figure 4. Note that each point may represent many releases at the same given position.

FIGURE 4. POSITIONS OF RELEASES OF TAGGED BLACK MARLIN DURING 2019/20

For the fourth year in succession, black marlin topped the list of species tagged. The total of 1,787 was down a little on the previous year (2,104 black marlin tagged) and also down somewhat on the average annual number tagged for the previous 10 years (2,216).

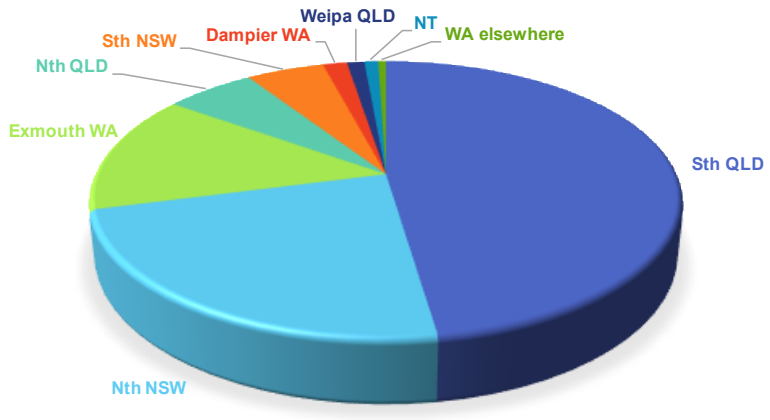
Over the history of the Program, the number of black marlin tagged for any given year is strongly influenced by the appearance or non-appearance on the east coast of juvenile fish in their first year of life. In those years, thousands of these juveniles, ranging from 5 kg to 30 kg, are tagged, initially off Cairns and Townsville in the north, then as they make their way south along the Queensland (QLD) coast to Hervey Bay, the Sunshine and Gold Coasts and then into northern and central NSW. The last very strong recruitment of these occurred in 2017/18 when more than 2,500 were tagged during their north to south migration.

As was the case in 2018/19, there was only a modest 'show' of this size class of black marlin in 2019/20 indicating a low recruitment year. Most of the fish reaching central NSW waters were mostly two to three year old fish, ranging from 40 to 150 kg and averaging 85 kg.

Numbers of black marlin tagged in Western Australian waters in 2019/20 were down on the previous year (283 compared with 463). Most of these (246) were tagged off Exmouth (size range 20-60 kg) and only 28 tagged off Dampier (10-70 kg). Just six black marlin were tagged off Broome but as noted below under 'Sailfish', the Broome Fishing Club discontinued tagging of billfish some years ago but members of that club still release hundreds of sailfish each year.

Other areas where black marlin were tagged were the Northern Territory, mainly off Darwin (16) and off Weipa, western Cape York (20). There were no recorded tag-and-releases of black marlin outside Australian waters in 2019/20.

FIGURE 5. PROPORTIONS OF BLACK MARLIN TAGGED BY REGION, 2019/20



The number of black marlin reported tagged during the heavy tackle season off Cairns/Lizard Island (35), was the lowest on record, continuing a trend in this specialist fishery of not tagging released black marlin. As discussed in previous reports, there has been a marked shift towards free release of fish by many of the charter captains operating in the fishery. In a fishery such as this, where close to 100% of fish are released, tag cards have been used in the past to estimate total catches through time. Therefore, in this case, and also for the sailfish fishery off Broome, WA (see below), the use of release cards has been strongly recommended in order to continue the long-term recording of total released catch, with or without a tag. A release card would contain the same information as a tag card, minus a tag number, and data would be entered in a separate field of the Game Fish Tagging database, would lack a tag number (but would be assigned a unique identifying number) but would be compatible with tag data in every other way.

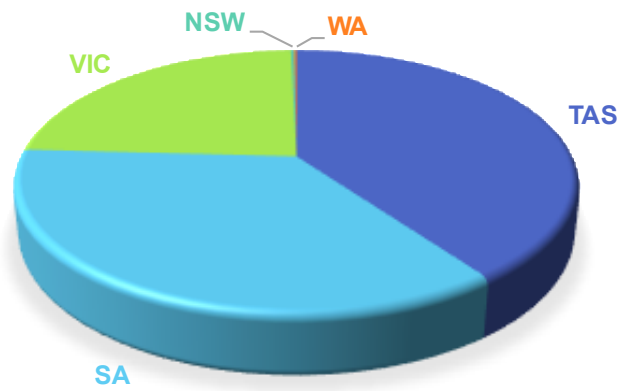
SOUTHERN BLUEFIN TUNA

Locations of all southern bluefin tuna (SBT) tagged during the past season are shown in Figure 6. Note that each point may represent many releases at the same position.

FIGURE 6. POSITIONS OF RELEASES OF TAGGED SOUTHERN BLUEFIN TUNA DURING 2019/20

A total of 1,354 SBT were tagged in 2019/20, a healthy increase from the previous year (988) but still under the average number tagged for the past 10 years (1,724). Figure 7 shows that 40% of SBT tagged this year were released in Tasmania, followed by South Australia, (35.8%) and Victoria (23.7%). As is usually the case, the numbers of SBT tagged in NSW and Western Australia remained very small (3 and 2 respectively).

FIGURE 7. PROPORTIONS OF SOUTHERN BLUEFIN TUNA TAGGED BY STATE, 2019/20



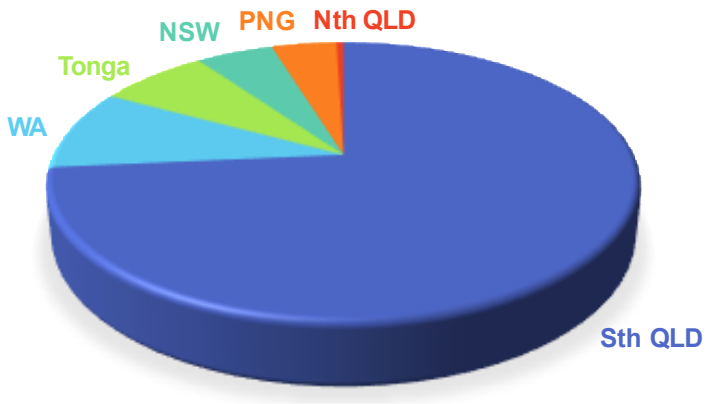
BLUE MARLIN

Locations of all blue marlin tagged during the past season are shown in Figure 8. Note that each point may represent many releases at the same position.

FIGURE 8. POSITIONS OF RELEASES OF TAGGED BLUE MARLIN DURING 2019/20

A total of 669 blue marlin were tagged during 2019/20, which was 29 more than the previous year's tally and right on the average number tagged over the past 10 years (675). Figures 8 and 9 show that this season, nearly three quarters of all blue marlin tagged were released off southern QLD, mainly off the Gold Coast. New South Wales releases were well down though, with just 33 tagged compared with 81 the previous year and a remarkable 320 in 2017/18. In Western Australia, 48 blue marlin were tagged off Exmouth compared with 33 the previous season and 107 the season before that. After a big year on blue marlin in PNG the previous season, when 182 were tagged, mainly off Rabaul, New Britain, this year saw a more modest 28 released. The most blue marlin tagged in an overseas location though was 47, released off the island of Vava'u, Tonga.

FIGURE 9. PROPORTIONS OF BLUE MARLIN TAGGED BY REGION, 2019/20



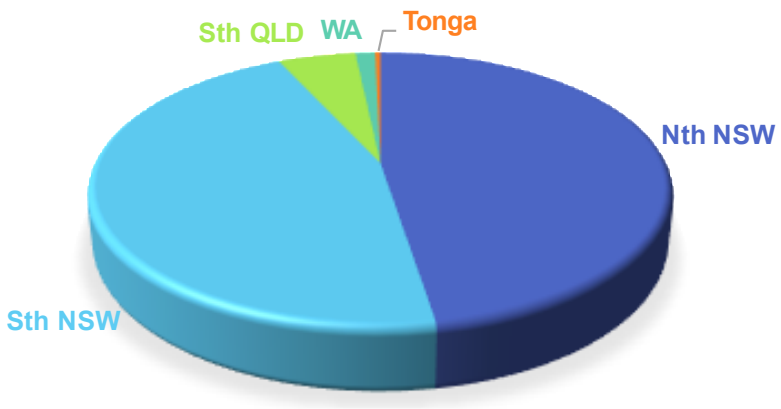
STRIPED MARLIN

Locations of all striped marlin tagged during the past season are shown in Figure 10. Note that each point may represent many releases at the same position.

FIGURE 10. POSITIONS OF RELEASES OF TAGGED STRIPED MARLIN DURING 2019/20

A total of 1152 striped marlin were tagged in 2019/20, about 200 more than the previous year and very close to the average for the past 10 years (1,124). As usual, the great majority (93%) of striped marlin tagged during the season were released off NSW, with numbers being evenly split between the northern part of the State (primarily off Port Stephens) and the southern ports of Jervis Bay, Ulladulla and Bermagui (Figure 11). Small numbers of striped marlin were also tagged off southern QLD (59), Exmouth WA (15) and Tonga (4).

FIGURE 11. PROPORTIONS OF STRIPED MARLIN TAGGED BY REGION, 2019/20



SAILFISH

Locations of all sailfish tagged during the past season are shown in Figure 12. Note that each point may represent many releases at the same position.

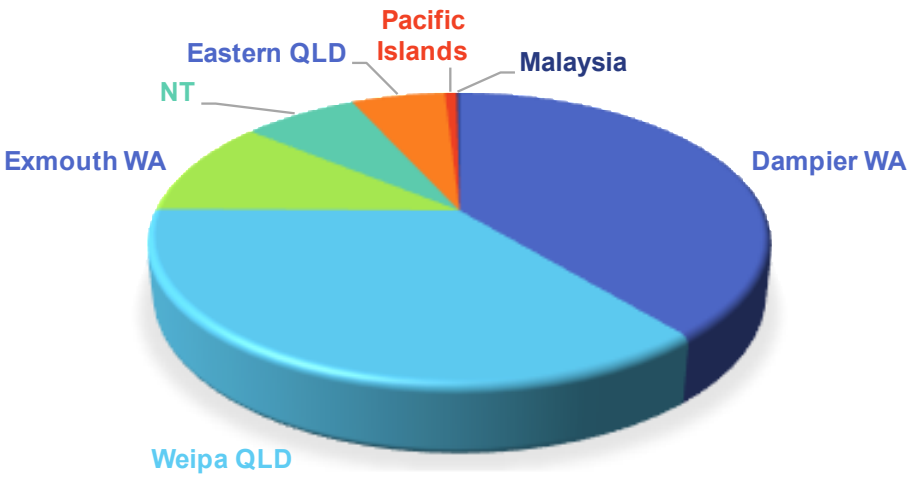
FIGURE 12. POSITIONS OF RELEASES OF TAGGED SAILFISH DURING 2019/20

The number of sailfish tagged in 2019/20 (1,243) was well up on the previous year (834). This was mainly due to a large increase in numbers tagged off Weipa, western Cape York QLD. In the past, tagging of hundreds of sailfish each year off Broome WA contributed significantly to the Program's annual total. However, since 2017, a decision by the Broome Fishing Club to allow free release rather than tagging for points resulted in a sharp decline in sailfish tagging in that region. As a case in point,

during the 2018 Broome Billfish Tournament, a total of 347 sailfish were free released, which, if tagged, would have substantially increased the tally for the season.

The lack of tagging of sailfish off Broome has been offset to some extent in Western Australia by the tagging of over 500 sailfish off Dampier and Exmouth WA combined for the second year in succession (see Figure 13). In contrast, only 71 sailfish were tagged in QLD waters, continuing a run of lean sailfish years. This year, only very small numbers of sailfish were tagged in neighbouring countries (Papua New Guinea, Tonga and Malaysia).

FIGURE 13. PROPORTIONS OF SAILFISH TAGGED BY REGION, 2019/20



YELLOWTAIL KINGFISH

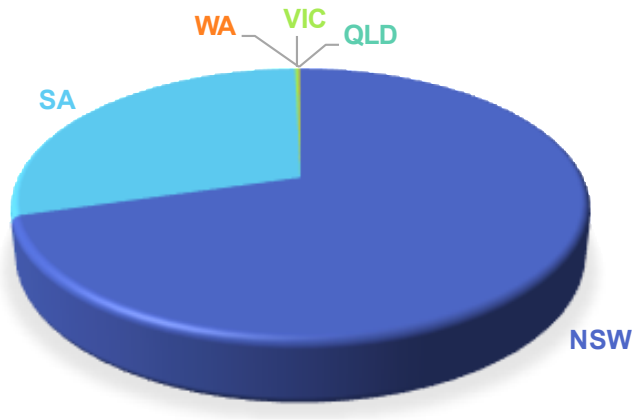
Locations of all yellowtail kingfish tagged during the past season are shown in Figure 14. Note that each point may represent many releases at the same position.

FIGURE 14. POSITIONS OF RELEASES OF TAGGED YELLOWTAIL KINGFISH DURING 2019/20

A total of 1,644, yellowtail kingfish was tagged during 2019/20, nearly 600 more than the previous year and the highest total in the past 14 years of the Program. This large increase was due almost entirely to releases in NSW waters, from 494 to 1,158 tagged, while the numbers tagged in South Australia were similar in both years (479 and 526). Very small numbers of kingfish were also tagged in Victoria, WA and southern QLD.

As has been the case for several years, a high proportion of kingfish tagged in South Australia were relatively large, with many in the 10-20kg, or even 20-30kg range. In contrast, the great majority of kingfish tagged off NSW were estimated at less than 5kg in weight at release.

FIGURE 15. PROPORTIONS OF YELLOWTAIL KINGFISH TAGGED BY STATE, 2019/20



TAGGING TRENDS THROUGH TIME

Reviewing the numbers of different species of gamefish tagged over this long running Program, it is clear that these can and do fluctuate widely over time, sometimes showing long-term trends, and sometimes indicating marked shifts from one year to the next. Such changes may be reflecting the abundance of particular species over these periods, or they may simply be reflecting changes in availability of those species to recreational fisheries around Australia. For example, the number of black marlin tagged each year is strongly influenced by the appearance or non-appearance of a 'pulse' of juvenile fish in their first year of life on the Australian east or west coasts, or both.

To inspect this in more detail, the numbers of key gamefish species tagged over the past 5 years are plotted on a single graph (Figure 16), while individual plots for ten of the key species tagged for the past 12 years are shown in Figure 17. One point to note when examining these graphs is that Figure 16 shows the same scale for numbers tagged of all species, while in Figure 17, the numbers tagged – shown on the vertical axes – are not to the same scales, but more readily show relative fluctuations for each species through time, as well as covering a longer time frame than Figure 16.

FIGURE 16. NUMBERS OF THE KEY SPECIES AND SPECIES GROUPS TAGGED IN 2019/20 AND THE PREVIOUS FOUR YEARS

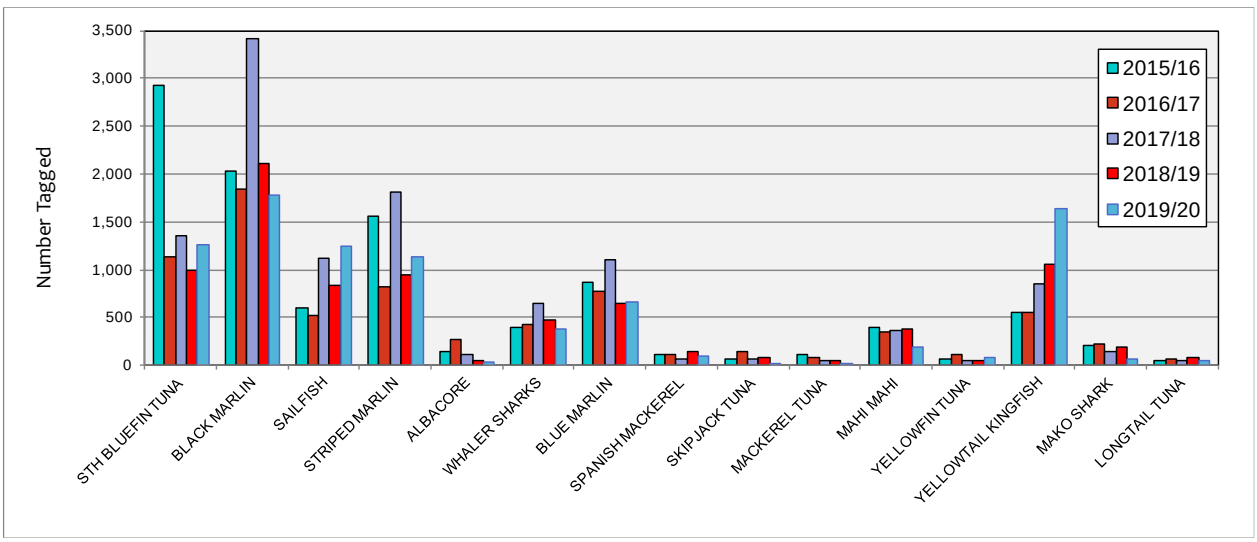
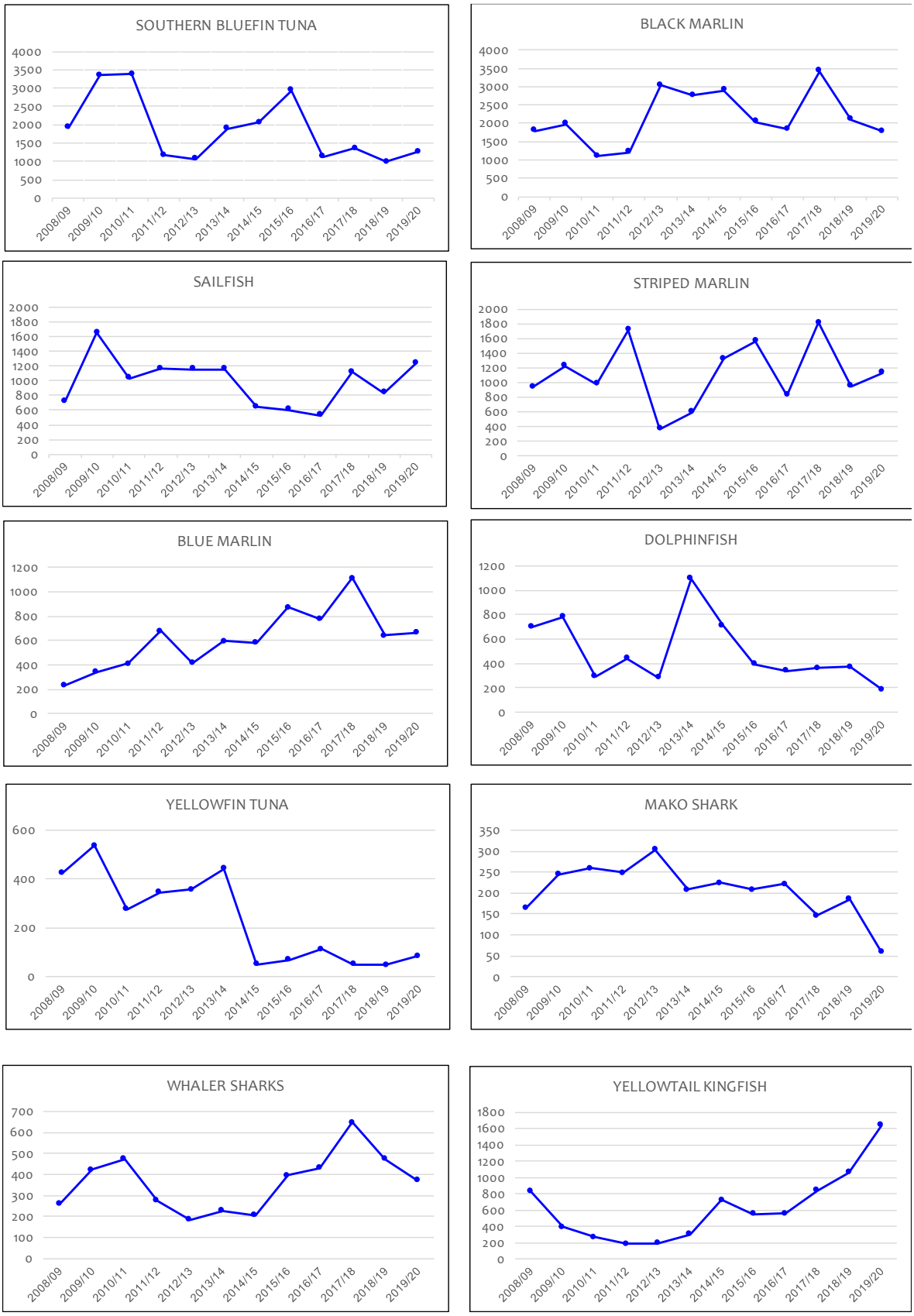


FIGURE 17. NUMBERS OF KEY GAMEFISH SPECIES TAGGED OVER THE PAST 12 YEARS



Focusing on particular species shown in Figure 17, we see quite large fluctuations in numbers of southern bluefin tuna tagged over the given timeframe, from lows of around 1,000 in several years to highs of over 3,000 in others. After a drop in numbers tagged in 2016/17, numbers have fluctuated quite steadily around 1,200 to 1,300 tagged per year.

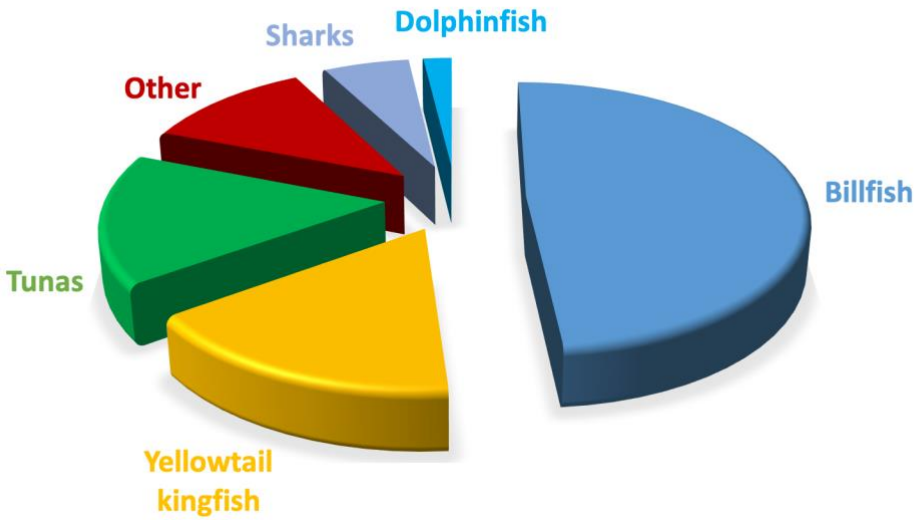
For black marlin, after reaching near record numbers tagged in 2017/18, numbers tagged over the past two years dipped below 2,000, but with no indication of a downward long term trend. Numbers of sailfish tagged increased from a slight dip the year before; striped marlin releases also increased a little from the previous year, maintaining a relatively steady trend through time. With increased targeting by offshore anglers, blue marlin tagging had shown a steady increase over the past decade. The number tagged then showed a dip to 640 tagged in 2018/19, maintaining at around the same numbers (665) in 2019/20. Numbers of dolphinfish tagged from year to year are highly variable, reflecting recruitment events of this very short-lived species. Numbers tagged had been steady at around 400 per year for the previous four seasons, but dropped in 2018/19 to just 186 tagged – the lowest tally for the past 12 years at least. Yellowfin tuna have shown the most dramatic shift, with numbers tagged declining sharply in 2008/09 followed by a stable period and then another sharp and sustained drop in numbers since 2014/15. After an all time low of just 47 tagged in 2017/18, just 84 were tagged in 2018/19, continuing a very low trend for the past six years now. The number of mako sharks tagged has been relatively steady over the past decade while numbers of whaler sharks (combined species), from a low base 3 to 5 years ago, showed a steady increase to a record high in 2017/18, followed by a drop in the past year. Lastly, following a dip in numbers tagged in the early 2010s, yellowtail kingfish releases climbed steadily to match in 2017/18 the number tagged ten years earlier, exceed that number in 2018/19 and extend to a record high of over 1,600 tagged in the past year.

Combining the species tagged into species or species groups, Figure 18 shows that billfish as a group constituted just under 50% of overall taggings in 2019/20. This was very similar to the previous year but down a little down on the year before (60.5%). This result continues a trend of much higher proportions of billfish tagged than for earlier ‘average’ years of the Program when billfish were averaging between 30 and 35% of the total tagged.

The proportion of tunas tagged represented 15.8% of the total in 2019/20, slightly up on 2018/19 (14.5%). With very few yellowfin tuna being tagged over the past six or seven years, fluctuations in tuna taggings are largely due to fluctuations in numbers of southern bluefin tuna tagged each year.

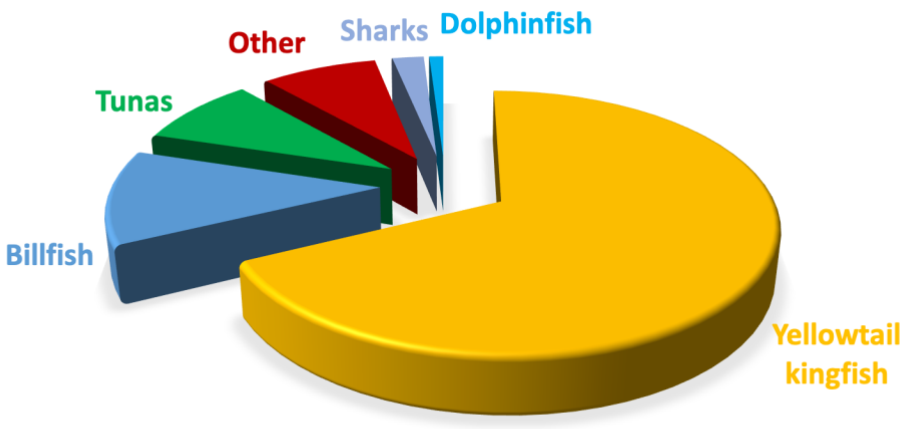
Sharks represented only 5.8% or all fish tagged in 2019/20 which was less than the previous two 9.9% and 8.9% respectively), and a little less than the average of about 7% over the 12 years or so.

FIGURE 18. SPECIES GROUPS TAGGED IN 2019/2020



Now considering recaptured species or species groups, Figure 19 shows the proportions of the major species groups recaptured in 2019/20, and as is usually the case, indicates quite different proportions to those tagged. This year, yellowtail kingfish dominated recaptures even more than usual, with 67.8% of all recaptures (59.1% and 52.9% for the previous two years respectively). Billfish represented the next highest proportions of recaptures at 12.0% followed by tunas (8.7% and sharks (8.2%).

FIGURE 19. SPECIES GROUPS RECAPTURED IN 2019/2020



RECAPTURE HIGHLIGHTS IN 2019/20

The full list of completed recaptures that were reported in 2019/20 is shown in Appendix I. Some of the highlights of these recaptures are detailed below. Because of the interest among anglers, we tend to emphasise some of the longer times at liberty or longer distances moved by tagged fish, however, these may often be exceptions to the rule. In contrast, many fish are also recaptured relatively close to their points of release, often, but not always within relatively short times. Therefore, it is stressed that information gained from these less 'spectacular' recaptures is just as important to our understanding of the movements and growth of game fish as are longer term, longer distance recaptures.

BLACK MARLIN

A total of seventeen black marlin recaptures were reported during 2019/20. Times at liberty ranged from 2 to 857 days and minimum distances travelled from zero to 1,200 nautical miles. Twelve of the recaptured black marlin had been tagged in QLD waters and five off NSW. Sixteen of the recaptured marlin were caught by recreational boats in Australian east coast waters while the other was taken by a local longline vessel in PNG waters.

The furthest distance recorded by a black marlin in 2019/20 was for a fish tagged inside the Great Barrier Reef off Townsville in July 2017 and recaptured 2 years 4 months later by artisanal fishers off Kaniet Island in northern Papua New Guinea waters (see image below) – a minimum swim, allowing for land masses, of around 1,200 nautical miles (Figure 20).

Image: Tagged black marlin recaptured near Kaniet Island, northern PNG. Originally released by Craig Dykstra off Townsville QLD* in July 2017, it had been at liberty for 857 days. This fish had been estimated at just 10 kg on release (around 6 months old), and weighed 85 kg on recapture – a healthy growth rate, and fitting well with previous estimates for the species.

A second long-distance black marlin recapture recorded during the year travelled in the opposite direction. Also tagged off Cairns, this fish, estimated at 15 kg, was recaptured six months later 1,100 nautical miles south, off Port Stephens NSW where it was estimated at 45 kg (Figure 21).

A third fish tagged off the Gold Coast at an estimated size of 25 kg was recaptured during the 'heavy-tackle' black marlin season off Opal Reef northern QLD after eight months, again showing a good growth rate to an estimated 65 kg (Figure 21).

Three black marlin had been at liberty for close to a year, one moving from Ballina NSW to Port Stephens while the other two, both tagged off the Gold Coast QLD, were recaptured very close to their points of release. All three had been estimated at 30 kg at release (likely a little over one year old) and had grown to estimated weights of 40 to 60 kg in the intervening 11 months or so. Based on previous long distance recaptures of black marlin of this size class, it is very likely that these fish had moved considerable distances during their times at liberty, but had returned to the same general region a year later.

Images: A black marlin, tagged off Ballina NSW in March 2019 by Max McLelland (top image), was recaptured nearly a year later wide of Port Stephens at the area known as the 'car park' (bottom image). The tag shows considerable growth of goose-neck barnacles and was removed and retagged with a fresh tag before re-release. Heavy fouling of tags such as this is relatively uncommon, depending very much on the environment in which the fish has inhabited through time.

This year, eight of the recaptures of black marlin occurred within three months of release between the Sunshine Coast QLD and Port Stephens NSW. Distances moved by those fish ranged from zero to 86 nautical miles, indicating a relatively high degree of residency in this general area during late summer / early autumn of 2020. This pattern contrasts with movements in some other years when dispersal of tagged fish from this region has been very rapid.

Image: John Chow recaptured this heathy black marlin off the Gold Coast on 30 March 2020. It had been tagged 86 days earlier at Barwon Banks, off the Sunshine Coast, by Brett Hemming. At release it was estimated at 30 kg and at recapture and re-release, at 40 kg.

FIGURE 20. INTERNATIONAL RECAPTURED BLACK MARLIN RECORDED IN 2019/20.

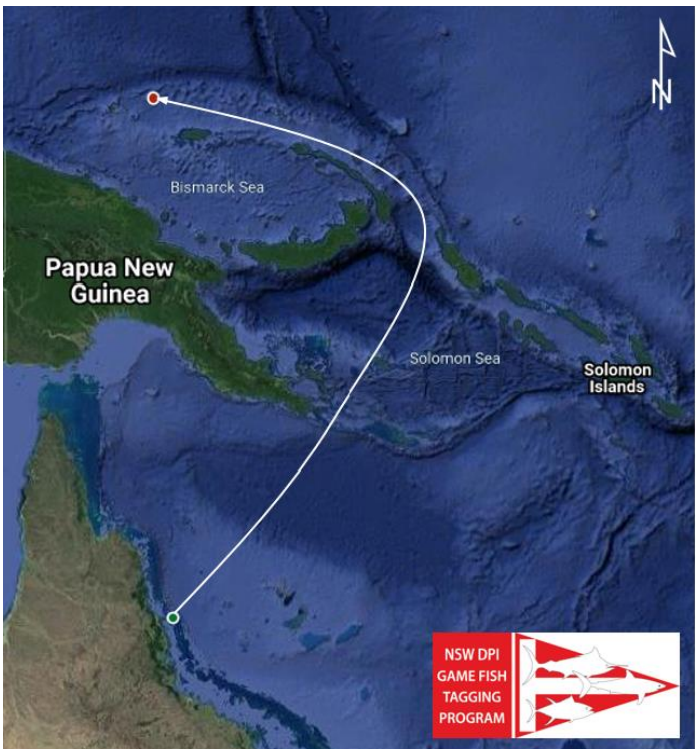
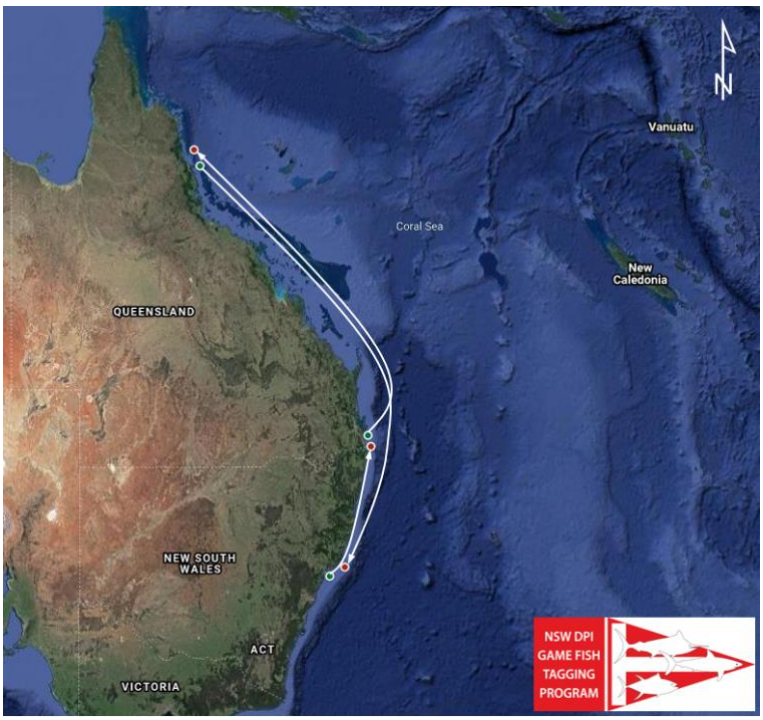


FIGURE 21.COASTAL MOVEMENTS BY RECAPTURED BLACK MARLIN RECORDED IN 2019/20



BLUE MARLIN

Three blue marlin were recaptured in 2019/20 compared with just one the previous year. One of these had been tagged wide of Exmouth WA in December 2019 and was recaptured two months later by an Indonesian longline vessel 200 nautical miles to the northwest in an area known as the outer Exmouth Plateau. When released the fish was estimated at 100 kg, which proved to be especially accurate since it weighed 105 kg at recapture. The other two blue marlin were both recaptured in November 2019 by recreational boats northeast of Fraser Island QLD only nine days apart. One had been tagged just 3 days earlier at the same location – the shortest time between release and recapture for a blue marlin in the Program's history. The other Fraser Island blue marlin recapture had been tagged wide of Sydney 222 days earlier. Prior to these recaptures, there had been just 41 blue marlin recaptures reported to NSW DPI so each new recapture of this important species adds more to our knowledge of its movements.

FIGURE 22. BLUE MARLIN MOVEMENTS BY RECAPTURED FISH RECORDED IN 2019/20

Image: One of three blue marlin recaptured during the season, it was tagged by Clay Buckland off Fraser Island in November 2019 and recaptured in the same area just three days later by Joe Stella. This is the shortest time between release and recapture for a blue marlin in the Program's history. Also of note is the dark bronze colour of the fish at release. This is often thought, without any real proof, to be a sign of exhaustion but recaptures like this prove that at least some fish with this coloration can recover fully, and quickly after release.

SAILFISH

It was a good season for sailfish recaptures with 17 recorded for the 2019/20 year, 12 more than each of the previous two years. Seven had been tagged off Dampier WA, six off Weipa QLD, and one each off Hayman Island QLD, Mooloolaba QLD, Vava'u, Tonga and Kuala Rompin, Malaysia. Times-at-liberty ranged from zero to 661 days (22 months) while minimum distances moved ranged from zero to 538 nautical miles.

The long-distance movement was by a fish tagged near Hayman Island QLD in October 2018 and recaptured near Kosman Island off the eastern tip of Papua New Guinea in January 2020. It was caught by a PNG-based Taiwanese longline vessel. This was a significant recapture since, over the course of the tagging Program, 363 sailfish have been recaptured but just two Australian-tagged fish, including this one, had moved apparent minimum distances of more than 500 nautical miles. The overwhelming majority of all other recaptured sailfish have been caught near their release points– 85% within 20 nautical miles and 90% within 50 nautical miles. This pattern is true for sailfish tagged at different locations on both the west and east coasts of Australia as well as for two sailfish hotspots in the Gulf of Carpentaria – Weipa and Groote Eylandt.

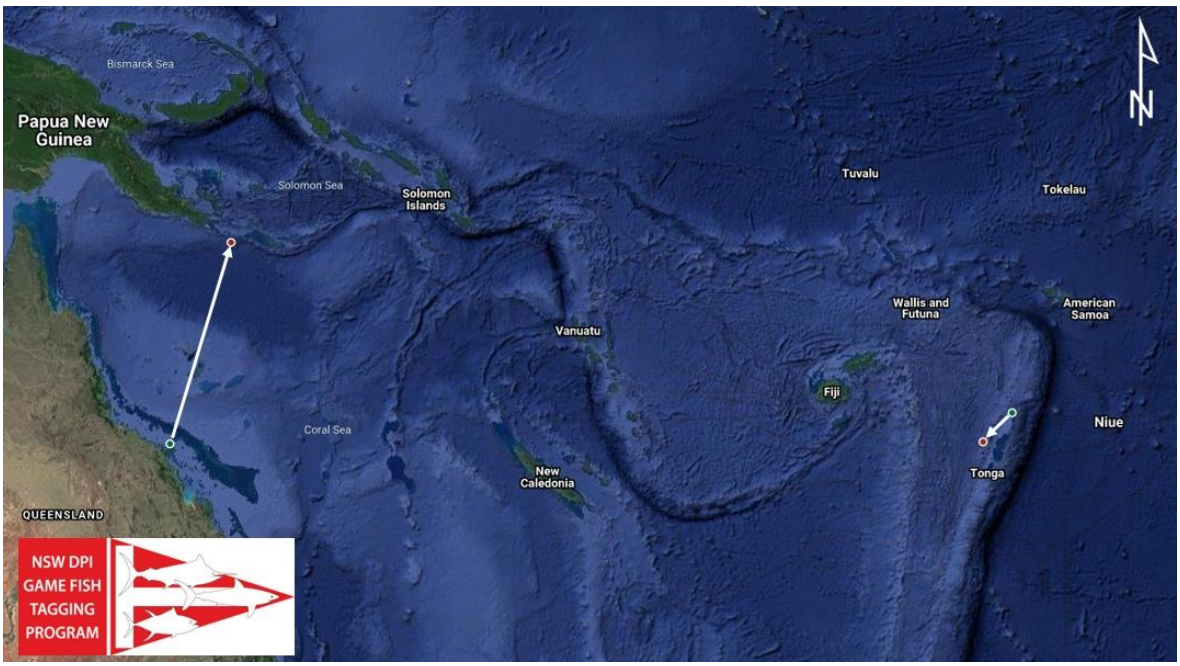
Images: Two sailfish recaptured off Weipa QLD. Both had also been previously tagged in the same area. Top image: Tagged by Mark Parkes and recaptured by Theona Down after 53 days. Bottom image: Tagged by Andrea Kennedy and recaptured by Kane Cullen just six days later.

Intriguingly, many of the sailfish recaptured at or near their release locations have been caught after peroiods of nearly exactly one, two, three, four or in one case off Broome WA, seven years. It is generally believed by anglers in these locations that sailfish are not present year round, so these results strongly suggest annual homing, or 'philopatry' — meaning the tendency to return to one's 'homeland'. The general lack of recaptures of sailfish away from tagging sites remains difficult to explain, but may simply be due to lack of fishing effort targeting sailfish in other areas and at other times of the year.

As well as the numbers of sailfish tagged under the NSW DPI Program, each year since 2015 many sailfish have also been tagged off Groote Eylandt, NT using tags supplied by the US-based Billfish Foundation. Over that time, around 900 sailfish have been tagged by members of the Groote Eylandt Game and Sport Fishing Club and 35 recaptures recorded, all caught by club members in local waters. These results further support the possibility of philopatry in sailfish.

Also, as reported in previous newsletters, many sailfish are caught and released off Broome, WA each year, but are no longer tagged due to a change in policy of the Broome Fishing Club. In the past, all of those fish, often numbering in the hundreds, were tagged as part of the NSW DPI Program, so the removal of these releases from the database needs to be taken into account when analysing long-term trends in numbers of sailfish caught and released through time.

FIGURE 23. THE LONG-DISTANCE MOVEMENT BY A SAILFISH RECAPTURED IN 2019/20



STRIPED MARLIN

There were 11 striped marlin recaptured in 2019/20 (seven more than the previous year) which included one fish that was recaptured on two separate occasions. Times at liberty between release and recapture ranged from 11 to 218 days and minimum distances moved from eight to 1,007 nautical miles. Eight of the recaptured fish had been tagged off NSW, the other three were released off southern QLD. And interestingly, four of the 11 recaptures were reported by commercial longline vessels.

The striped marlin that was recaptured twice was the first time this has happened for this species in the history of the Program. It was originally tagged on 20 February 2020 north of the 'Carpark' offshore from Port Stephens, NSW, and was estimated to be 60kg upon release. Twenty-two days later the fish was recaptured and re-tagged about eight nautical miles from its release position, estimated at 65 kg on this occasion. Then, 14 days later it was recaptured by an Australian longline vessel fishing wide of the continental shelf off Tathra, southern NSW. This time the fish was landed and weighed in at 72.4 kg. Interestingly, when the fish was recaptured the first time the tag was not able to be retrieved, but a note was made to this effect on the tag card in the comments section. When the fish was subsequently recaptured for the second time, two tag numbers were submitted, allowing the puzzle to be pieced together of the two recaptures, based on the dates and the notes on the second tag card. This illustrates the importance of how important it is to leaving remarks on your tag cards, especially if you notice a previous tag on the fish. Overall the fish had spent just 36 days at liberty and had travelled a straight-line distance of 250 nautical miles from Port Stephens to Tathra. Over the years, many marlin have been recaptured within a day or two of release, sometimes even on the same day, and this double recapture further illustrates the resilience of billfish to catch and release of these species.

In last year's Tagging Report, we noted that a striped marlin tagged off the NSW central coast in April 2019 had been recaptured in June of that year in the eastern Coral Sea by a French flagged longline vessel. The fish had been at liberty for 70 days and travelled a minimum distance of 865 nautical miles in that time. This year, a similar event occurred with a striped marlin tagged off Merimbula,

southern NSW on New Year's Day 2019 being recaptured in August the same year by a New Caledonian longline vessel at the Bellona Plateau in the outer Coral Sea just 100 nautical miles from the abovementioned recapture (Figure 24). On review, over the last ten years the Program has had five recaptures reported from this area in the outer Coral Sea. In all cases the fish have been recaptured by international long line vessels. Research suggests that striped marlin migrate to the Coral Sea area during the winter/ spring months to participate in spawning activity and it is likely these fish had headed to the area for this reason.

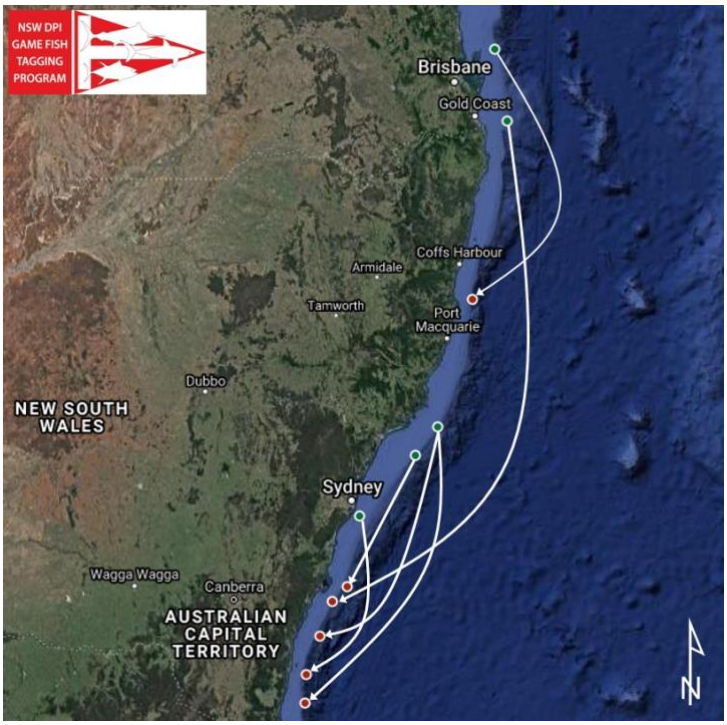
The second furthest distance moved by a tagged striped marlin this year – 474 nautical miles, was achieved by the smallest striped marlin ever tagged and recaptured on the Program. Estimated at just 20 kg when it was released off the Gold Coast, QLD in November 2019, it was recaptured off Jervis Bay, NSW 65 days later and estimated at about 25 kg before being re-released (Figure 25). Interestingly, when it was tagged, the hook had noticeably damaged its bill, the injury had completely healed when it was recaptured.

Juvenile striped marlin of this size or less are rarely encountered off eastern Australia. In fact, they seem to be 'cryptic' or hidden in that they are not commonly caught by longline vessels either in the general area of the southwestern Pacific. As is often the case though, there are exceptions to this 'rule', with striped marlin of perhaps 8 kg to 15 kg occasionally, but consistently being caught by local longliners off New Caledonia and by anglers off Fiji.

Image: A tagged striped marlin recaptured by junior angler Tiana Holden off Jervis Bay NSW in February 2020. The fish had been originally tagged by Chris Olding at Swansea Canyons NSW 34 days earlier. Tiana was happy to place a new tag in the shoulder of the fish and re-release it in great condition.

FIGURE 24. NORTHERLY MOVEMENTS BY RECAPTURED STRIPED MARLIN RECORDED IN 2019/20.

FIGURE 25. SOUTHERLY MOVEMENTS BY RECAPTURED STRIPED MARLIN RECORDED IN 2019/20.



Recaptures of this species this year once again add to findings from previous years which have shown striped marlin to be far less migratory than black or blue marlin, and that their times-at-liberty are nearly always short, rarely exceeding 12 months (see Appendix).

Over the long course of the Program, the continuing lack of long term recaptures of striped marlin has remained somewhat of a mystery. There have now been 273 recaptures of the species recorded on the Program but only 4.0% of these have been recaptured more than one year after release. This contrasts with two other billfishes, black marlin and sailfish, for which 11.2% and 10.6% of recaptures have occurred more than a year after release respectively. The most likely explanation for this discrepancy is that striped marlin have a natural tendency to reject tags at a higher rate than other species, although this had not been proven. We noted however in last year's report a recently published scientific paper that added weight to the tag-rejection hypothesis, so it is worth repeating a summary of that report again here.

The paper describes the results of a study in which striped marlin were surgically implanted with data-recording 'archival' tags. The researchers, had been frustrated with the perennial problem of pop-up satellite tags, jabbed into the shoulder of billfish, detaching from the fish far too prematurely – just 49 days on average for striped marlin even though tags had been typically set to pop-up after six months or more. They therefore decided to surgically implant essentially similar archival tags into the body cavity so that they could not possibly be released or rejected and would therefore potentially record data for years. The only 'catch' with this method was that the fish would need to be recaptured, killed and cleaned in order for the tag to be hopefully found and the data from the tag subsequently downloaded. This meant a lot of fish would need to be implanted if even one or two tags might be expected to be returned. The researchers therefore implanted these expensive tags into 99 striped marlin, all caught by rod-and-reel off Magdalena Bay, Mexico between 2008 and 2010.

The results were quite remarkable. Of the 99 fish tagged, 10 were recaptured and the internal tags found and returned. This translates into a known recapture rate of 10.1% – an order of magnitude higher than for conventional tagging with dart tags. Equally interesting was the fact that times between release and recapture of the implanted fish ranged from 1.1 years to 7.6 years, greatly exceeding the vast majority of times at liberty for conventionally tagged striped marlin. In addition, when the archival tags were implanted, a specially designed external conventional tag was also placed in the shoulder of each fish with a message offering a large reward to retrieve the implanted tag and return it. However, not one of the recaptured fish had retained its external tag, clearly indicating a high tag loss rate, at least from fish at liberty for more than a year.

Surgically implanting a piece of hardware into a live striped marlin is a very different proposition than simply jabbing a small barbed tag into the shoulder of a fish while it is still in the water. Each fish had to be laid on the deck with a deck-hose in its mouth while the tag was implanted and the incision sutured, possibly leading to at least some post-release mortality. As well, with the external tag missing, it is highly likely that other implanted fish were also recaptured but the tag not noticed at all. In fact, two of the implanted tags were not found until the fish were being processed at commercial facilities. In other words, the actual recapture rate of tagged fish is likely to have been even higher than the 10.1% figure, adding further weight to our knowledge that billfish actually have high post-release survival rates, and that striped marlin in particular must indeed reject standard plastic tags at a relatively high rate.

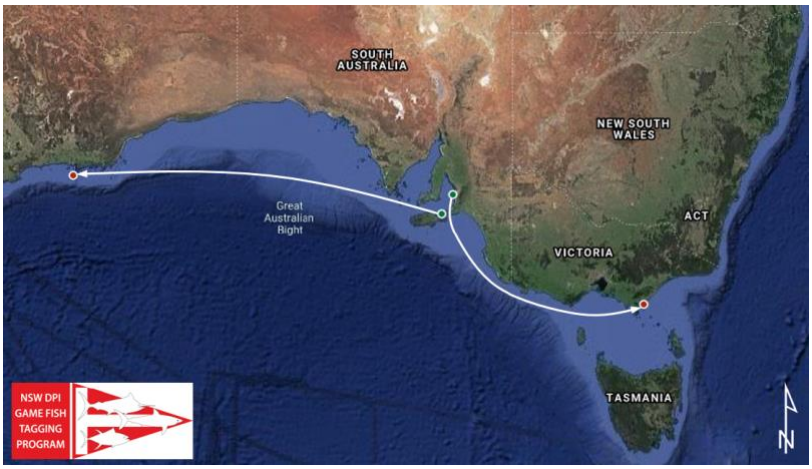
SHARKS

Recaptures of tagged sharks were somewhat down in 2019/20 compared with recent years. Just nine sharks were recaptured, consisting of four tiger sharks, two bronze whalers, two bull sharks and an unidentified whaler. Three of the tiger sharks had been tagged off Western Australia, two in the south of the State off Dunsborough and the third in the north (off Dampier). The fourth was released off Fraser Island QLD. The Dampier shark and one of the Dunsborough sharks were recaptured the same day they were released. The other Dunsborough shark moved 80 nm north during its 100 days at liberty while the shark released off Fraser Island was at liberty for six months and had moved just 26 nautical miles to the north.

The two recaptured bronze whaler sharks (*Carcharhinus brachyurus*) had both moved considerable distances, one from Kangaroo Island SA to Esperance WA, the other from Port Adelaide SA to Port Welshpool VIC (Figure 26). The latter shark had been at liberty for a little over 13 years (4,816 days), one of the longest times-at-liberty for the Program. At release, it measured 118 cm long and was estimated to weigh 5 kg. No weight was recorded when recaptured but its length was 275cm, supporting other research indicating that this species is particularly slow growing.

One of the bull shark (*Carcharhinus leucas*) recaptures was noteworthy in that it was a large shark, originally tagged by NSW DPI researchers studying the species in Sydney Harbour. It was tagged in January 2018 and measured 292 cm total length at release. Exactly two years later it was recaptured by a land-based angler off Drummoyne, just two nautical miles from its release point. It had grown just 13 cm in that time and weighed in at 160 kg.

FIGURE 26. MOVEMENTS BY RECAPTURED BRONZE WHALER SHARKS RECORDED IN 2019/20.



SOUTHERN BLUEFIN TUNA

An impressive total of 35 tagged SBT were recaptured in 2019/20, by far the highest number of recaptures of this species for the Program. Of those, 29 were caught in purse seine nets by the commercial ranching fishery operating off SA. Eighteen of those recaptured SBT had been tagged and released in SA waters, 6 off VIC and 5 off eastern TAS. The furthest distance moved by any of these was 822 nautical miles from Bruny Island TAS to the Great Australian Bight (Figure 27). When considering these particular recaptures, care should be taken in interpreting both rates of movement and growth rates since the fish are held alive in pens for months after capture, and fed liberally with pilchards to increase their weight and quality for the market.

This means that there may be considerable periods between recapture and recovering the tags which may not occur until the fish are harvested and processed and also that growth rates between tagging and harvesting may be higher than in nature.

Two other SBT were recaptured by commercial vessels in 2019/20, both at considerable distances from their release points (Figure 28). One of those, recaptured south of Bali, Indonesia, set a new record for the longest time at liberty for the species on the Program. It was originally released in June 2010 off Port MacDonnell SA, measuring 74cm in length and estimated at 8kg and when recaptured by an Indonesian longline vessel, it measured 155 cm long and weighed 76kg (gilled and gutted weight). The SBT had therefore been at liberty for a remarkable 3,372 days (9 years 3 months) easily surpassing the previous SBT record of 2,208 days (6 years 3 months) at liberty. During its time at liberty the fish had moved a minimum distance of 2,280 nautical miles from where it was tagged off South Australia.

SBT have been studied extensively since the 1960s, primarily by CSIRO and Japanese researchers. Larval sampling and inspection of gonads from landed fish in Indonesia strongly indicated that SBT spawn annually between September and February in a specific area to the south of Java and Bali. Since the origins of the Tagging Program in the mid 1970s, just six recaptures have been reported from this region – three of those in the last two years.

The other long distance recapture was of a SBT tagged off Rocky Island, SA in April 2016 and recaptured in July 2019 on Challenger Plateau off New Zealand by a local longline vessel. During its 1,192 days at liberty (3 years 3 months) the fish had grown from an estimated 7.8 kg to 45 kg.

Two other landmark recaptures of SBT were made during 2019/20. Prior to October 2019 the Program had not received any reported recaptures of SBT over 100kg (colloquially termed ‘barrels’). That all quickly changed when two fish weighing more than 100 kg were recaptured within two days of each other. And equally remarkably, these two recaptured ‘barrels’ had been originally tagged from the same boat some three and a half years earlier.

The first of these huge recaptured SBT was released off Cape Jaffa, SA on 8 November 2015 from the boat *Storm Tamer*. It was estimated at 75kg and 150cm long (fork length) and was swum boat-side before being released in good condition. The fish was recaptured by another recreational boat off Port MacDonnell, SA (105 nautical miles from its release point) on 20 September 2019 – 1,394 days (3 years 10 months) later. Upon recapture the fish tipped the scales at 105kg and measured 168cm.

The second ‘barrel’ had been released offshore of Robe, SA, on 4 October 2015, also from the boat *Storm Tamer.* This fish was a larger specimen that was estimated at 170cm fork length and 95kg at release. Fast forward to 23 September 2019 when the fish was recaptured off Port MacDonnell by a spear-fisher targeting SBT from the well-known charter vessel *Dream Catcher II*. Upon recapture the fish weighed in at an enormous 125kg. It had spent 1,450 days at liberty (just under 4 years) and was caught about 84 nautical miles from its original release location. In all likelihood, during their times at liberty, both of these fully adult fish had made extensive migrations to the spawning grounds off Indonesia, and had returned to waters off South Australia for feeding.

Recaptures such as these are great examples of the valuable scientific information that continues to accrue from this long term gamefish tagging Program.

FIGURE 27. 2019/20 RECAPTURES OF SOUTHERN BLUEFIN TUNA BY SOUTH AUSTRALIAN TUNA FARM COMMERCIAL VESSELS.

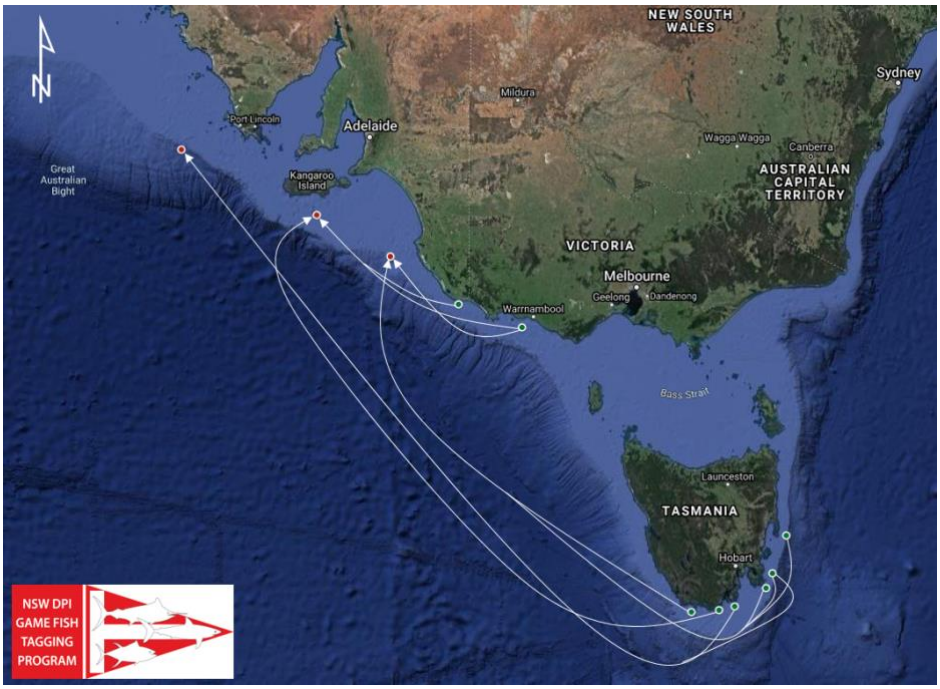
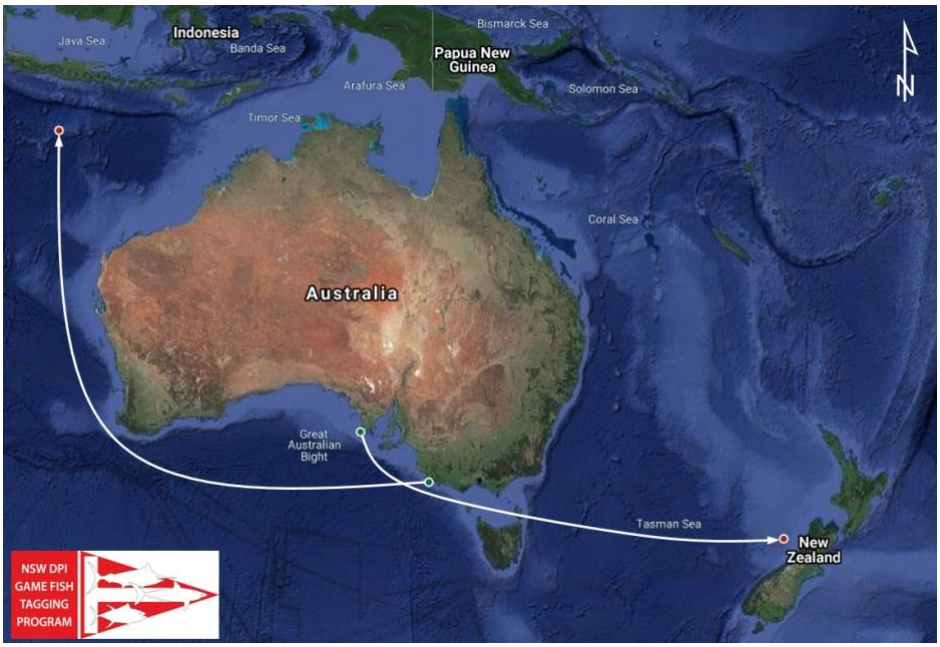


FIGURE 28. LONG DISTANCE MOVEMENTS BY RECAPTURED SOUTHERN BLUEFIN TUNA IN 2019/20



YELLOWTAIL KINGFISH

Recapture rates of tagged yellowtail kingfish have always ranked very highly compared with other species, currently showing an overall rate of 7.3% over the life of the tagging Program to date. In fact, this single species accounts for 33.4% of all recaptures even though it represents 8.25% of total numbers of fish tagged. As a result of this relatively high recapture rate, every year, many reports of tagged kingfish are received, always adding incrementally to our knowledge of the species, but often providing surprises as well.

In 2019/20, 272 recaptures of tagged kingfish were reported, exactly double the number for the previous year, which was the largest number for the previous 12 years. Times at liberty ranged from zero days (17 fish were recaptured the day of their release) to 2,229 days (6 years and 1 month). The latter fish had been tagged off Coffin Bay SA at an estimated weight of 18 kg, and recaptured just 170 nautical miles to the northeast, off Port Augusta SA where it weighed 23 kg. The second longest time at liberty was set by a kingfish tagged off Port Augusta SA and recaptured at exactly the same location after 1,837 days (5 years 10 days).

The longest distance recorded for a tagged kingfish in 2019/20 was by a fish tagged off Taylor Island SA and recaptured 420 days later off Seal Rocks NSW (see Figure 29). The calculated minimum displacement for this and all other fish recaptured on the Program is normally a straight line between the release and recapture points. In this case, that distance is 838 nautical miles, however, when land masses are taken into account, the minimum distance travelled by this fish around the coast, passing through Bass Strait, would have been approximately 1,130 nautical miles.

Seven other kingfish tagged in South Australia were also recaptured in NSW waters this year (Figure 26a)with times-at-liberty ranging from 328 to 1,097 days. When released, these tagged fish were estimated to weigh between 7 and 16 kg, and upon recapture, from 13.5 to 22 kg.

Image: One of the tagged kingfish that made the swim from South Australia to NSW. Speared by Luke Patrick at Jervis Bay in November 2019, the fish had been tagged 569 days earlier by Jac Crowe fishing at the Hummocks, near Coffin Bay.

Movements of tagged kingfish from South Australian to NSW waters have been regularly recorded for a number of years now, strongly suggesting that fish from both areas form a single stock. This is further supported by the fact that the fish making these long journeys are larger, presumably adult

fish in the 12 to 25 kg size range. It is possible therefore that these recaptures represent part of a spawning migration of kingfish into NSW waters.

Since the Program's origins in 1973, there had only ever been three reported recaptures of kingfish originally tagged in NSW and recaptured in Victoria. That all changed in 2019/20 when not one but four kingfish, originally tagged inside Sydney Harbour, were all recaptured within three days of each other in Victoria, on the same reef. Between July and September 2019 over 140 kingfish were tagged at Middle Harbour, and while there had been many locally reported recaptures from these tagged fish, the four exceptions to the rule swam all the way to Tamboon Reef, eastern VIC. The four fish which are summarised in Table 3 spent between 201 and 233 days at liberty and travelled over 295 nautical miles (~545km) around the southeast coast of Australia. It is highly likely the fish had travelled together in a school

TABLE 3. DETAILS ON FOUR KINGFISH, ALL TAGGED IN MIDDLE HARBOUR NSW, AND RECAPTURED AT THE SAME LOCATION IN VICTORIA

Date Tagged	Release Angler	Location	Length (cm)	Date Recapt	Recapture Angler	Recapture Location	Recapt Length (cm)	Days at Liberty	Distance Travelled (nm)
12/7/19	Seamus McCleave	Sydney Harbour	104	29/1/20	Kyle Dicecco	Tamboon Reef	105	201	295
6/7/19	Seamus McCleave	Sydney Harbour	87	26/1/20	Gawaine Blake	Tamboon Reef	87	204	295
4/7/19	Seamus McCleave	Sydney Harbour	96	26/1/20	Adem Temel	Tamboon Reef	97	206	295
7/9/19	Vic Levett	Sydney Harbour	92	26/1/20	Adriano Prazza	Tamboon Reef	95	233	295

In contrast to these longer distance movements, of the 271 recaptured kingfish, 47% were recaptured at their release locations, 24.4% had moved 1 to 10 nautical miles and 8.8% had moved 51 to 100 nautical miles. Of the remaining 19.6% of fish that had moved more than 100 nautical miles (53 fish), 14 had been tagged in NSW waters (Figure 30) and 39 in SA waters.

Another interesting statistic from this year's kingfish recaptures was the fact that 97% of all recaptured fish were reported by recreational anglers (including those fishing from charter vessels). The remaining recaptures were reported by commercial fishers.

FIGURE 29. MOVEMENTS OF YELLOWTAIL KINGFISH FROM SOUTH AUSTRALIA TO NEW SOUTH WALES RECORDED DURING 2019/20

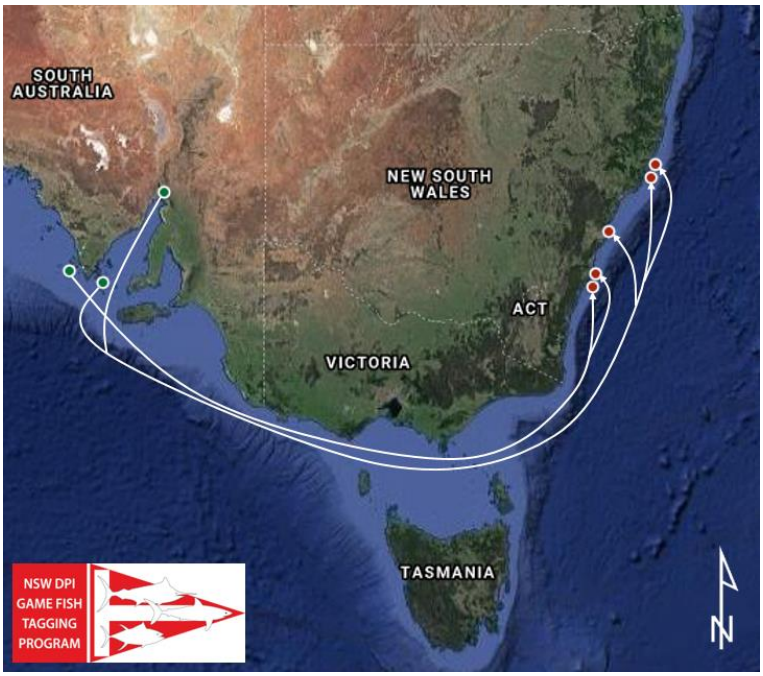
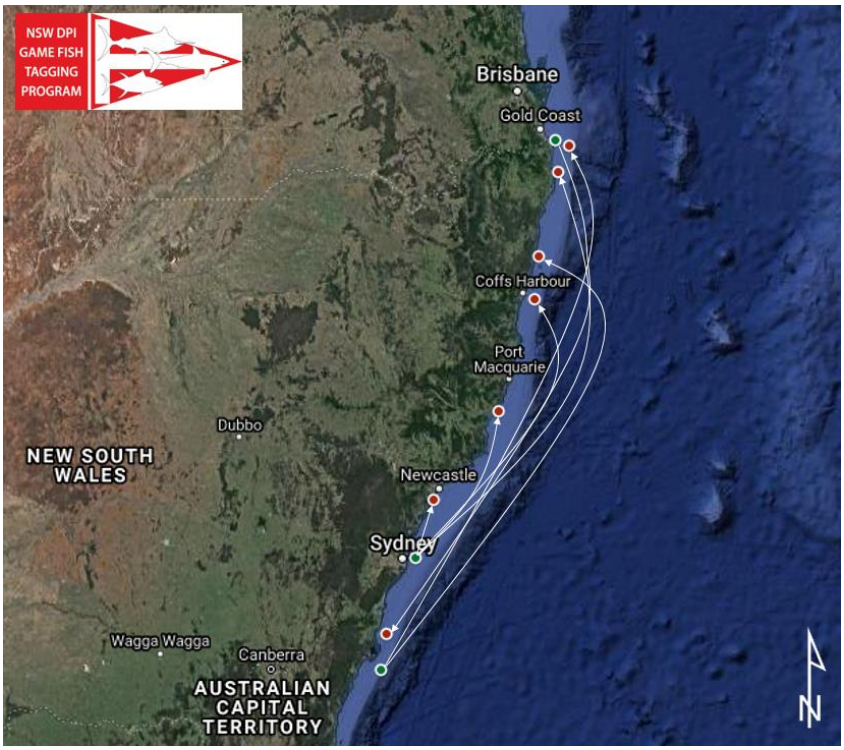


FIGURE 30. LONGER DISTANCES MOVED BY RECAPTURED YELLOWTAIL KINGFISH DURING 2019/20 THAT HAD BEEN TAGGED IN NEW SOUTH WALES WATERS.



Images: The two images above are of the same kingfish. Originally tagged in July 2019 by Seamus McCleave in Middle Harbour, Sydney (top), the fish was subsequently recaptured in January 2020 by Gawaine Blake on Tamboon Reef, northeastern Victoria (bottom) – a minimum swim of 204 nm south in its 261 days at liberty. At release, the fish measured 86 cm and was estimated at 7 kg, and at recapture, 87 cm and 7 kg. See text regarding three other kingfish that made the same journey.

SAMSON FISH

A total of 452 Samson fish were tagged in 2019/20 and 29 recaptures recorded during the year. Sixteen of those had been released in previous years. 27 of the recaptured fish had been tagged off South Australia, mainly around islands in the vicinity of Coffin Bay/Port Lincoln, while the other two

had been tagged in NSW waters (Coffs Harbour and Southwest Rocks). As was the case last year, most of the SA tagged fish were recaptured within 30 nautical miles of their release points, with just one fish moving more than 50 nautical miles – released at Rocky Island and recaptured at Cabbage Patch, SA, 52 nautical miles to the east. That particular fish had been at liberty for a remarkable 2,865 days (7 years 10 months), which at the time was a new record for this species on the Program, beating the previous record by 113 days. At release, the fish was measured at 96cm and estimated to weigh around 10kg. When recaptured, it measured 125cm and weighed 17kg. Interestingly, the angler reported that the tag looked relatively fresh, and after some quick photos the fish was re-released for another lucky angler to potentially encounter. As noted, this was a record time at liberty for Samson fish at the time of recapture, but that record was well and truly broken again just two months later. This fish had also been tagged at Rocky Island, way back in March 2012 and was recaptured at the same locality in January 2020 after 3,688 days (10 years 35 days). At release, it was measured 100 cm long and estimated at about 10 kg and at recapture, was 130 cm long and weighed 16 kg. Again, the fish was re-released.

A number of other recaptures of SA tagged Samson fish also occurred after lengthy periods – 1,814, 1,510, 1,502, 1,084 and 1,072 days – all of which showed very little apparent displacement in the interim (0 to 6 nautical miles).

Regarding the two NSW recaptures of Samson fish, one was recaptured after 245 days, having moved 11 nautical miles from Southwest Rocks to Nambucca Heads, while the other was tagged off Coffs Harbour and recaptured in the same vicinity 15 days later.

Image: The new time-at-liberty record holder for samsonfish. Tagged by Aaron Komaroni in March 2012 off Rocky Islands, SA, this fish was recaptured by Ashley Smith (pictured) 7 years and 10 months later at the Cabbage Patch, just 52 nm from its release point. It had been estimated at 10 kg on release, and 17 kg at recapture and increased in length by about 30 cm. Note how clean the tag is after such a long time at liberty.

RECAPTURES WITH MISSING TAG CARDS

Each year, we receive notification of recaptures of some fish for which no tag card has been received. In many cases, the missing card is eventually sent, or is located by contacting club recorders or boat owners who have returned tag cards from the same batch of tags as the missing ones. In some cases though, these efforts fail to locate the missing cards, which disappointedly means potentially valuable information is lost. This year, we received information on 23 recaptures for which no matching tag card had been received at the time of writing this report. These are shown in Table 3 below in the hope that the cards might be located, and to encourage the return of any completed tag cards, regardless of when the fish were released.

We ask you to take a careful look at the Table, and if you have tagged any of the species listed at any time, please check to make sure there are no completed tag cards sitting in a drawer on a boat or at home. Note that the recapture location may be very different from where a fish was originally tagged.

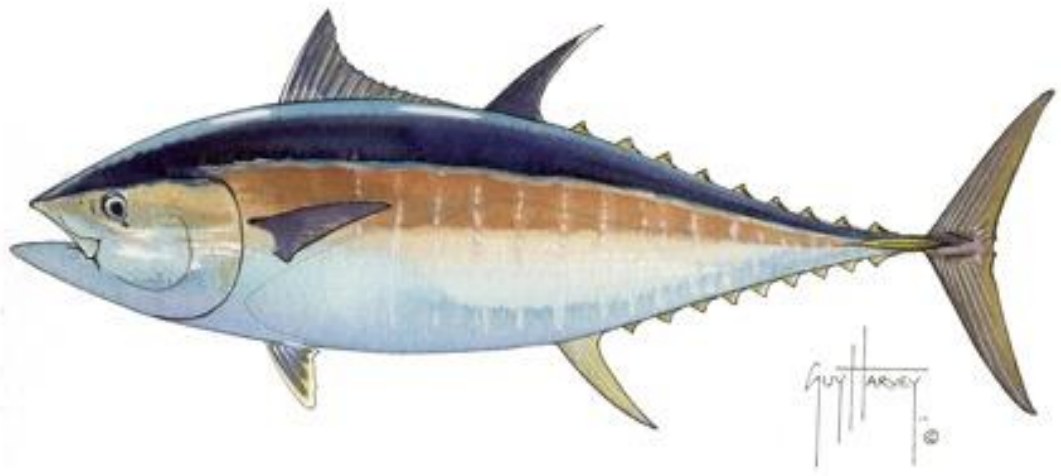
TABLE 4 DETAILS OF FISH RECAPTURED IN 2019/20 FOR WHICH NO TAG CARD HAS SO FAR BEEN RECEIVED.

Tag No	Species	Where recaptured	Date recaptured	Recapt Lngth (cm)	Recapt Wt (kg)
B163952	BLACK MARLIN	GOLD COAST (SPOT X) QLD	27/2/20	180	50
B135228	BLACK MARLIN	GOLD COAST (SPOT X) QLD	26/4/20		30
B144032	BLUE MARLIN	147NM NE KAVIENG, PNG	1/11/19	150	
B095811	BLUE MARLIN	WADDY PT CANYONS (25NM S) QLD	27/11/19		110
A644225	DOLPHINFISH	SYDNEY EAST FAD NSW	6/2/20	95	5
S243628	MAKO SHARK	ULLADULLA (100 FATH E) NSW	26/1/20	170	55
A514198	SAMSON FISH	ROCKY ISLAND (SW) SA	26/1/20	96	12
A644121	SAMSON FISH	CABBAGE PATCH (STH) SA	15/1/20	96	
A630245	SAMSON FISH	ROCKY ISLAND SA	23/2/20	104	8
A642419	SAMSON FISH	CABBAGE PATCH SA	9/2/20	96	8
A626619	SAMSON FISH	MARION BAY SA	31/7/19	119	14
A691129	STHN BLUEFIN TUNA	KANGAROOS IS. (30NM S) SA	24/1/20		
B152041	STRIPED MARLIN	PORT STEPHENS (CAR PARK) NSW	13/3/20		75
A616233	YELLOWTAIL KINGFISH	PORT AUGUSTA SA	18/10/19	119	14
A627753	YELLOWTAIL KINGFISH	WILLIAMS ISLAND (SA)	13/12/19	123	11
A639344	YELLOWTAIL KINGFISH	12 MILE REEF NSW	19/12/19	74	
A639334	YELLOWTAIL KINGFISH	12 MILE REEF NSW	19/12/19	82	
A609357	YELLOWTAIL KINGFISH	PORT AUGUSTA SA	10/10/19	136	
A612373	YELLOWTAIL KINGFISH	PORT AUGUSTA SA	4/11/19	144	24
A616851	YELLOWTAIL KINGFISH	PORT WAKEFIELD SA	29/9/19		28
A623588	YELLOWTAIL KINGFISH	MANNING RIVER NSW	19/10/19	124	9.5
A639343	YELLOWTAIL KINGFISH	MIDDLE HARBOUR, SYD NSW	22/9/19	99	10
A639341	YELLOWTAIL KINGFISH	MIDDLE HARBOUR, SYD NSW	7/8/19	80	6.5

SCIENTIFIC VALUE OF THE GAME FISH TAGGING PROGRAM

It may not be widely realized that data accumulated on the Tagging Program is often sought for a wide variety of studies of aspects of the biology and fisheries of pelagic fishes. **Appendix III** shows the impressive list of reports, university theses and peer-reviewed scientific papers that have utilised data from the Program in some way. It is not just information derived from recaptures of tagged fish that make the Program so valuable. Understanding changes through time in availability of fish or fishing activities of the recreational sector would not be possible in the absence of the Program. Thus, the tagging database is widely recognised as a vital source of information on long term trends in the relative abundance of pelagic fish, and is used wherever possible for studies on changes in catches in relation to historic environmental variables such as temperature, chlorophyll, sea height and El Niño/La Niña cycles. Such studies' reports and publications are also included in Appendix III.

FOCUS ON SOUTHERN BLUEFIN TUNA (*THUNNUS MCCOYII*)



Each year, the tagging report takes a look at the biology of a key species tagged on the Program. The following summary of the biology of the southern bluefin tuna has been adapted and updated from the book, 'Fishes of the Open Ocean' by Julian Pepperell (UNSW Press, U. Chicago Press). Illustration courtesy Guy Harvey.

The southern bluefin could be considered a 'classic' tuna in that it is closely related to, and resembles the tuna of the ancients, the bluefin tuna of the Mediterranean and Atlantic oceans, *Thunnus thynnus*. So similar is the southern bluefin to its Atlantic counterpart, that for many years, the two were considered to be subspecies. It is now clear however that there are three distinct bluefin tuna species, the Atlantic bluefin, the northern Pacific bluefin and the southern bluefin.

IDENTIFICATION

The bluefin tunas are distinguished from most other tunas within their geographic range by their relatively short pectoral fins – usually measuring less than 80% of the head length, and their general lack of body patterning or colouration. The southern bluefin is also a more robust tuna compared with the somewhat similar longtail tuna, *Thunnus tonggol*. Occasionally, northern Pacific bluefin tuna (*Thunnus orientalis*) overlap in their distribution with southern bluefin, especially off western New Zealand and sometimes off southeastern Australia. To distinguish between Pacific bluefin and

southern bluefin, firstly, look at the caudal keels (the horizontal projections on either side of caudal peduncle, or tail 'wrist'). If they are yellow then the fish is a southern bluefin. Sometimes, though, southern bluefin may have dark keels and even experts can make mistakes in telling the two species apart. There are also some rather obscure internal characters used by taxonomists to split these two bluefins. However, to be absolutely certain, a small muscle sample may need to be taken for DNA analysis.

GEOGRAPHIC RANGE

Southern bluefin tuna have an unusual distribution compared with most other tunas. The species is entirely confined to the southern hemisphere mainly within a relatively narrow band between the latitudes 30° to 50° South, across the three major oceans.

The exception to this overall distribution pattern is the northerly extension of the species in the eastern Indian ocean, along the northwest shelf of Australia, as far north as Java and Bali in Indonesia. This extension is seasonal and due to the unusual fact that southern bluefin have one, and only one specific spawning site which is confined to this area (see below).

MOVEMENTS

Very young fish are first encountered moving south along the WA coast. From there, they slowly move into southern Australian waters where one to five year old fish (up to about 40 kg) are found while adult fish over about 90 kg occur off southeastern Australia and New Zealand. Intensive tagging experiments by CSIRO on southern bluefin tuna have been conducted over many years. Results have shown what appears to be a clearcut pattern of movement or migration. Long distance movements of tagged fish away from the Australian south coast have been recorded numerous times, with most fish moving in a westerly direction across the Indian ocean towards South Africa. In contrast, movements of tagged fish eastwards to New Zealand and beyond have been far less frequent.

The use of archival, or ‘smart’ tags, has added to information on movements. For example, two fish tagged and released off South Australia were recaptured about 10 months later quite near their release points. However, the stored data in the tags showed that both fish had travelled half way to South Africa, and back, during this time.

All of the releases of tagged southern bluefin have taken place around the southern half of Australia, and while there have been many thousands of recaptures, some showing trans-oceanic movements, only a small number have been recaptured on the spawning grounds off Indonesia (or at least reported from there). It also seems odd that, notwithstanding that adult fish are certainly found on the spawning grounds, the size of fish tends to increase with distance away from those grounds. Thus, very large southern bluefin are found off southeast Australia, New Zealand and South Africa, leading to the question as to whether any or all of these mature fish undertake an annual long distance trek to the spawning grounds. Perhaps so, but if that were the case, complete absences of large bluefin would occur during the spawning season (September to April) everywhere except the spawning grounds. This is not the case, so perhaps only a proportion of adults migrate to spawn each year. Popup satellite tags have more recently been attached to larger, adult fish Tagging of seven adult tuna off southeastern Australia showed that fish wandered freely around southeastern and southern Australia, with finally, one of them making the presumed, but previously unproven journey to the spawning grounds off Java. The question of what proportion of adults might spawn each year still, however, remains.

GROWTH AND SIZE

The southern bluefin tuna is among the slowest growing of all tunas, which is a major contributing factor to its having been overfished in the past. The most recent studies on growth rates of the species indicate that, by the time they are one year old, southern bluefin will have reached only about 3.5 kg (55 cm) in size – much smaller than previously thought. (In contrast, a one year old yellowfin tuna would weigh 10 to 15 kg). This relatively slow growth continues, with fish apparently not maturing until they are about 12 years old (about 90 kg in weight and 165 cm long). (Again, the yellowfin tuna comparison is interesting: age and size at maturity are about three years old, and 40 kg respectively).

REPRODUCTION

In contrast, to most other tunas that spawn over extensive areas, the southern bluefin has a remarkably discrete spawning ground, confined to a small area off southern Indonesia. That spawning occurs there was proven decades ago by larval sampling surveys which found concentrations of southern bluefin larvae in this area, and only in this area, from September to March, with peak larval catches in January/February. Adult fish with ripe ovaries and testes are also found on these grounds during the same period. Recent studies have shown that the average age of mature fish on the spawning grounds is very old, with most fish exceeding 20 years.

BEHAVIOUR

By measuring the temperature inside stomachs of southern bluefin tuna, researchers have found that juvenile fish feed an average of once per day, ingesting up to several kilograms of food each time. Of particular interest was the finding that this feeding event occurred mostly at dawn. Night feeding was relatively uncommon but when it did occur, as might be suspected, it was during the full moon quarter. When migrating over deep oceanic areas, southern bluefin were found to feed much deeper than when near shore, often down to 300 metres below the surface. They also were capable of fasting for 5 days or more, especially when they were near the northern edge of their migratory range.

FISHERIES

The catch history of southern bluefin is not a happy one. Historically, world catches of southern bluefin tuna peaked at about 80,000 tonnes in 1960/61, the bulk being taken by Japanese longliners. During the 1960s, 70s and 80s, the total catch declined steeply and steadily, dipping below 20,000 tonnes by the late 1980s. During the late 1980s and mid 1990s, quotas (total catch limits) were steadily imposed on all components of the fishery. Unfortunately, it has since come to light that not all countries agreeing to the quotas maintained their catches at or below those levels did so, resulting in higher catches than were considered sustainable. While long term recovery of the stock is not yet assured, there are good signs that this is occurring, as indicated by the upsurge in recreational fishing for the species off southern Australia.

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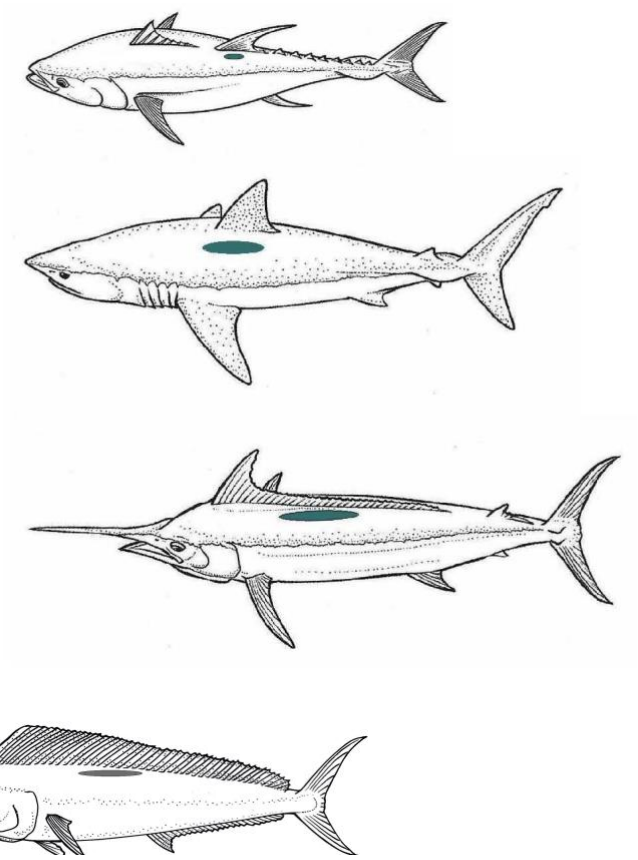
TAGGING TIPS

RECOMMENDED TAGGING AREAS



HOW TO TAG LARGE GAME FISH

- Once the angler brings the fish within range, the fish should be traced and led alongside the boat so that it presents a broad tagging target. It is usually best to keep the boat moving slowly forwards to enable better control of the fish.
- Once the fish is in position for tagging, the person handling the tag pole should take position behind the person tracing the fish to allow for a clear tag shot.
- An attempt to apply the tag should only be made if the fish is calm or subdued. The tag should be placed towards the middle of the fish, well above the lateral line towards the dorsal fin.
- For billfish and most sportfish, the fish should be tagged with a firm, well-aimed stroke—simply place the tag against the fish's flank and push. Do not stab. Sharks will require a firm jab in order to penetrate their tough skin.
- Once the tag has been placed, remove the hook if possible (a de-hooker can facilitate this) or cut the trace close to the fish's mouth.
- Revive any fish that appear to be exhausted or are struggling to remain upright in the water. A commonly used approach for billfish is to hold the fish firmly by its submerged bill whilst the boat moves forwards at 2 to 3 knots. This ensures a good flow of water over the fish's gills.

- The fish should only be released when it shows strong signs of life and displays improved skin colour, which may take several minutes or more. Exercise caution, especially in rough weather. Alternatively, use a snooter. This is a safe and effective tool for reviving billfish.
- Fill out the tag card immediately and return to NSW DPI (or your fishing club recorder) as soon as possible, otherwise tagging is of no value.

HOW TO TAG SMALL GAME/SPORT FISH

Smaller pelagic species may be removed from the water before tagging. This enables improved accuracy of tagging and may simplify hook removal. Often holding the fish on its back will lessen its 'flapping'. Try to prevent the fish damaging itself on hard, hot, or dry surfaces. A wet foam mat or similar is ideal (or a wet towel will suffice) for on-boat tagging.

Pelagic tags should be inserted using a hand tagger or short pole since they are designed to lock behind the bony structures of the dorsal fin or second dorsal fin in order to stay in position. Carefully insert the tag into the fish's back, close to the base of the fin and angled in so that it passes through the bony structures at the base of the fin. Try to insert the tag at an angle of at least 45° to reduce water friction and then twist the tag pole before removing it. In effect, you should be trying to hook the barb of the tag around one of these spines, which then locks the tag in place.

TAGGING AND IMPROVED SURVIVAL TIPS

Elect one crew member as the person in charge of the tagging equipment, to ensure that:

- The number of the tag in position on the tag pole matches that on the tag card
- Details of the tagging are promptly recorded on the card
- The card is handed to the fishing club recorder or mailed to NSW DPI as soon as possible.
- Use non-offset circle hooks whenever possible when using live or dead baits. These hooks minimise deep hooking, foul hooking and bleeding and promote the survival of tagged fish.
- Keep your tag cards in an orderly bundle. This will help to ensure that tags do not become loose and fall out of their corresponding tag card.
- Load your tagging pole with a tag before you hook a fish to ensure that it is attached properly and is readily available whenever you wish to tag a fish.
- Check the length of your billfish tag applicator 75mm is the optimal length for most billfish —this ensures that the tag is placed at the correct depth and reduces the risk of the tag being shed by the fish.
- Do not attempt to tag very active fish, especially if the fish is jumping at the side of the boat. Poor tag placement can injure fish or result in the tag being shed. The recommended tagging areas are shown below. It is better to release the fish without tagging, if accurate tag placement is not possible.

ESTIMATING THE SIZE OF TAGGED FISH

This may be done by estimating the weight of the fish or by measuring the fish when it is in, or alongside the boat. If the fish is less than a metre in length it may be carefully brought on board and measured using a standard measuring tape. However, larger fish should remain in the water.

If you estimate the size of the fish (especially fish weight), get a consensus from all the crew immediately after release, and record immediately (first impressions are always best!).

For measuring length of fish in the water, it is best to rig up a simple tape measure. It helps if it is flexible, and at least 4 metres long. Attach a tennis ball to the zero end and when a fish is alongside, or being held at the back of the boat, float the tennis ball to the tail fork and get a measurement to the fish's snout, or to the tip of the lower jaw for billfish. For billfish, it is important that the recorded measurement should state where the fish was measured from and to (i.e. lower jaw to tail fork length or total length - tip of bill to end of tail).

REPORTING A PREVIOUSLY TAGGED FISH

If an earlier tag is noticed on a fish, should the tag be retrieved and the fish re-tagged, or leave the tag in place? If the tag is well secured and the tag number can be read whilst attached to the fish the fish can be returned after first carefully recording the tag number (taking a clear photo is a good way to record the number) and measuring/and or estimating the weight of the fish. Alternatively if it is hard to read the tag or the fish is not enabling you to easily see the tag number, cut off the tag and replace with another if you have tagging equipment on board.

If the fish is small enough to measure, then this should be done, ideally from the tip of the snout to the tip of the tail (or if a billfish, from the tip of the lower jaw to the tail fork).

One other point regarding reporting recaptures of tagged fish should be kept in mind. In these days of nearly 100% release of billfish, previously tagged fish are quite often caught and re-released without being able to retrieve the earlier tag. If you do hook and release a fish which has a previous tag in place, you should definitely record the details of the event (even though the tag number is unknown) and report the incident to NSW DPI as a genuine recapture. In this way, better statistics on actual recapture rates of billfish will be able to be maintained.

CONTACT THE PROGRAM

If you would like to contact the game fish tagging Program either to obtain further information on the Program, tags, or to report a recapture directly, call +61 (02) 6691 9602 or email gamefish.tagging@dpi.nsw.gov.au or head to the DPI website and find the online reporting form.

ACKNOWLEDGEMENTS

The Game Fish Tagging Program, operated by NSW DPI, is generously supported by the NSW Recreational Fishing Trust through funds raised from the Recreational Fishing Licence in that State. We also acknowledge the thousands of anglers, club officials, captains and crew who participate in the Program. Without this continued effort, our knowledge of the biology of pelagic fish would be much the poorer. This report was prepared with the assistance of Clay Hilbert, Phil Bolton and Emma Simpson of NSW DPI.

Image: Andy Clark releasing one of the 1,152 striped marlin tagged during 2019/20.

APPENDIX I: ALL RECAPTURES OF TAGGED FISH REPORTED IN 2019/20

Species	Date tagged	Release location	Days at liberty	Dist moved (nmi)	Direction
AUSTRALIAN SALMON	13-May-17	PRICE (YORK PENINSULA)	824	102	WSW
AUSTRALIAN SALMON	27-Apr-20	STRAGGLERS	0	0	–
BLACK MARLIN	09-Jul-17	CAIRNS	857	1,200	NW
BLACK MARLIN	04-Feb-18	REDHEAD (EAST)	744	318	NE
BLACK MARLIN	22-Jan-19	GOLD COAST (15 FATH NE)	331	16	NE
BLACK MARLIN	10-Mar-19	BALLINA (WIDE)	349	254	SW
BLACK MARLIN	14-Mar-19	GOLD COAST (SPOT X)	335	0	NW
BLACK MARLIN	15-Mar-19	GOLD COAST EAST	246	815	NNW
BLACK MARLIN	08-May-19	FRASER ISLAND (SANDY CAPE SHOAL)	151	22	SSW
BLACK MARLIN	29-Aug-19	FITZ GROUNDS	177	1,023	SSE
BLACK MARLIN	22-Dec-19	THE HARDS (QLD)	56	86	SE
BLACK MARLIN	04-Jan-20	MOOLOOLABA (16 MILE)	57	143	SE
BLACK MARLIN	04-Jan-20	BARWON BANKS	86	81	SE
BLACK MARLIN	04-Jan-20	BARWON BANKS	78	0	NW
BLACK MARLIN	25-Jan-20	GIBBER REEF (2NM S)	29	51	SW
BLACK MARLIN	26-Jan-20	SEAL ROCKS (4NM E)	31	30	S
BLACK MARLIN	01-Feb-20	GOLD COAST (SPOT X)	49	74	NW
BLACK MARLIN	16-Feb-20	GOLD COAST (SPOT X)	2	0	NW
BLACK MARLIN	22-Feb-20	PORT STEPHENS (CAR PARK)	27	28	NW
BLUE MARLIN	08-Apr-19	SYDNEY (WIDE)	222	597	NE
BLUE MARLIN	04-Nov-19	FRASER ISLAND (20NM E)	3	0	NW
BLUE MARLIN	14-Dec-19	EXMOUTH (TANTABIDDI 20NM NW)	61	197	NNW
BRONZE WHALER	26-Nov-06	SEMAPHORE (5 NM W)	4,816	464	ESE
BRONZE WHALER	18-Nov-17	KANGAROO ISLAND (AMERICAN R) SA	838	793	W
BULL SHARK	22-Jan-18	SYDNEY HARBOUR	729	2	W
BULL SHARK	21-Jan-20	REDCLIFFE	2	0	NW
DOLPHINFISH	10-Jul-19	BYRON BAY FAD	11	17	SE
DOLPHINFISH	10-Jul-19	BYRON BAY FAD	0	0	–
DOLPHINFISH	09-Jan-20	BOTANY BAY WIDE FAD	21	0	NW
DOLPHINFISH	13-Mar-20	PORT HACKING FAD	35	56	SSW
SAILFISH	11-Aug-17	WEIPA	733	4	W
SAILFISH	15-Nov-17	WEIPA	604	13	SE
SAILFISH	19-Aug-18	WEIPA	364	5	W
SAILFISH	07-Sep-18	DAMPIER (ROSEMARY IS 5NM N)	661	8	NE
SAILFISH	23-Sep-18	DAMPIER (ANCHORAGE NE)	343	7	SW
SAILFISH	02-Oct-18	KUALA ROMPIN	373	17	NNW
SAILFISH	20-Oct-18	HAYMAN ISLAND	451	538	NNE
SAILFISH	23-Feb-19	DAMPIER (ANCHORAGE NE)	181	6	ESE
SAILFISH	06-Apr-19	DAMPIER ARCHIPELAGO	141	11	W
SAILFISH	08-Apr-19	MOOLOOLABA (18 MILE)	140	0	NW

APPENDIX I: RECAPTURES OF TAGGED FISH REPORTED IN 2019/20 (CONTD)

Species	Date tagged	Release location	Days at liberty	Dist moved (nmi)	Direction
SAILFISH	16-Jun-19	WEIPA (35NM SW)	53	10	SW
SAILFISH	24-Jun-19	DAMPIER ARCHIPELAGO (10NM N)	25	8	W
SAILFISH	04-Jul-19	DAMPIER (ROSEMARY IS 5NM N)	0	0	–
SAILFISH	09-Jul-19	VAVA'U 5 NM W (TONGA)	26	99	SW
SAILFISH	20-Jul-19	WEIPA (FALSE PERA HEAD 15NM W)	54	1	N
SAILFISH	10-Aug-19	WEIPA (THUD POINT 16NM W)	6	5	W
SAILFISH	26-Aug-19	DAMPIER (ROLEY ROCK 5 NM NW)	296	3	S
SAMSON FISH	19-Feb-10	ROCKY ISLAND (SW)	3,688	1	NNE
SAMSON FISH	12-Mar-12	ROCKY ISLAND (SA)	2,865	52	ESE
SAMSON FISH	25-Aug-14	WILLIAMS ISLAND (SA)	1,814	6	NE
SAMSON FISH	24-Jan-16	ROCKY ISLAND (SA)	1,502	0	NW
SAMSON FISH	25-Feb-16	GREENLY ISLAND (SA)	1,510	1	SSW
SAMSON FISH	01-Apr-17	ROCKY ISLAND (SA)	1,084	2	NNE
SAMSON FISH	10-Jun-17	MARION BAY (SA)	1,072	0	NW
SAMSON FISH	16-Dec-17	ROCKY ISLAND (SA)	799	0	NW
SAMSON FISH	26-Jan-18	COFFIN BAY	751	29	SW
SAMSON FISH	26-Jan-18	COFFIN BAY	737	7	SSW
SAMSON FISH	27-Feb-18	ROCKY ISLAND (SA)	727	2	W
SAMSON FISH	26-Mar-18	HOPKINS ISLAND (SA)	699	30	SW
SAMSON FISH	10-Jun-18	MARION BAY (SA)	417	0	NW
SAMSON FISH	10-Jun-18	MARION BAY (SA)	417	0	NW
SAMSON FISH	24-Jun-18	KANGAROO ISLAND (SA)	398	0	NW
SAMSON FISH	16-Feb-19	HUMMOCKS (SA)	378	16	SW
SAMSON FISH	10-Apr-19	THE PASSAGE (SA)	125	0	NW
SAMSON FISH	22-Apr-19	GREENLY ISLAND (SA)	340	0	NW
SAMSON FISH	22-Apr-19	HUMMOCKS (SA)	287	0	NW
SAMSON FISH	17-May-19	SOUTH WEST ROCKS (15 FA)	248	11	NNW
SAMSON FISH	01-Dec-19	COFFS HARBOUR (STH SOL)	57	15	SW
SAMSON FISH	09-Jan-20	ROCKY ISLAND (SA)	55	9	NE
SAMSON FISH	09-Jan-20	ROCKY ISLAND (SA)	56	15	NE
SAMSON FISH	13-Jan-20	CABBAGE PATCH (SA)	27	0	NW
SAMSON FISH	13-Jan-20	CABBAGE PATCH (SA)	0	0	–
SAMSON FISH	09-Feb-20	ROCKY ISLAND (SA)	24	9	NE
SAMSON FISH	10-Feb-20	GREENLY ISLAND (SA)	23	0	NW
SAMSON FISH	01-Mar-20	FOUR HUMMOCKS ISLAND (SA)	4	0	NW
SAMSON FISH	06-Mar-20	PONDALOWIE (SA)	5	19	NW
SILVER TREVALLY	01-Jan-20	KINGSCOTE (K'GROO IS) SA	71	0	NW
SOUTHERN BLUEFIN TUNA	26-Jun-10	PORT MACDONNELL (SA)	3,372	2,280	WNW
SOUTHERN BLUEFIN TUNA	04-Oct-15	ROBE (SA)	1,450	84	SE
SOUTHERN BLUEFIN TUNA	08-Nov-15	CAPE JAFFA	1,394	101	SSE

APPENDIX I: RECAPTURES OF TAGGED FISH REPORTED IN 2019/20 (CONTD)

Species	Date tagged	Release location	Days at liberty	Dist moved (nmi)	Direction
SOUTHERN BLUEFIN TUNA	08-Apr-16	ROCKY ISLAND (SA)	1,192	1,691	ESE
SOUTHERN BLUEFIN TUNA	23-Mar-17	LIGUANEA ISLAND (SA)	1,096	181	SSE
SOUTHERN BLUEFIN TUNA	17-Jan-18	NEWLAND HEAD (SA)	738	109	S
SOUTHERN BLUEFIN TUNA	05-Apr-18	PORT MACDONNELL	686	111	WNW
SOUTHERN BLUEFIN TUNA	21-Apr-18	CABBAGE PATCH (SA)	639	43	W
SOUTHERN BLUEFIN TUNA	28-Apr-18	EAGLEHAWK NECK (TAS)	692	586	WNW
SOUTHERN BLUEFIN TUNA	06-May-18	PORT MACDONNELL	684	191	WNW
SOUTHERN BLUEFIN TUNA	06-May-18	PORT MACDONNELL	629	101	WNW
SOUTHERN BLUEFIN TUNA	08-May-18	PORT MACDONNELL	688	114	WNW
SOUTHERN BLUEFIN TUNA	14-May-18	CABBAGE PATCH (SA)	620	121	SSE
SOUTHERN BLUEFIN TUNA	02-Jun-18	PORT FAIRY	657	258	WNW
SOUTHERN BLUEFIN TUNA	11-Jun-18	PORTLAND (STH) VIC	648	245	WNW
SOUTHERN BLUEFIN TUNA	24-Jun-18	PORTLAND (10NM S)	407	225	WNW
SOUTHERN BLUEFIN TUNA	13-Jul-18	PORT FAIRY	595	176	NW
SOUTHERN BLUEFIN TUNA	17-Jan-19	VICTOR HARBOUR	431	126	WSW
SOUTHERN BLUEFIN TUNA	10-Feb-19	VICTOR HARBOUR	375	113	S
SOUTHERN BLUEFIN TUNA	16-Mar-19	CABBAGE PATCH (SA)	354	100	SSE
SOUTHERN BLUEFIN TUNA	16-Mar-19	CABBAGE PATCH (SA)	356	93	SSE
SOUTHERN BLUEFIN TUNA	18-Mar-19	CABBAGE PATCH (SA)	368	105	SE
SOUTHERN BLUEFIN TUNA	21-Apr-19	PORT FAIRY (10NM SW)	310	180	WNW
SOUTHERN BLUEFIN TUNA	22-Apr-19	GREENLY ISLAND (SA)	285	266	ESE
SOUTHERN BLUEFIN TUNA	06-May-19	PORT MACDONNELL (SBT GROUNDS)	290	101	WNW
SOUTHERN BLUEFIN TUNA	26-May-19	WHALE HEAD (TAS STH)	299	618	NW
SOUTHERN BLUEFIN TUNA	08-Jun-19	EAGLEHAWK NECK (NUGGETS)	231	525	WNW
SOUTHERN BLUEFIN TUNA	09-Jun-19	BRUNY ISLAND SOUTH (TAS)	211	822	WNW
SOUTHERN BLUEFIN TUNA	09-Jun-19	MAATSUYKER ISLAND (TAS)	264	493	NW
SOUTHERN BLUEFIN TUNA	09-Jun-19	SCHOUTEN IS (TAS)	292	554	WNW
SOUTHERN BLUEFIN TUNA	22-Jun-19	TASMAN ISLAND	217	548	WNW
SOUTHERN BLUEFIN TUNA	05-Aug-19	PORT MACDONNELL (15NM S)	307	36	ESE
SOUTHERN BLUEFIN TUNA	21-Dec-19	VICTOR HARBOUR (SEAL ROCK)	93	107	SW
SOUTHERN BLUEFIN TUNA	26-Jan-20	VICTOR HARBOUR	57	103	WSW
SOUTHERN BLUEFIN TUNA	01-Feb-20	HIPPOLYTE ROCKS (3 NM E)	147	4	SE
SPANISH MACKEREL	16-Mar-19	SCOTTS HEAD	146	202	NE
STRIPED MARLIN	01-Jan-19	MERIMBULA SHELF	218	1,007	NNE
STRIPED MARLIN	10-Nov-19	JIMS MOUNT (GOLD COAST)	65	474	SSW
STRIPED MARLIN	07-Dec-19	SWANSEA CANYONS	85	129	SSW
STRIPED MARLIN	18-Dec-19	CAPE MORETON CANYONS	44	225	S
STRIPED MARLIN	16-Jan-20	JIBBON (100 FA EAST)	11	155	SSW
STRIPED MARLIN	19-Jan-20	SWANSEA CANYONS	34	136	SSW
STRIPED MARLIN	20-Feb-20	PORT STEPHENS (CAR PARK)	49	187	SSW

APPENDIX I: RECAPTURES OF TAGGED FISH REPORTED IN 2019/20 (CONTD)

Species	Date tagged	Release location	Days at liberty	Dist moved (nmi)	Direction
STRIPED MARLIN	20-Feb-20	PORT STEPHENS (CAR PARK)	22	8	SW
STRIPED MARLIN	21-Feb-20	PORT STEPHENS (CAR PARK)	21	11	NE
STRIPED MARLIN	03-Mar-20	DRUM CANYONS	19	130	NNE
STRIPED MARLIN	13-Mar-20	PORT STEPHENS (CAR PARK)	14	245	SSW
TIGER SHARK	12-Feb-19	FRASER ISLAND	183	26	N
TIGER SHARK	14-Nov-19	DUNSBOROUGH (WA)	100	81	NNE
TIGER SHARK	23-Nov-19	DUNSBOROUGH (WA)	0	0	–
TIGER SHARK	11-Jun-20	DAMPIER ARCHIPELAGO	0	0	NW
WHALER SHARK	06-Nov-19	CURRAMBENE CREEK MOUTH	19	1	S
YELLOWTAIL KINGFISH	10-Oct-13	COFFIN BAY	2,229	170	NE
YELLOWTAIL KINGFISH	29-Sep-14	PORT AUGUSTA (OUTLET CHANNEL)	1,837	0	NW
YELLOWTAIL KINGFISH	18-Nov-14	PORT AUGUSTA (OUTLET CHANNEL)	1,775	101	SE
YELLOWTAIL KINGFISH	23-Aug-15	PORT AUGUSTA (OUTLET CHANNEL)	1,573	167	SSW
YELLOWTAIL KINGFISH	31-Oct-15	COFFIN BAY	1,612	161	NNW
YELLOWTAIL KINGFISH	10-Jan-16	ROCKY ISLAND (SA)	1,374	204	NE
YELLOWTAIL KINGFISH	29-Mar-16	GREENLY ISLAND (SA)	1,338	195	ENE
YELLOWTAIL KINGFISH	23-Oct-16	COFFIN BAY	1,118	151	ENE
YELLOWTAIL KINGFISH	28-Oct-16	COFFIN BAY	1,132	173	NE
YELLOWTAIL KINGFISH	20-Nov-16	PORT RIVER (ADELAIDE)	1,084	0	NW
YELLOWTAIL KINGFISH	28-Nov-16	PORT AUGUSTA (OUTLET CHANNEL)	1,097	747	E
YELLOWTAIL KINGFISH	01-Dec-16	PORT AUGUSTA (OUTLET CHANNEL)	1,102	171	SSW
YELLOWTAIL KINGFISH	06-Jan-17	HUMMOCKS (SA)	1,134	16	SW
YELLOWTAIL KINGFISH	10-Jan-17	HUMMOCKS (SA)	1,055	784	SE
YELLOWTAIL KINGFISH	28-Feb-17	HUMMOCKS (SA)	1,081	16	SW
YELLOWTAIL KINGFISH	21-Oct-17	COFFIN BAY	739	170	NE
YELLOWTAIL KINGFISH	09-Nov-17	PORT AUGUSTA (OUTLET CHANNEL)	721	139	SE
YELLOWTAIL KINGFISH	12-Nov-17	PORT AUGUSTA (OUTLET CHANNEL)	722	0	NW
YELLOWTAIL KINGFISH	24-Nov-17	PORT AUGUSTA (OUTLET CHANNEL)	824	685	SE
YELLOWTAIL KINGFISH	24-Nov-17	PORT AUGUSTA (OUTLET CHANNEL)	824	685	SE
YELLOWTAIL KINGFISH	24-Nov-17	PORT AUGUSTA (OUTLET CHANNEL)	678	0	NW
YELLOWTAIL KINGFISH	24-Nov-17	PORT AUGUSTA (OUTLET CHANNEL)	678	0	NW
YELLOWTAIL KINGFISH	25-Nov-17	PORT AUGUSTA (OUTLET CHANNEL)	739	0	NW
YELLOWTAIL KINGFISH	26-Nov-17	PORT AUGUSTA (SA)	721	0	NW
YELLOWTAIL KINGFISH	06-Dec-17	LONG REEF	647	330	NNE
YELLOWTAIL KINGFISH	17-Dec-17	SYDNEY (NORTH HEAD)	598	2	W
YELLOWTAIL KINGFISH	13-Feb-18	HUMMOCKS (SA)	597	27	ENE
YELLOWTAIL KINGFISH	18-Feb-18	ROCKY ISLAND (SA)	629	170	ENE
YELLOWTAIL KINGFISH	10-Mar-18	HUMMOCKS (SA)	679	2	WSW
YELLOWTAIL KINGFISH	15-Mar-18	HUMMOCKS (SA)	690	782	SE
YELLOWTAIL KINGFISH	03-Apr-18	SOUTH HEAD NSW	576	6	NE

APPENDIX I: RECAPTURES OF TAGGED FISH REPORTED IN 2019/20 (CONTD)

Species	Date tagged	Release location	Days at liberty	Dist moved (nmi)	Direction
YELLOWTAIL KINGFISH	25-Apr-18	HUMMOCKS (SA)	569	773	SE
YELLOWTAIL KINGFISH	29-Apr-18	POINT PERPENDICULAR	625	73	NNE
YELLOWTAIL KINGFISH	25-Jun-18	12 MILE REEF	542	0	NW
YELLOWTAIL KINGFISH	26-Jun-18	12 MILE REEF	400	0	NW
YELLOWTAIL KINGFISH	26-Jun-18	12 MILE REEF	407	14	WNW
YELLOWTAIL KINGFISH	28-Jul-18	12 MILE REEF	339	135	NNE
YELLOWTAIL KINGFISH	09-Aug-18	12 MILE REEF	432	0	NW
YELLOWTAIL KINGFISH	29-Aug-18	PORT AUGUSTA (OUTLET CHANNEL)	409	0	NW
YELLOWTAIL KINGFISH	01-Sep-18	MIDDLE HARBOUR	316	0	NW
YELLOWTAIL KINGFISH	01-Sep-18	MIDDLE HARBOUR	442	2	E
YELLOWTAIL KINGFISH	22-Sep-18	COFFIN BAY	406	170	NE
YELLOWTAIL KINGFISH	22-Sep-18	COFFIN BAY	406	170	NE
YELLOWTAIL KINGFISH	24-Sep-18	PORT AUGUSTA (OUTLET CHANNEL)	373	0	NW
YELLOWTAIL KINGFISH	25-Sep-18	THE PEAK NSW	450	10	ENE
YELLOWTAIL KINGFISH	29-Sep-18	PORT AUGUSTA (OUTLET CHANNEL)	421	0	NW
YELLOWTAIL KINGFISH	29-Sep-18	PORT AUGUSTA (OUTLET CHANNEL)	407	0	NW
YELLOWTAIL KINGFISH	12-Oct-18	PORT AUGUSTA (OUTLET CHANNEL)	411	0	NW
YELLOWTAIL KINGFISH	13-Oct-18	PORT AUGUSTA (OUTLET CHANNEL)	415	167	SSW
YELLOWTAIL KINGFISH	19-Oct-18	GOAT ISLAND (SYDNEY)	388	243	NNE
YELLOWTAIL KINGFISH	20-Oct-18	PORT AUGUSTA (OUTLET CHANNEL)	406	0	NW
YELLOWTAIL KINGFISH	20-Oct-18	MIDDLE HARBOUR	506	6	NNE
YELLOWTAIL KINGFISH	27-Oct-18	PORT AUGUSTA (OUTLET CHANNEL)	393	28	S
YELLOWTAIL KINGFISH	27-Oct-18	PORT AUGUSTA (OUTLET CHANNEL)	393	28	S
YELLOWTAIL KINGFISH	27-Oct-18	PORT AUGUSTA (OUTLET CHANNEL)	393	28	S
YELLOWTAIL KINGFISH	27-Oct-18	PORT AUGUSTA (OUTLET CHANNEL)	393	28	S
YELLOWTAIL KINGFISH	04-Nov-18	PORT AUGUSTA (OUTLET CHANNEL)	413	171	SSW
YELLOWTAIL KINGFISH	08-Nov-18	PORT AUGUSTA (OUTLET CHANNEL)	326	0	NW
YELLOWTAIL KINGFISH	09-Nov-18	PORT AUGUSTA (OUTLET CHANNEL)	329	0	NW
YELLOWTAIL KINGFISH	10-Nov-18	COFFIN BAY	349	170	NE
YELLOWTAIL KINGFISH	10-Nov-18	COFFIN BAY	338	0	NW
YELLOWTAIL KINGFISH	18-Nov-18	PORT AUGUSTA (SA)	331	60	SE
YELLOWTAIL KINGFISH	24-Nov-18	PORT AUGUSTA (OUTLET CHANNEL)	328	746	E
YELLOWTAIL KINGFISH	30-Nov-18	PORT AUGUSTA (OUTLET CHANNEL)	330	0	NW
YELLOWTAIL KINGFISH	30-Nov-18	GOAT ISLAND (SYDNEY)	220	362	NNE
YELLOWTAIL KINGFISH	03-Dec-18	12 MILE REEF	381	0	NW
YELLOWTAIL KINGFISH	17-Dec-18	PARRAMATTA RIVER	207	140	NNE
YELLOWTAIL KINGFISH	29-Dec-18	THE PASSAGE (SA)	302	167	NNE
YELLOWTAIL KINGFISH	29-Dec-18	THE PASSAGE (SA)	420	838	E
YELLOWTAIL KINGFISH	30-Dec-18	SPALDING COVE	336	162	NNE
YELLOWTAIL KINGFISH	07-Jan-19	SOUTH WEST ROCKS (FISH ROCK)	275	0	NW

APPENDIX I: RECAPTURES OF TAGGED FISH REPORTED IN 2019/20 (CONTD)

Species	Date tagged	Release location	Days at liberty	Dist moved (nmi)	Direction
YELLOWTAIL KINGFISH	12-Jan-19	JERVIS BAY	291	345	NNE
YELLOWTAIL KINGFISH	16-Jan-19	JERVIS BAY	214	440	NNE
YELLOWTAIL KINGFISH	27-Jan-19	LONG REEF	442	8	NE
YELLOWTAIL KINGFISH	14-Feb-19	GOAT ISLAND (SYDNEY)	409	4	NE
YELLOWTAIL KINGFISH	20-Feb-19	GREENLY ISLAND (SA)	233	196	ENE
YELLOWTAIL KINGFISH	04-Mar-19	GREENLY ISLAND (SA)	281	63	ESE
YELLOWTAIL KINGFISH	04-Mar-19	GREENLY ISLAND (SA)	236	196	ENE
YELLOWTAIL KINGFISH	05-Mar-19	OLD MANS HAT	181	2	E
YELLOWTAIL KINGFISH	05-Mar-19	GREENLY ISLAND (SA)	250	196	ENE
YELLOWTAIL KINGFISH	06-Mar-19	OLD MANS HAT	119	1	W
YELLOWTAIL KINGFISH	08-Mar-19	ROCKY ISLAND (SA)	324	1	SSW
YELLOWTAIL KINGFISH	14-Mar-19	GREENLY ISLAND (SA)	202	196	ENE
YELLOWTAIL KINGFISH	05-Apr-19	CLARKE ISLAND (SYDNEY HARBOUR)	205	1	N
YELLOWTAIL KINGFISH	08-Apr-19	JIBBON BEACH	120	17	NNE
YELLOWTAIL KINGFISH	21-Apr-19	DEE WHY (SYDNEY)	156	131	NNE
YELLOWTAIL KINGFISH	23-Apr-19	GREENLY ISLAND (SA)	355	15	ESE
YELLOWTAIL KINGFISH	25-Apr-19	TEXAS REEF	180	0	NW
YELLOWTAIL KINGFISH	01-May-19	LONG REEF	109	318	NNE
YELLOWTAIL KINGFISH	09-May-19	BALLINA (48 FATH E)	129	0	NW
YELLOWTAIL KINGFISH	09-May-19	BLUEFISH POINT	69	8	W
YELLOWTAIL KINGFISH	19-May-19	NORTH HEAD (BLUEFISH POINT)	247	5	WSW
YELLOWTAIL KINGFISH	19-May-19	THE PEAK	157	9	NW
YELLOWTAIL KINGFISH	22-May-19	BONDI	118	0	NW
YELLOWTAIL KINGFISH	26-May-19	LONG REEF	181	9	SW
YELLOWTAIL KINGFISH	02-Jun-19	PORT HACKING RIVER	140	1	NW
YELLOWTAIL KINGFISH	04-Jun-19	SOUTH HEAD	193	1	W
YELLOWTAIL KINGFISH	04-Jun-19	SOUTH HEAD	337	9	SSE
YELLOWTAIL KINGFISH	11-Jun-19	12 MILE REEF	22	14	WNW
YELLOWTAIL KINGFISH	15-Jun-19	THE PEAK	303	0	NW
YELLOWTAIL KINGFISH	04-Jul-19	MIDDLE HARBOUR	10	0	NW
YELLOWTAIL KINGFISH	04-Jul-19	MIDDLE HARBOUR	0	0	–
YELLOWTAIL KINGFISH	04-Jul-19	MIDDLE HARBOUR	11	0	NW
YELLOWTAIL KINGFISH	04-Jul-19	MIDDLE HARBOUR	206	261	SSW
YELLOWTAIL KINGFISH	04-Jul-19	MIDDLE HARBOUR	0	0	–
YELLOWTAIL KINGFISH	05-Jul-19	MIDDLE HARBOUR	51	0	NW
YELLOWTAIL KINGFISH	05-Jul-19	MIDDLE HARBOUR	29	0	NW
YELLOWTAIL KINGFISH	06-Jul-19	MIDDLE HARBOUR	11	0	NW
YELLOWTAIL KINGFISH	06-Jul-19	MIDDLE HARBOUR	204	261	SSW
YELLOWTAIL KINGFISH	06-Jul-19	MIDDLE HARBOUR	27	0	NW
YELLOWTAIL KINGFISH	06-Jul-19	SYDNEY HARBOUR	0	0	–

APPENDIX I: RECAPTURES OF TAGGED FISH REPORTED IN 2019/20 (CONTD)

Species	Date tagged	Release location	Days at liberty	Dist moved (nmi)	Direction
YELLOWTAIL KINGFISH	06-Jul-19	MIDDLE HARBOUR	67	0	NW
YELLOWTAIL KINGFISH	06-Jul-19	MIDDLE HARBOUR	18	0	NW
YELLOWTAIL KINGFISH	09-Jul-19	MIDDLE HARBOUR	15	0	NW
YELLOWTAIL KINGFISH	12-Jul-19	MIDDLE HARBOUR	201	261	SSW
YELLOWTAIL KINGFISH	12-Jul-19	MIDDLE HARBOUR	72	0	NW
YELLOWTAIL KINGFISH	12-Jul-19	MIDDLE HARBOUR	0	0	–
YELLOWTAIL KINGFISH	12-Jul-19	SOUTH SOLITARY ISLAND	37	0	NW
YELLOWTAIL KINGFISH	12-Jul-19	SOUTH SOLITARY ISLAND	36	0	NW
YELLOWTAIL KINGFISH	12-Jul-19	SOUTH WEST ROCKS (FISH ROCK)	78	0	NW
YELLOWTAIL KINGFISH	12-Jul-19	SOUTH WEST ROCKS (FISH ROCK)	13	0	NW
YELLOWTAIL KINGFISH	12-Jul-19	FISH ROCK (SOUTH WEST ROCKS)	14	0	NW
YELLOWTAIL KINGFISH	12-Jul-19	SOUTH WEST ROCKS (FISH ROCK)	89	0	NW
YELLOWTAIL KINGFISH	12-Jul-19	MIDDLE HARBOUR	25	0	NW
YELLOWTAIL KINGFISH	12-Jul-19	MIDDLE HARBOUR	44	0	NW
YELLOWTAIL KINGFISH	13-Jul-19	SOUTH WEST ROCKS (JAIL REEF)	82	3	ENE
YELLOWTAIL KINGFISH	14-Jul-19	MIDDLE HARBOUR	0	0	–
YELLOWTAIL KINGFISH	14-Jul-19	MIDDLE HARBOUR	142	1	SE
YELLOWTAIL KINGFISH	14-Jul-19	MIDDLE HARBOUR	159	1	SE
YELLOWTAIL KINGFISH	14-Jul-19	MIDDLE HARBOUR	35	0	NW
YELLOWTAIL KINGFISH	15-Jul-19	MIDDLE HARBOUR	42	0	NW
YELLOWTAIL KINGFISH	15-Jul-19	MIDDLE HARBOUR	42	0	NW
YELLOWTAIL KINGFISH	16-Jul-19	12 MILE REEF	22	0	NW
YELLOWTAIL KINGFISH	16-Jul-19	12 MILE REEF	18	0	NW
YELLOWTAIL KINGFISH	16-Jul-19	MIDDLE HARBOUR	28	0	NW
YELLOWTAIL KINGFISH	17-Jul-19	MIDDLE HARBOUR	67	75	NNE
YELLOWTAIL KINGFISH	17-Jul-19	MIDDLE HARBOUR	102	4	WSW
YELLOWTAIL KINGFISH	17-Jul-19	MIDDLE HARBOUR	91	4	WSW
YELLOWTAIL KINGFISH	17-Jul-19	MIDDLE HARBOUR	56	3	WNW
YELLOWTAIL KINGFISH	19-Jul-19	VALLA REEF	15	1	W
YELLOWTAIL KINGFISH	01-Aug-19	12 MILE REEF	70	0	NW
YELLOWTAIL KINGFISH	03-Aug-19	12 MILE REEF	104	0	NW
YELLOWTAIL KINGFISH	03-Aug-19	12 MILE REEF	73	0	NW
YELLOWTAIL KINGFISH	05-Aug-19	12 MILE REEF	19	0	NW
YELLOWTAIL KINGFISH	05-Aug-19	12 MILE REEF	137	42	SW
YELLOWTAIL KINGFISH	08-Aug-19	MIDDLE HARBOUR	114	4	WSW
YELLOWTAIL KINGFISH	13-Aug-19	SOUTH WEST ROCKS (FISH ROCK)	11	0	NW
YELLOWTAIL KINGFISH	14-Aug-19	12 MILE REEF	235	10	WSW
YELLOWTAIL KINGFISH	15-Aug-19	12 MILE REEF	9	0	NW
YELLOWTAIL KINGFISH	15-Aug-19	12 MILE REEF	0	0	–
YELLOWTAIL KINGFISH	16-Aug-19	12 MILE REEF	126	0	NW

APPENDIX I: RECAPTURES OF TAGGED FISH REPORTED IN 2019/20 (CONTD)

Species	Date tagged	Release location	Days at liberty	Dist moved (nmi)	Direction
YELLOWTAIL KINGFISH	18-Aug-19	SOUTH WEST ROCKS (FISH ROCK)	45	0	NW
YELLOWTAIL KINGFISH	24-Aug-19	12 MILE REEF	5	0	NW
YELLOWTAIL KINGFISH	28-Aug-19	12 MILE REEF	0	0	–
YELLOWTAIL KINGFISH	29-Aug-19	12 MILE REEF	257	10	WSW
YELLOWTAIL KINGFISH	01-Sep-19	BLUEFISH POINT	58	0	NW
YELLOWTAIL KINGFISH	01-Sep-19	BLUEFISH POINT	154	7	WSW
YELLOWTAIL KINGFISH	03-Sep-19	BLUEFISH POINT	0	0	–
YELLOWTAIL KINGFISH	03-Sep-19	BLUEFISH POINT	145	0	NW
YELLOWTAIL KINGFISH	03-Sep-19	BLUEFISH POINT	50	1	S
YELLOWTAIL KINGFISH	03-Sep-19	BLUEFISH POINT	73	4	N
YELLOWTAIL KINGFISH	03-Sep-19	BLUEFISH POINT	58	0	NW
YELLOWTAIL KINGFISH	04-Sep-19	WOOLI	66	7	ESE
YELLOWTAIL KINGFISH	04-Sep-19	TRIAL BAY (STH WEST ROCKS)	0	0	–
YELLOWTAIL KINGFISH	04-Sep-19	NORTH HEAD (BLUEFISH POINT)	81	56	SSW
YELLOWTAIL KINGFISH	05-Sep-19	BLUEFISH POINT	30	0	NW
YELLOWTAIL KINGFISH	07-Sep-19	MIDDLE HARBOUR	141	261	SSW
YELLOWTAIL KINGFISH	11-Sep-19	PORT HACKING	64	2	W
YELLOWTAIL KINGFISH	15-Sep-19	MIDDLE HARBOUR	246	33	NNE
YELLOWTAIL KINGFISH	15-Sep-19	PARRAMATTA RIVER	196	2	E
YELLOWTAIL KINGFISH	15-Sep-19	PARRAMATTA RIVER (GLADESVILLE)	64	4	SE
YELLOWTAIL KINGFISH	18-Sep-19	PORT RIVER	48	0	NW
YELLOWTAIL KINGFISH	18-Sep-19	MIDDLE HARBOUR	176	3	SW
YELLOWTAIL KINGFISH	23-Sep-19	PORT PIRIE (SA)	27	40	NNW
YELLOWTAIL KINGFISH	26-Sep-19	SYDNEY HARBOUR	27	6	ENE
YELLOWTAIL KINGFISH	28-Sep-19	TWEED HEADS (15NM E)	126	433	SSW
YELLOWTAIL KINGFISH	28-Sep-19	PORT AUGUSTA (POWER STATION)	20	0	NW
YELLOWTAIL KINGFISH	28-Sep-19	MIDDLE HARBOUR	25	3	SW
YELLOWTAIL KINGFISH	02-Oct-19	PORT AUGUSTA (OUTLET CHANNEL)	25	0	NW
YELLOWTAIL KINGFISH	02-Oct-19	PORT AUGUSTA (OUTLET CHANNEL)	25	0	NW
YELLOWTAIL KINGFISH	02-Oct-19	NORTH HEAD (BLUEFISH POINT)	176	208	SW
YELLOWTAIL KINGFISH	03-Oct-19	PORT AUGUSTA (OUTLET CHANNEL)	46	0	NW
YELLOWTAIL KINGFISH	06-Oct-19	PORT AUGUSTA (OUTLET CHANNEL)	21	0	NW
YELLOWTAIL KINGFISH	08-Oct-19	PORT AUGUSTA (OUTLET CHANNEL)	20	0	NW
YELLOWTAIL KINGFISH	10-Oct-19	PORT AUGUSTA (OUTLET CHANNEL)	58	0	NW
YELLOWTAIL KINGFISH	10-Oct-19	PORT AUGUSTA (OUTLET CHANNEL)	58	0	NW
YELLOWTAIL KINGFISH	10-Oct-19	COFFIN BAY (NTH OF TOWNSHIP) SA	19	170	NE
YELLOWTAIL KINGFISH	11-Oct-19	PORT AUGUSTA (OUTLET CHANNEL)	25	0	NW
YELLOWTAIL KINGFISH	14-Oct-19	COFFIN BAY	26	170	NE
YELLOWTAIL KINGFISH	14-Oct-19	COFFIN BAY	26	170	NE
YELLOWTAIL KINGFISH	14-Oct-19	12 MILE REEF	31	0	NW

APPENDIX I: RECAPTURES OF TAGGED FISH REPORTED IN 2019/20 (CONTD)

Species	Date tagged	Release location	Days at liberty	Dist moved (nmi)	Direction
YELLOWTAIL KINGFISH	15-Oct-19	12 MILE REEF	80	0	NW
YELLOWTAIL KINGFISH	18-Oct-19	PORT AUGUSTA (OUTLET CHANNEL)	62	171	SSW
YELLOWTAIL KINGFISH	18-Oct-19	PORT AUGUSTA (OUTLET CHANNEL)	62	171	SSW
YELLOWTAIL KINGFISH	19-Oct-19	BLUEFISH POINT	11	1	S
YELLOWTAIL KINGFISH	19-Oct-19	BLUEFISH POINT	59	0	NW
YELLOWTAIL KINGFISH	19-Oct-19	BLUEFISH POINT	25	1	S
YELLOWTAIL KINGFISH	20-Oct-19	PORT AUGUSTA (POWER STATION)	8	0	NW
YELLOWTAIL KINGFISH	20-Oct-19	SYDNEY HARBOUR	32	0	NW
YELLOWTAIL KINGFISH	21-Oct-19	NORTH HEAD (BLUEFISH POINT)	2	1	N
YELLOWTAIL KINGFISH	21-Oct-19	NORTH HEAD (BLUEFISH POINT)	0	0	–
YELLOWTAIL KINGFISH	23-Oct-19	PORT HACKING	170	2	W
YELLOWTAIL KINGFISH	23-Oct-19	NORTH HEAD (BLUEFISH POINT)	25	1	N
YELLOWTAIL KINGFISH	30-Oct-19	THE PEAK	57	8	SW
YELLOWTAIL KINGFISH	31-Oct-19	PORT ADELAIDE (SA)	15	5	NNW
YELLOWTAIL KINGFISH	31-Oct-19	BLUEFISH POINT	38	7	WSW
YELLOWTAIL KINGFISH	31-Oct-19	BLUEFISH POINT	38	7	WSW
YELLOWTAIL KINGFISH	06-Nov-19	PORT RIVER (ADELAIDE)	4	0	NW
YELLOWTAIL KINGFISH	06-Nov-19	12 MILE REEF	9	0	NW
YELLOWTAIL KINGFISH	14-Nov-19	12 MILE REEF	30	0	NW
YELLOWTAIL KINGFISH	17-Nov-19	BLUEFISH POINT	34	21	NNE
YELLOWTAIL KINGFISH	17-Nov-19	BLUEFISH POINT	34	21	NNE
YELLOWTAIL KINGFISH	18-Nov-19	12 MILE REEF	35	0	NW
YELLOWTAIL KINGFISH	18-Nov-19	12 MILE REEF	31	0	NW
YELLOWTAIL KINGFISH	21-Nov-19	LONG REEF	8	5	S
YELLOWTAIL KINGFISH	23-Nov-19	PORT AUGUSTA (OUTLET CHANNEL)	0	0	–
YELLOWTAIL KINGFISH	24-Nov-19	PORT AUGUSTA (OUTLET CHANNEL)	13	171	SSW
YELLOWTAIL KINGFISH	25-Nov-19	GOAT ISLAND (SYDNEY)	84	3	ENE
YELLOWTAIL KINGFISH	25-Nov-19	LAKE MACQUARIE (SWANSEA)	0	0	–
YELLOWTAIL KINGFISH	06-Dec-19	LONG REEF	67	0	NW
YELLOWTAIL KINGFISH	06-Dec-19	BLUEFISH POINT	107	4	N
YELLOWTAIL KINGFISH	07-Dec-19	LONG REEF	75	0	NW
YELLOWTAIL KINGFISH	08-Dec-19	WOOLI	29	7	ESE
YELLOWTAIL KINGFISH	08-Dec-19	SYDNEY HARBOUR	31	3	ENE
YELLOWTAIL KINGFISH	09-Dec-19	TUMBY BAY (SA)	2	0	NW
YELLOWTAIL KINGFISH	12-Dec-19	BLUEFISH POINT	10	3	SW
YELLOWTAIL KINGFISH	15-Dec-19	HUMMOCKS (SA)	56	0	NW
YELLOWTAIL KINGFISH	15-Dec-19	HUMMOCKS (SA)	14	0	NW
YELLOWTAIL KINGFISH	17-Dec-19	12 MILE REEF	7	0	NW
YELLOWTAIL KINGFISH	19-Dec-19	JERVIS BAY (SIGHT BOARDS)	32	6	WSW
YELLOWTAIL KINGFISH	22-Dec-19	SOUTH WEST ROCKS (FISH ROCK)	4	5	WNW

APPENDIX I: RECAPTURES OF TAGGED FISH REPORTED IN 2019/20 (CONTD)

Species	Date tagged	Release location	Days at liberty	Dist moved (nmi)	Direction
YELLOWTAIL KINGFISH	23-Dec-19	LONG REEF	1	6	SSW
YELLOWTAIL KINGFISH	23-Dec-19	LONG REEF	177	234	NNE
YELLOWTAIL KINGFISH	29-Dec-19	HUMMOCKS (SA)	0	0	–
YELLOWTAIL KINGFISH	03-Jan-20	COOGEE	11	1	NE
YELLOWTAIL KINGFISH	04-Jan-20	LONG REEF	49	0	NW
YELLOWTAIL KINGFISH	08-Jan-20	COOGEE	4	0	NW
YELLOWTAIL KINGFISH	08-Jan-20	COOGEE	46	0	NW
YELLOWTAIL KINGFISH	09-Jan-20	ROCKY ISLAND (SA)	46	0	NW
YELLOWTAIL KINGFISH	09-Jan-20	ROCKY ISLAND (SA)	51	0	NW
YELLOWTAIL KINGFISH	14-Jan-20	SOUTH HEAD	7	3	S
YELLOWTAIL KINGFISH	14-Jan-20	COOGEE	76	2	S
YELLOWTAIL KINGFISH	15-Jan-20	PORT KEMBLA	167	43	NNE
YELLOWTAIL KINGFISH	20-Jan-20	JERVIS BAY	25	1	NNE
YELLOWTAIL KINGFISH	06-Feb-20	LONG REEF	59	3	E
YELLOWTAIL KINGFISH	10-Feb-20	ROCKY ISLAND (SA)	19	0	NW
YELLOWTAIL KINGFISH	22-Feb-20	SOUTH HEAD	6	1	S
YELLOWTAIL KINGFISH	22-Feb-20	LONG REEF	13	0	NW
YELLOWTAIL KINGFISH	23-Feb-20	COOGEE	26	0	NW
YELLOWTAIL KINGFISH	28-Feb-20	SOUTH WEST ROCKS (FISH ROCK)	4	0	NW
YELLOWTAIL KINGFISH	29-Feb-20	ROCKY ISLAND (SA)	6	0	NW
YELLOWTAIL KINGFISH	05-Mar-20	FOUR HUMMOCKS ISLAND (SA)	38	0	NW
YELLOWTAIL KINGFISH	10-Mar-20	PORT JACKSON	39	5	ENE
YELLOWTAIL KINGFISH	12-Mar-20	LONG REEF	24	0	NW
YELLOWTAIL KINGFISH	13-Mar-20	LONG REEF	0	0	–
YELLOWTAIL KINGFISH	20-Mar-20	COOGEE	0	0	–
YELLOWTAIL KINGFISH	20-Mar-20	COOGEE	78	11	NE
YELLOWTAIL KINGFISH	18-Apr-20	THE PEAK	3	0	NW
YELLOWTAIL KINGFISH	01-May-20	WOLLONGONG	1	2	E
YELLOWTAIL KINGFISH	04-May-20	WOLLONGONG	1	8	W
YELLOWTAIL KINGFISH	06-May-20	LONG REEF	26	0	NW
YELLOWTAIL KINGFISH	07-May-20	BLUEFISH POINT	27	47	NNE
YELLOWTAIL KINGFISH	12-May-20	THE PEAK	33	0	NW
YELLOWTAIL KINGFISH	29-May-20	SOUTH WEST ROCKS (FISH ROCK)	17	0	NW
YELLOWTAIL KINGFISH	03-Jun-20	LAKE MACQUARIE (SWANSEA)	18	0	NW
YELLOWTAIL KINGFISH	03-Jun-20	LAKE MACQUARIE (SWANSEA)	18	0	NW
YELLOWTAIL KINGFISH	05-Jun-20	LONG REEF	23	6	SW
YELLOWTAIL KINGFISH	07-Jun-20	LONG REEF	11	0	NW
YELLOWTAIL KINGFISH	07-Jun-20	SOUTH WEST ROCKS (FISH ROCK)	0	0	–
YELLOWTAIL KINGFISH	11-Jun-20	SOUTH WEST ROCKS (FISH ROCK)	19	0	NW
YELLOWTAIL KINGFISH	11-Jun-20	SOUTH WEST ROCKS (FISH ROCK)	0	0	–
YELLOWTAIL KINGFISH	19-Jun-20	12 MILE REEF	1	0	NW

APPENDIX II: TOP TAGGING BOATS AND ANGLERS FOR 2019/2020

NSW DPI would like to recognise the boats and anglers that have provided exceptional contributions to the Program over the past season. These boats and anglers are shown in the table below with the numbers of fish that they tagged over the 2019/2020 season. We will continue to develop these end of season summaries and acknowledge the strong supporters of the tagging Program in future years.

TOP TAGGING BOATS AND ANGLERS 2019/2020

Species	Top boat	Runner up boat
Billfish combined	**118 – *Get N Any* (QLD) Weipa Billfish Club**	**114 – *The Wench* (WA) King Bay GFC**
Black Marlin	**71 – *Reel Crazy* (QLD) Sunshine Coast GFC**	**63 – *Reel Teaser* (QLD) Gold Coast GFC**
Blue Marlin (International)	**37 - *Blue Marlin Magic* (Tonga) Vava'u SFC**	**26 – *Ultimate One* (PNG) New Britain GFC**
Blue Marlin (Australia)	**31 – *Little Audrey* (NSW) Sydney GFC**	**21 - *Caboom* (QLD) Gold Coast GFC**
Striped Marlin	**31 – *Ya Mum* (NSW) Jervis Bay GFC**	**25 – *Zorro* (NSW) Broken Bay GFC**
Sailfish	**102 – *Wine Down* (QLD) Weipa Billfish Club**	**96 – *Get N Any* (QLD) Weipa Billfish Club**
Shortbill Spearfish	**3 – *Born Free* (NSW) Newcastle & Port Stephens GFC**	**2 – *The Purge* (NSW) Lake Macquarie GFC**
Swordfish	**4 - *Buck Hunter* (NSW) Exmouth GFC**	**2 - *Tagged by Commercial Vessel* (NSW)**
Shark combined	**58 – *The Hulk* (NSW) Eden S & GFC**	**25 – *Reel Screamer* (WA) King Bay GFC**
Mako Shark	**15 – *Stik Face II* (VIC)**	**5 - *Swordfish* (TAS) Tuna**

Species	Top boat	Runner up boat
	Warrnambool Offshore & Light GFC	**Club of Tasmania**
Blue Shark	**3 – *Sally 2.0* (TAS) Tuna Club of Tasmania**	**2 – *El Bandito* (NSW) Wollongong GFC**
Tiger Shark	**10 – *Disco Prawn* (WA) Nickol Bay SFC**	**4 – *Reel Screamer* (WA) Kign Bay GFC**
Whaler Shark	**56 - *The Hulk* (NSW) Eden S & GFC**	**19 - *Reel Screamer* (WA) Kign Bay GFC**
Hammerhead Shark	**6 – *Old Blue* (NSW) Newcastle GFC**	**4 - *Yahootoo* (NSW) Newcastle GFC**
Thresher Shark		
Tuna combined	**110 - *Seismic* (TAS) St Helens GFC**	**102 – *Galaxy Star* (SA) GFC of SA**
Yellowfin Tuna	**16 – *Mr Magoo* (NSW) Port Hacking GFC**	**7 - *Murrifin* (NSW) Broken Bay GFC**
Southern Bluefin Tuna	**110 - *Seismic* (TAS) St Helens GFC**	**102 – *Galaxy Star* (SA) GFC of SA**
Bigeye Tuna	**3 - *Tagged by Commercial Vessel* (NSW)**	
Albacore Tuna	**9 – *Outta Bounds* (VIC) Victorian GFC**	**4 – *Hey Presto* (TAS) Nowra SFC**
Longtail Tuna	**16 - *Black Rat* (NSW)**	**5 – *Chasin Tail* (WA) King Bay GFC**

Species	Top boat	Runner up boat
Dogtooth Tuna		
Spanish Mackerel	**27 - *Anarchy* (QLD) Mackay GFC**	**13 – *Storm Front* (WA) Geraldton Districts Offshore AC**
Mahi Mahi	**37 – *Esprit* (NSW) Fozies Fishing Adventures**	**15 – *Hooked Up* (NSW)**
Yellowtail Kingfish	**358 - *Ocean Hunter* (NSW) Ocean Hunter Sports Fishing Charters**	**212 - *Raptor* (SA) Raptor Fishing Charters**
Samsonfish	**85 – *Reel Salty* (NSW) GFC of South Australia**	**72 - *Bettsea* (SA) Adelaide GFC**

Species	Top individual	Runner up individual
Billfish	**83 - Darryl French (QLD) Weipa Billfish Club**	**79 – Bryce Bartleson (QLD) Sunshine Coast GFC**
Shark	**33 – Peter McMahon (NSW) Eden S & GFC**	**25 – Rob McMahon (NSW) Eden S & GFC**
Tuna	**83 - Eythan Purton (TAS) St Helens GFC**	**46 - Rolf Czabayski (SA) GFC of South Australia**
Seriola	**398 - Vic Levett (NSW)**	**137 - Seamus McCleave (NSW)**

APPENDIX III

SCIENTIFIC PUBLICATIONS UTILIZING OR CITING DATA FROM THE TAGGING PROGRAM

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CURRENT UNIVERSITY THESES

The following post-graduate studies utilizing data from the NSW DPI Game Fish Tagging Program are currently under way:

Guillemin, Tristan. Macquarie University. Evolution of the blue marlin fishery off the east coast of Australia. Ph.D Program.

Smith, Laura. University of Queensland. Population structure of sailfish (*Istiophorus platypterus*) and its ecology and distribution in the Indo-Pacific. Ph.D Program.

Osborne, Felicity. University of Southern Queensland. The interactive effects of anthropogenic impacts on coastal fisheries value and condition. Ph.D Program.

PREVIOUS UNIVERSITY THESES

The following theses have all been successfully completed, most of them relying heavily on data from the NSW DPI Game Fish Tagging Program:

Cameron Baber, James Cook University. Examining the impacts of environmental factors on the distribution of the shortfin mako shark, *Isurus oxyrinchus*, from eastern Australia. M.Sc., 2018.

Samuel Williams, University of Queensland. The global biology, ecology and phylogenetic status of black marlin (*Istiompax indica*) Ph.D. 2018.

Shane Ovington, University of Queensland. The distribution and size structure of blue marlin (*Makaira nigricans*) along the East Coast of Australia, modelled from recreational capture and tagging data. B.Sc. Honours 2017.

Stephanie Brodie, University of New South Wales. The ecology and distribution of two pelagic fish: yellowtail kingfish *Seriola lalandi* and dolphinfish *Coryphaena hippurus*. Ph.D. 2016.

Bonnie Holmes, University of Queensland. The biology and ecology of the tiger shark (*Galeocerdo cuvier*) on the east coast of Australia. Ph.D 2015.

Nicholas Hill. James Cook University. Variability in the distribution and movement of black marlin (Istiompax indica) determined via environmental conditions along the East Coast of Australia using recreational tag data. B.Sc. Honours, 2014.

Samuel Williams, University of Queensland Genetic population structure of black marlin (*Istiompax indica*) within the central Indo-Pacific: Breeding populations defined despite mitonuclear discordance. B.Sc. Honours, 2014.

Ronan Lynch, University of Queensland, Variability in the spatial and temporal occurrence, and size composition of sailfish (*Istiophorus platypterus*) in eastern Australian waters, and the influence of environmental conditions. B.Sc. Honours, 2012.

Richard Keller Kopf, Charles Sturt University. Age, growth and reproductive dynamics of striped marlin, *Kajikia audax*, in the southwest Pacific ocean. Ph.D., 2010.

Tom Bridge, University of Sydney. Effects of environmental variables on the recruitment and distribution of juvenile black marlin, *Makaira indica*, off the east coast of Australia. B.Sc. Honours, 2007.

John Hoolihan, University of New South Wales, Biology and stock structure of sailfish in the Persian Gulf. Ph.D., 2005.

Danielle Williams, University of New South Wales. Variations in the size composition and occurrence of yellowfin tuna (*Thunnus albacares*) in eastern Australian waters through time, inferred from a unique recreational-based dataset. B.Sc. Honours, 2003.

Ricky Chan, University of New South Wales. Biology of pelagic sharks off New South Wales. Ph.D., 2001.

Joanne Bennett, University of New South Wales. Ecology of dolphin fish (*Coryphaena hippurus*) and other large pelagic species: Environmental influences on their distribution. B.Sc. Honours, 2000.

CURRENT PROJECTS USING DATA

The following projects are currently under way that is utilizing data from the Game Fish Tagging Program:

“Investigate oceanographic and environmental factors impacting on the Eastern Tuna and Billfish Fishery (ETBF)”. Led by CSIRO with input from AFMA, BoM, ABARES and the University of the Sunshine Coast.

“Enhance and upgrade the Gamefish Tagging Program’s recapture database through an online GIS platform” Pepperell Research, funded by NSW Recreational Fishing Trusts

MAGAZINES, EMAIL LISTS

Many articles on the tagging Program have appeared in recreational fishing magazines, especially in 'Bluewater Boats & Sportfishing', which is targeted at a game fishing audience.

Regular updates on the tagging Program, provided by NSW DPI staff, are published in 'Bluewater Boats & Sportfishing'.

Tag Times e-zine is distributed to a large email list on a regular basis.

Lastly, detailed Annual Reports on the Game Fish Tagging Program have been regularly published throughout its history, originally in hard copy, and digitally over the past decade. These are all available at NSW Game Fish Tagging Reports