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NSW DPI Game Fish Tagging Program

Annual Report 2015–2016

Recreational Fishing Trusts

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Acknowledgments

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This report was prepared with the assistance of Phil Bolton and Mick Gamble of NSWDPI.

Prepared by Pepperell Research

JTN 14353

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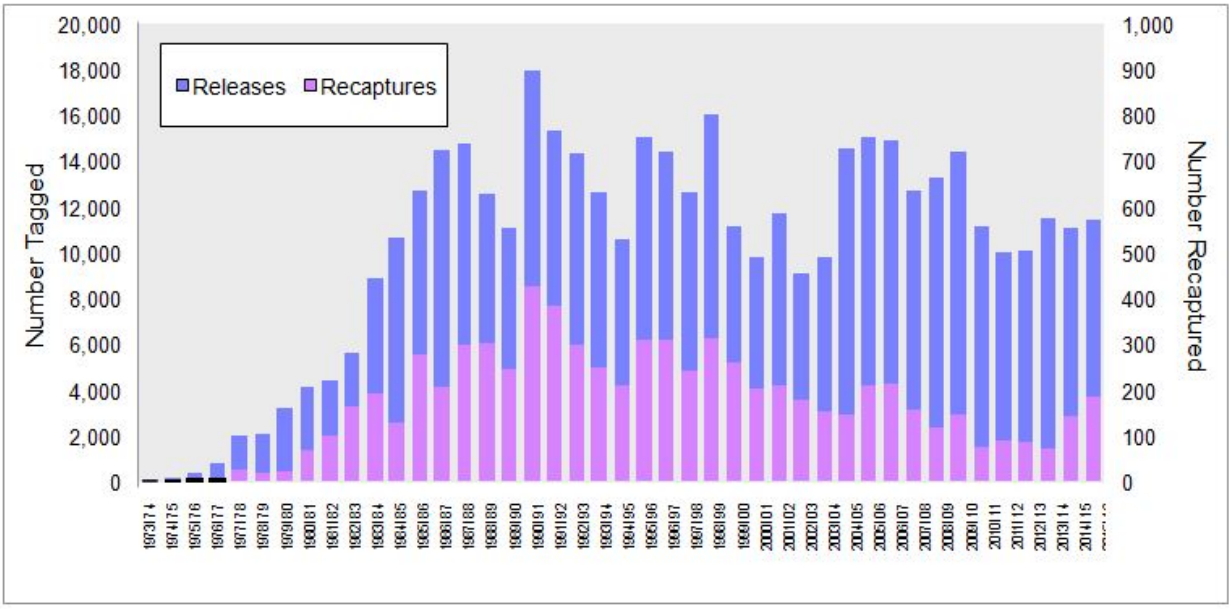
NSW DPI Game Fish Tagging Program 2015/2016

The number of fish tagged during 2015/16 exceeded 11,000 for the third year in a row while the number of reported recaptures was the highest in nine years. Overall, 11,397 fish were tagged (nearly 400 more than the previous year) and 184 recaptured (39 more than the previous year).

Figure 1 illustrates the number of fish tagged and recaptured on the program through time. Following a rapid increase in tagging during the 1970s and early 1980s, numbers of fish tagged each year have fluctuated around an average of about 12,300, made up of varying proportions of species of fish tagged in different years. The 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, resulting in greater than usual numbers of some species becoming available to anglers. As outlined further in this report, compared with the previous year, in 2015/16 numbers of southern bluefin tuna tagged increased considerably, as did blue marlin, striped marlin and whaler sharks. On the other hand, species tagged in lower numbers included black marlin, dolphinfish and yellowtail kingfish.

Figure 1 Numbers of fish tagged and recaptured by year, to 2015/2016



The Program to date

As at the end of June 2016, the grand totals of fish tagged and recaptured on the program stood at 446,345 and 7,660 respectively (Table 1), continuing the program's status as the largest of its kind in the world. This table summarises taggings and recaptures of the top 25 species or species groups tagged, with the remainder combined as 'all other species'.

The single species tagged in the highest numbers continues to be black marlin with over 64,500 tagged (14.5% of all releases) followed by yellowfin tuna, yellowtail kingfish, sailfish, striped marlin, dolphinfish and southern bluefin tuna. Other prominent key species are albacore, whaler sharks (as a group), blue marlin and mako sharks.

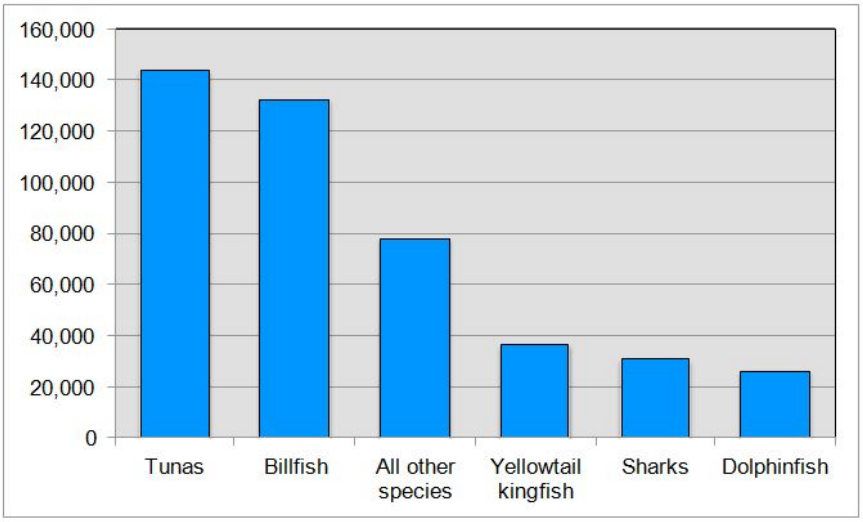
Table 1 Total numbers of fish tagged and recaptured: 1974-2016

Species	Total Tagged	Recaptures	% Recapt
Black marlin	64,571	514	0.80
Yellowfin tuna	38,090	717	1.88
Yellowtail kingfish	36,186	2,370	6.55
Sailfish	31,446	331	1.05
Striped marlin	26,552	247	0.93
Dolphinfish	26,004	239	0.92
Southern bluefin tuna	23,466	167	0.71
Albacore	21,938	169	0.77
Striped tuna	21,260	70	0.33
Mackerel tuna	20,672	62	0.30
Bonito	13,245	219	1.65
Whaler shark*	11,972	246	2.05
Australian salmon**	10,132	626	6.18
Blue marlin	9,635	34	0.35
Spanish mackerel	9,244	88	0.95
Mako shark	8,046	181	2.25
Silver trevally**	6,993	201	2.87
Hammerhead shark	5,567	58	1.04
Blue shark	4,962	78	1.57
Longtail tuna	4,961	59	1.19
Tailor**	4,031	123	3.05
Trevally	3,392	32	0.94
Barracuda	3,344	6	0.18
Queenfish	3,342	10	0.30
All other species	37,294	813	2.18
Total	**446,345**	**7,660**	**1.72**

*Whaler sharks for the purpose of this table include the following tag card entries: whaler sharks, bronze whalers, black tip and white tip sharks.

**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 remain the group tagged in the largest numbers – 143,632 tagged, or 32.4% of the total, followed by billfish – 132,204 or 29.7% of all fish tagged. A single species, yellowtail kingfish, with 36,186 tagged, represents 8.1% of all taggings while the total number of sharks (30,547) represent 7.1% of the total number of fish tagged on the program.

Figure 2 Total numbers of fish tagged as species groupings, 1974-2016



Summary for 2015/2016

Table 2. Numbers of all species or groups tagged and recaptured in 2015/2016

Species	Tagged	Recaptured
Southern bluefin tuna	2,932	24
Black marlin	2,031	19
Striped marlin	1,558	11
Blue marlin	873	4
Sailfish	601	11
Yellowtail kingfish	550	69
Dolphinfish	393	5
Whaler sharks	254	2
Samson fish	211	8
Mako shark	208	3
Australian salmon	204	4
Albacore	150	1
Bronze whaler shark	142	3
Spanish mackerel	116	1
Mackerel tuna	115	0
Blue shark	104	0
Hammerhead shark	96	2
Queenfish	74	0
Skipjack (striped) tuna	71	0
Yellowfin tuna	68	2
Golden trevally	57	0
Spotted mackerel	53	1
Tiger shark	49	2
Shortbill spearfish	49	0
Longtail tuna	48	0

Species	Tagged	Recaptured
Wahoo	44	0
Giant trevally	35	0
Scaly mackerel	30	0
Snapper	30	4
Gummy shark	29	2
School shark	28	2
Broadbill swordfish	25	0
Eagle ray	20	0
Silver trevally	20	0
Mulloway	20	3
Barracudas	17	0
Cobia	15	0
Gold spotted trevally	14	0
School mackerel	13	0
Blacktip shark	10	0
Bigeye tuna	9	0
Broad barred mackerel	8	0
Amberjack	8	1
Trevally	3	0
Thresher shark	3	0
Barramundi	2	0
Whitetip shark	1	0
Bigeye trevally	1	0
Rainbow runner	1	0
Tailor	1	0
Bonito	1	0
Barracouta	1	0
Dogtooth tuna	1	0
Grand Total	**11,397**	**184**

In 2015/16, with just under 3,000 tagged, southern bluefin tuna (SBT) were released in larger numbers than any other species, and in fact represented one quarter of all fish tagged for the year. When broken down by State, just over half of the SBT were tagged in South Australia (1,508), followed by Tasmania with 1,106 tagged. About 200 were tagged off the Victorian coast (a relatively low result), while only very small numbers were tagged off NSW or Western Australia.

Following three excellent years for numbers of juvenile black marlin running down the east coast, 2015/16 showed a one third decrease in overall numbers tagged compared with the previous near record year (2,031 vs 2,898). About 600 were tagged off the Fraser, Sunshine and Gold Coasts of southern Queensland compared with 1,200 the previous year. Numbers tagged off NSW (850) were similar to the previous year, although one shift was a significant proportion (250) of these tagged on the coast south of Sydney compared with the central and north coasts. Virtually all of the southern NSW fish tagged were 45 to 90 kg in size compared with 10 to 25 kg fish being tagged off the Sunshine Coast and to a lesser extent, northern and central NSW.

Off Western Australia, a similar pattern to previous years emerged with the main black marlin tag locations again being Dampier and Exmouth (188 and 165 tagged respectively), with only 15 released off Broome. The majority of black marlin tagged off Dampier were in the 15 to 30 kg range while those released off Exmouth were somewhat larger (many in the 40 to 80 kg range).

For a number of reasons, deploying tags on released black marlin during the heavy tackle season off Cairns/Lizard Island has dropped off in recent years. About 200 tagged black marlin were recorded in this fishery for the 2015 season, far fewer than the number of fish estimated to have been released. Novel methods for reliably recording non-tagged fish in this fishery are currently being investigated.

A record 873 blue marlin were tagged during 2015/16, continuing a steady upward trend for that species. Of this total, 632 were tagged off southern Queensland and NSW combined (450 last season), 95 off Western Australia (primarily Exmouth) and the remainder off Papua New Guinea, Tonga, Vanuatu and Fiji.

In contrast, the number of yellowfin tuna tagged, at just 68 fish, was the second lowest on record for the tagging program, only slightly more than the record low of 49 yellowfin tagged the year before. When only releases off NSW are considered, just 28 yellowfin were tagged between Tweed Heads and Eden, compared with 46 the year before. As noted in last year's report, the average numbers of yellowfin tuna tagged per year in the 1980s, 1990s and 2000s were 720, 1,630 and 1,021 respectively, the great majority of which would have been tagged off NSW, so this marked decline in apparent availability of the species is understandably of considerable concern to the recreational fishery. Oddly however, commercial longline catches of yellowfin tuna off the southeast coast have not shown a downward trend over the same period. The commercial fleet fishes well wide of the continental shelf, and generally catches larger fish, so it would appear that either smaller yellowfin are not recruiting on to the shelf as they did in the past, or separate stocks of tuna occur coastally and oceanically. A proposal for research into this apparent anomaly is currently being prepared. While southern bluefin tuna topped the species list for taggings this year, *billfish* species filled second, third, fourth and fifth places. Also, for the first time in the history of the program there were more blue marlin tagged than sailfish, illustrating not only a relatively poor year for sailfish fishing, especially off Queensland, but in the case of blue marlin, a likely combination of increased abundance of the species off NSW together with a concomitant increase in targeting them off eastern Australia.

Figure 3 Numbers of main species and species groups tagged in 2015/2016 and the previous five years.

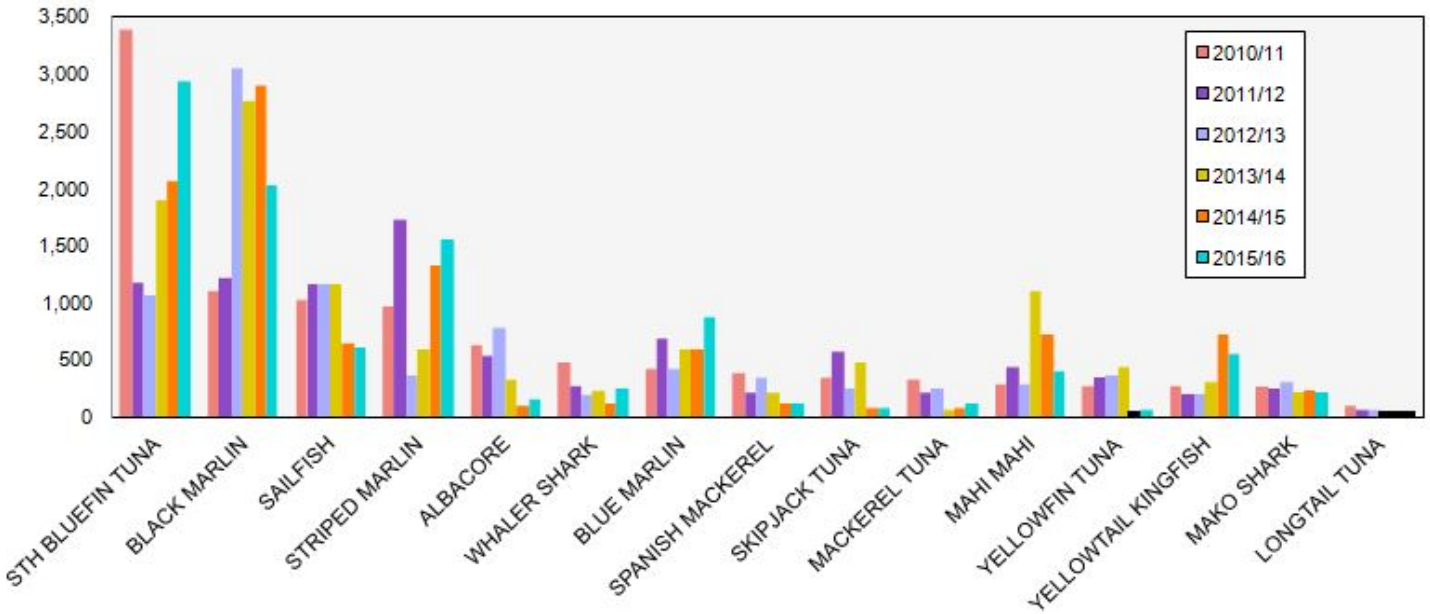


Figure 3 shows the variability in availability of different species for tagging across the past six seasons. For example, it illustrates large fluctuations in numbers of southern bluefin tuna tagged over that time, from a low of 1,000 in 2012/13 to highs of over 3,000 in 2010/11 and 2,900 last season. Figure 3 shows similar scales of variability in numbers of tagged black marlin, but in different years. Care should be taken in interpreting such changes. While for southern bluefin tuna, the locations of tagging are relatively consistent from year to year, numbers of black marlin tagged are strongly influenced by the appearance of strong year classes of juveniles on either the east or west coasts. Good and poor seasons on the adult black marlin fishery off the Great Barrier Reef can also affect overall numbers tagged in a given year.

Figure 3 also shows a steady increase in numbers of striped marlin tagged, after a sharp drop in 2012/13, as well as an increasing trend in taggings of blue marlin over the past six years. The last two years have shown a drop in numbers of sailfish tagged, dolphinfish taggings have shown a downward trend in the past three years, to average levels while mako and whaler shark taggings have been relatively consistent over this period.

Again reiterating points made in previous reports, the detection and quantification of changes over time in either fishing activities of the recreational sector, or availability of fish, would be all but impossible in the absence of the tagging program. 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 abundance in relation to historic environmental variables.

The most recent example of this was a study conducted by James Cook University Honours student Nick Hill (and others) which cleverly used release information on over 18,000 tagged black marlin. They found that the ideal habitat for black marlin (as determined by the conditions prevailing at their release points) had shifted south at a rate of 88 km per decade (Hill et al. 2015).

Combining the species tagged into groups, Figure 4 shows that billfish dominated overall taggings in 2015/16, comprising 45.1% of all fish tagged – a slightly lower proportion than the previous year (49%), but still much higher than average years when billfish have averaged between 30 and 35% of all fish tagged in a given year. The proportion of tunas tagged represented 29.8% of the total (22% last year) while sharks represented 8.1% of the total, higher than the average of about 7% over the last decade or so.

Figure 4 Species groups tagged in 2015/2016

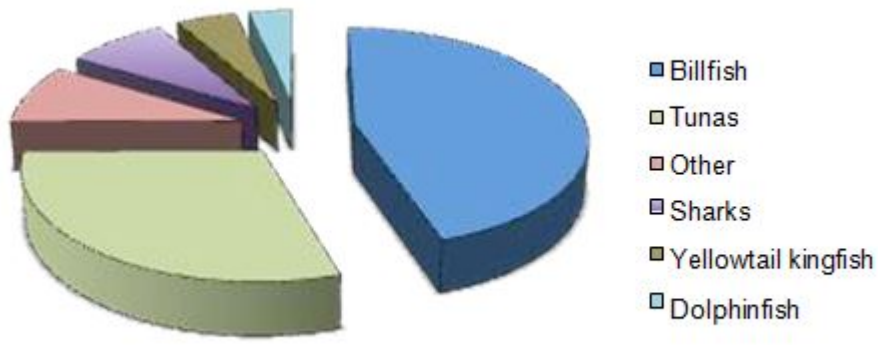
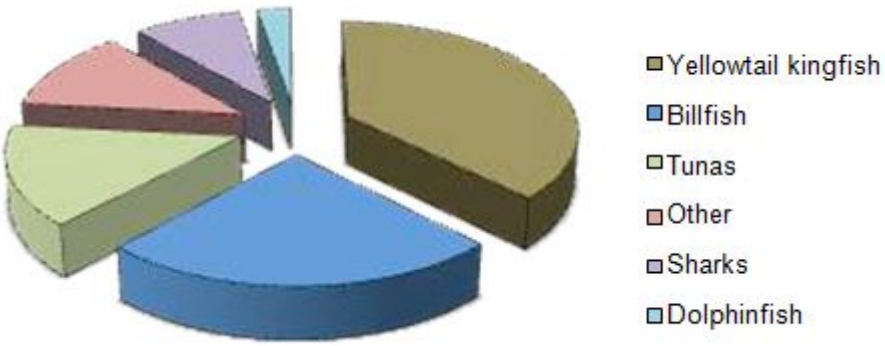


Figure 5 shows the proportions of the major species groups recaptured in 2015/16, and as is usually the case, indicating quite different proportions to those tagged.This year, yellowtail kingfish again dominated recaptures (37.5%) while billfish represented the next highest proportion of recaptures (24.5%). Shark recaptures as a proportion of the total (8.7%) showed a slight increase over last year (7.7%).

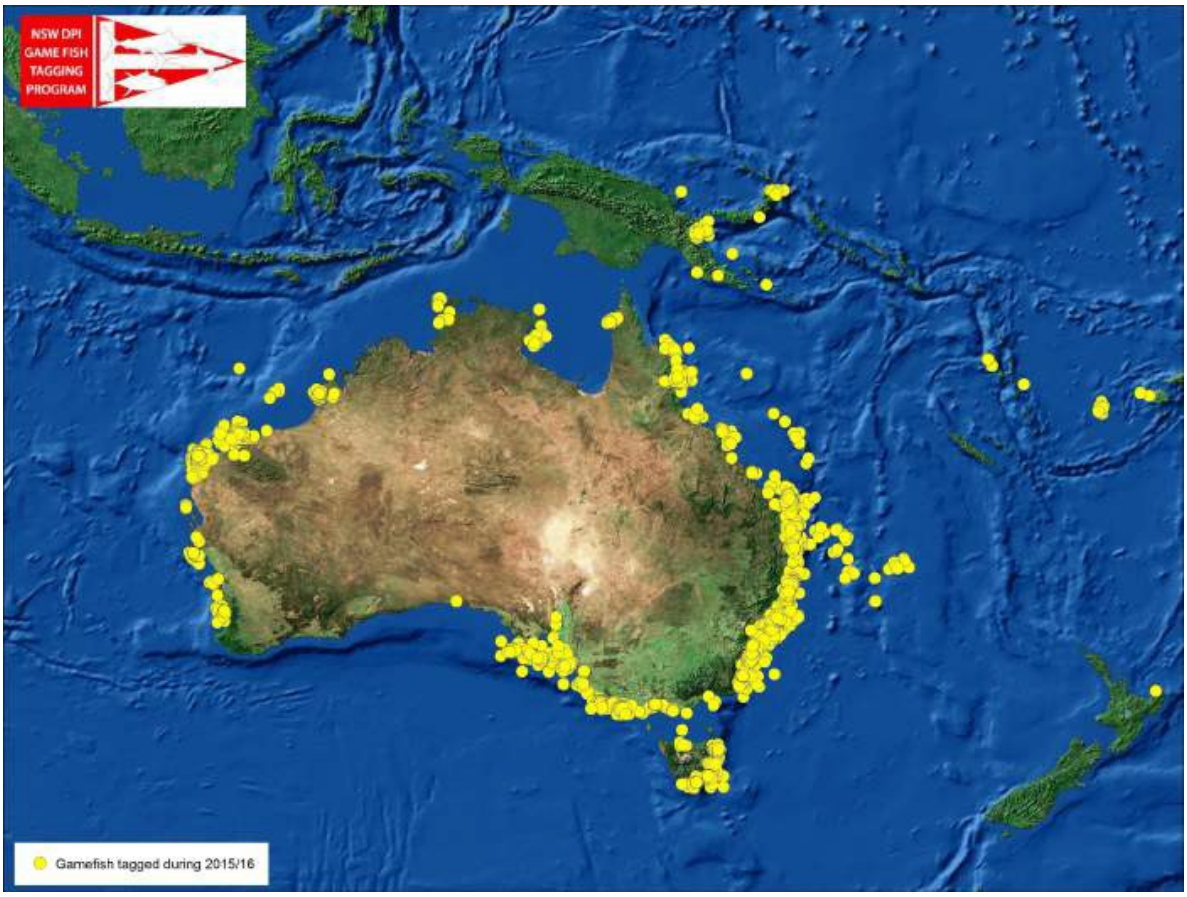
Figure 5 proportions of the major species groups recaptured in 2015/16



Highlights of the 2015/16 tagging year

The map below shows locations of fish tagged in 2015/16. While the program is primarily conducted around the Australian coast, it has historically also extended to neighbouring regions where anglers wish to tag their catch, with obvious benefits to accruing knowledge of the pelagic fishes of our general region. This plot showing the distribution of tagging activity is similar to previous years, with increased taggings around eastern Papua New Guinea and New Britain. Note that New Zealand operates its own similar tagging program.

Figure 6 Positions of releases of tagged gamefish during 2015/16.



Recaptures in 2015/16

All of the completed recaptures recorded in 2015/16 are listed in Appendix I. Following are just some of the highlights of these recaptures. These tend to emphasise some of the longer times at liberty or longer distances moved by tagged fish and as such, may quite 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 should be noted that the information gained from these 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

2015/16 marked another great year for not just releases but also recaptures of black marlin. A total of 19 recaptures were recorded with times at liberty ranging from 0 to 358 days and distances travelled from 0 to 900 nautical miles.

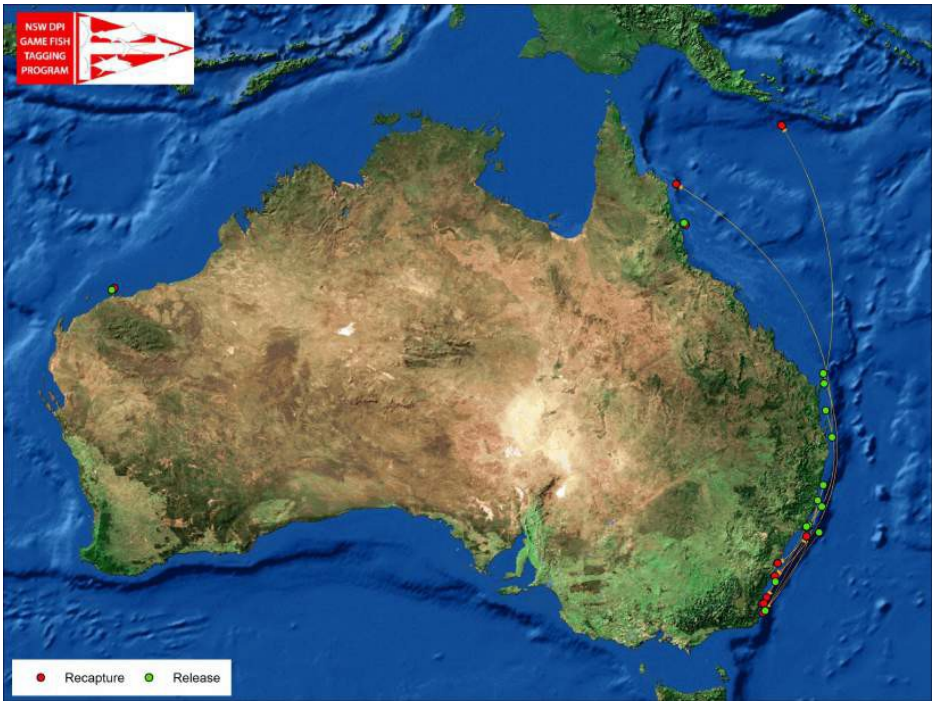
In years of mass migration of juvenile black marlin southward from northern Queensland, numbers of tagged fish are often recaptured along the way, as far south as central and southern NSW.

This year, although no long distance movements of black marlin tagged off northern Queensland were recorded, a number of fish tagged off southern Queensland were recaptured well to the south along the NSW coast.

Two small black marlin tagged inside Fraser Island apparently swam in opposite directions before being recaptured. Tagged in November 2015 within 5 days of each other, one fish, estimated at 10 kg at release, was recaptured by a local longline vessel near the island of Samarai on the eastern tip of Papua New Guinea after 162 days. The second fish, even smaller at 7 kg, was caught 128 days after release off the ‘Tubes’ at Jervis Bay by a land-based angler – the first such recapture of a black marlin in the program’s history. The fish weighed 14 kg on recapture, which fits well with the rapid growth rate previously estimated for this species.

In addition to the Jervis Bay recapture, there was a spate of other black marlin recaptures on the southern NSW coast that had been tagged off southern Queensland or northern/central NSW. These included a fish tagged off Coffs Harbour and recaptured off Wollongong, another from Port Stephens to Bermagui, one from Port Macquarie and recaptured off Tuross, one from Port Stephens to Tathra, and one tagged off Crescent Head and recaptured off Eden on the far south coast of NSW. The fastest rate of travel was a 70 kg fish that swam 260 nautical miles from Port Stephens to Bermagui in just 9 days. The furthest distance swum by a recaptured black marlin this year (900 nautical miles) was by a 15 kg fish that moved from Southport on the Gold Coast to No. 10 Ribbon Reef on the Great Barrier Reef. The fish had been at liberty for 8.5 months.

Figure 7 Recaptures of black marlin during 2015/16. Note many coastal movements to southern NSW and also two long distance movements north from southern QLD.



Blue marlin

Blue marlin tend to have a lower recapture rate than either black or striped marlin, but with increasing numbers being tagged in recent years, the number of reported recaptures has increased concomitantly. In 2015/16, four blue marlin recaptures were reported. One of these, estimated at 100 kg, was tagged off Newcastle, NSW in January 2016 and recaptured by a commercial vessel in the Solomon Sea – a straight-line distance of 1,473 nautical miles.

Two of the other recaptured blue marlin had been tagged off the Gold Coast, QLD, both in the first half of 2014 and both estimated at 120 kg. One was recaptured 21 months later off Tuross NSW (the most southerly blue marlin recapture for the program so far), while the other had headed northeast, to be recaptured nearly 22 months later by a New Caledonian longliner on the Lord Howe Rise, about half way between Australia and New Caledonia. Some previous recaptures of blue marlin, and several popup satellite tags have also shown long northeasterly movements from release locations off various parts of southeastern Australia.

An interesting observation was made on the blue marlin recaptured off Tuross. Not only was it bearing the previous tag, but it also had a longline hook in the corner of its jaw, neither of which was noticed until the fish was rolled over to remove the hook. This means that the fish had in fact been caught at least three times – once by the original tagging vessel, once by a longline vessel and once by the recapture vessel, which happily re-released it yet again. This recapture illustrates the importance of looking on both sides of a fish for a previous tag before releasing it.

Figure 8 Recaptures of blue marlin during 2015/16. Some previous recaptures have also shown movements to the Solomon Sea, while the recapture off southern NSW is the most southerly recapture for a blue marlin so far.

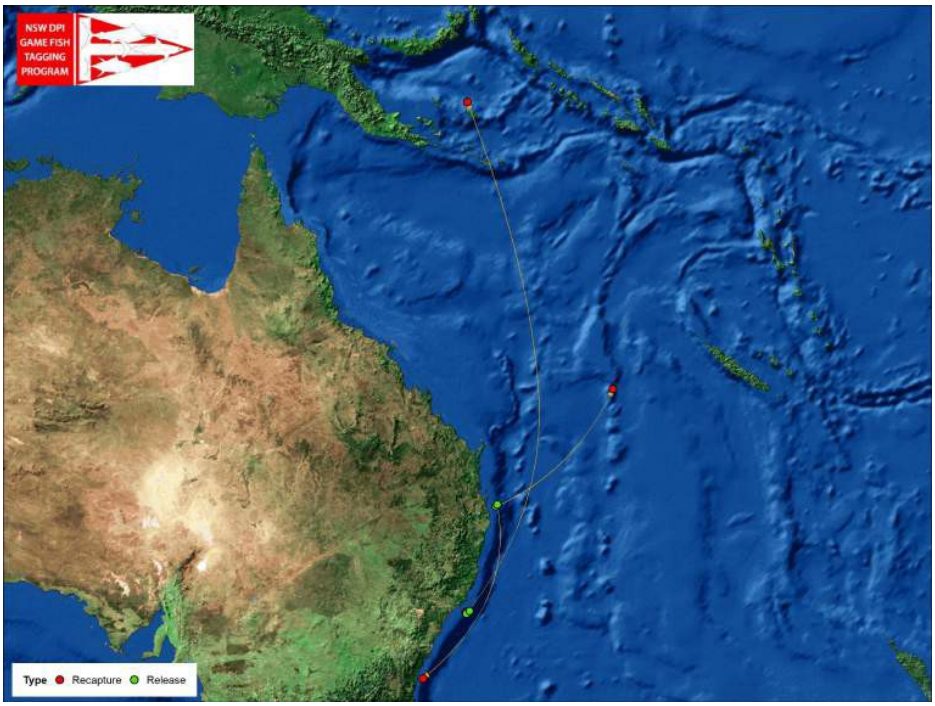


Figure 9 Releasing a typical blue marlin wide of the coast

Sailfish

Eleven sailfish recaptures were reported in 2015/16, nearly double the number for the previous year. Demonstrating the widespread scale of the tagging program, release locations for these fish included Papua New Guinea, northern QLD, southern QLD, Broome, WA and Groote Island, NT.

One sailfish recapture was particularly unusual. This was a very small fish, (estimated at 10 kg) tagged off Cape Moreton, QLD in December 2015. It was subsequently recaptured 57 days later (estimated at 15 kg) at Fish Rock, NSW, a distance of 238 nautical miles to the south. This is the first recapture of a sailfish in NSW waters, and also one of very few movements greater than 100 miles recorded for sailfish tagged off either eastern or western Australia.

More typical of sailfish recaptures was one tagged off Broome, WA and recaptured almost exactly one year later at the same location, and one tagged off Groote Eylandt, NT and recaptured a little over two years later just one mile from its release point. In contrast, two recaptures of PNG-tagged sailfish did show significant movements away from their release locations. Both were tagged off Port Moresby, were at liberty for some time, had moved about the same distance (114 and 125 nmi) in the same general direction to the west and were recaptured by commercial longliners. However, one had been at liberty for 308 days, while the second was recaptured after a considerably longer period (2 years and 48 days).

The apparent lack of movement of most recaptured sailfish around the Australian coast is somewhat difficult to explain since they are only seasonally present at most of these areas, and are believed to be absent at other times. Results of tagging in other areas though, including these examples from PNG and also satellite tagging of sailfish in other regions, do indeed show movements of at least some fish over hundreds of miles within months of release.

Therefore, lack of recaptures from other areas may simply indicate lack of fishing effort directed at sailfish in those locations, although more work is needed to confirm this possibility.

Striped marlin

In 2015/16, eleven striped marlin recaptures were reported, one by a commercial longlining vessel and the other 10 by recreational boats. All but one were recaptured relatively close to the coast, the one exception being the commercially caught fish that was taken about 160 nautical miles east of the Gold Coast, having been tagged three months earlier off Lakes Entrance, Victoria. This was also the longest distance recorded for a tagged striped marlin this year (750 nmi).

Six of the recaptured fish were caught off southern NSW coast from release positions between Port Stephens and Sydney. Bermagui was a hotspot, with three recaptures of northerly tagged striped marlin recaptured there, and two taggings of fish that were subsequently recaptured to the north, one off Ulladulla and one off Shoalhaven Heads.

Figure 10 Top billfish tagger for 2015/16, Chloe Lawrence, re-releasing a striped marlin off Jervis Bay that had been tagged previously off Merimbula, NSW

One of the fish recaptured off Bermagui had been tagged off Norah Head off the central NSW coast just 35 days previously. What made this recapture of special note was the fact that the original tag, which was retrieved, was completely covered by a massive growth of soft, gooseneck barnacles. Anglers often assume that barnacles take a long time to grow, but occasional observations like this clearly show that these particular barnacles grow very rapidly indeed.

Repeating a somewhat familiar pattern, ten of the recaptured striped marlin were caught within three months of release, one after 104 days and one after 13 months. There have now been 247 recaptures of tagged striped marlin reported on the program but as indicated in previous reports, only a very small proportion of these have been recaptured beyond one year at liberty (one of these, after 13 months last year). This lack of longer term recaptures continues to be difficult to explain, especially since much longer times at liberty have been regularly recorded for the other billfish species – black marlin and sailfish, and more lately, blue marlin. The most likely explanation for lack of long term recaptures for this species seems to be that they have an innate ability to reject tags at a higher rate than other species, although proving this would be very difficult.

Figure 11 tag removed from a striped marlin that had been released just 35 days earlier, showing that gooseneck barnacle growth can be very rapid in the open ocean.

Southern bluefin tuna (SBT)

After two seasons of relatively few recaptures of tagged SBT (five last year and four the year before), a total of 24 recaptures were reported during 2015/16. Of these, three were tagged off Tasmania, two off Victoria and the other 19 off South Australia. Notably, 20 of the recaptures were reported by commercial fishing operators catching SBT near Kangaroo Island, SA, for the pen-aquaculture industry operating out of Port Lincoln. Most of those recaptures were only recorded when tags were found when harvesting fish from pens, some months after their original capture. In most cases, the dates and places of capture were able to be traced from serial numbers on the floating cages in which the fish had been penned. The weights of those fish were recorded at harvest, but since penned fish are fed liberally, growth rates would invariably be higher than in the wild.

The furthest distance moved by a tagged SBT recorded in 2015/16 was by an estimated 25 kg fish tagged in April 2014 off Hippolyte Rocks, TAS. It was recaptured 21 months later near Kangaroo Island, SA, 618 nautical miles from its release point.

Eleven of the fish recaptured near Kangaroo Island by commercial nets were released from Port Fairy, VIC to Port MacDonnell, SA, with distances moved ranging from 170 to 370 nautical miles. Times at liberty for these fish, shown in Appendix I, mostly include the times that the fish were kept in pens between capture in the wild and harvesting – usually periods of 3 or more months, and so do not reflect actual rates of travel. Even so, several of these recaptured fish indicated times at liberty 399, 449, 647, 620, 673 and 995 days, providing useful information on longer term movements or lack thereof.

Mako shark

Three mako sharks were recaptured during 2015/16. One of these was just 3 kg when released by a commercial vessel wide of the Gold Coast – at which size it must have been just born. It was recaptured near the southern Queensland coast 108 days later when it was estimated at about 7 kg. The other two recaptured makos were re-caught relatively near their release points, one after nearly exactly one year, the other after 4 years one month. The latter fish was tagged wide of Botany Bay at an estimated weight of 110 kg. When recaptured at the Kiama canyons, it was taken and weighed 118 kg.

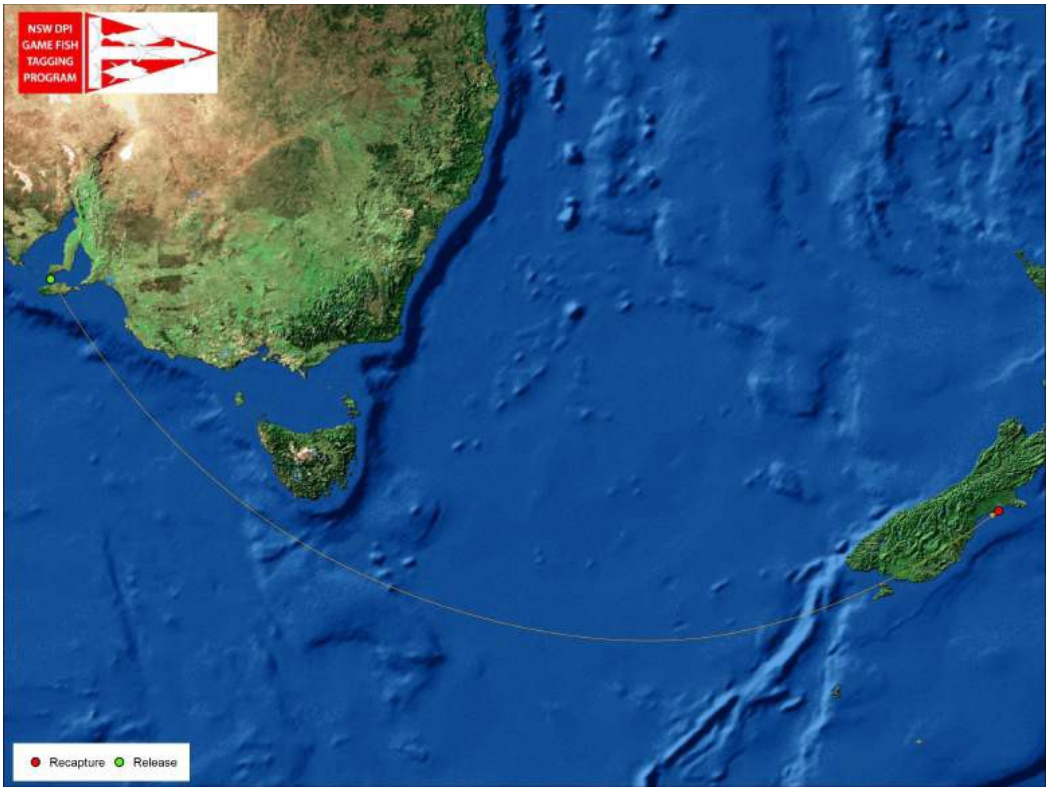
This apparent very slow growth rate is possibly explained by the fact that the shark was found to have a large internal growth surrounding a previous hook, although it was uncertain if it was the hook used when the shark was originally tagged.

Interestingly, the mako that had been at liberty for one year had grown from an estimated 80 kg to 110 kg.

School shark

A school shark caught and tagged off a jetty at Stenhouse Bay, SA in February 2014 made an epic swim all the way to New Zealand. The shark, measuring 151 cm and weighing 16.3 kg at tagging was recaptured 303 days later by a commercial fisherman fishing the Canterbury Bight on the South Island of New Zealand. It had travelled a straight line distance of 1,685 nautical miles and measured 155 cm on recapture.

Figure 12 Trans Tasman crossing by tagged school shark



Tiger shark

A group of keen anglers based in Dampier, WA have been tagging numbers of tiger sharks in the area for some years and some interesting recaptures have been eventuating. A tiger tagged off Delambre Island way back in September 2009 was recaptured only 40 miles from its release point 6 years 8 months later. At tagging, it had been estimated at 40 kg, and had grown to an estimated 220 kg during the intervening period. Recaptures like this that provide good data on actual growth rates of individual fish over long periods of time are invaluable to our understanding of the biology of many species.

Yellowfin tuna

Having noted above the dearth of yellowfin tuna tagged over the past two years, recaptures of previously tagged fish continue to be recorded. This year, two of these were logged, one that had been at liberty for 2 years 2 months, and the other for 4 years 8 months. The first of these was estimated at just 2 kg when tagged near Stradbroke Island, QLD and weighed 25 kg when recaptured 170 nautical miles off the coast of New Caledonia by a local longliner. The second fish was tagged off the Gold Coast at an estimated length of 70 cm (about 6 kg) and weighed 65 kg on recapture by an Australian longliner wide of Fraser Island. Again, both of these recaptures add very useful information on growth rates of this important species.

Albacore

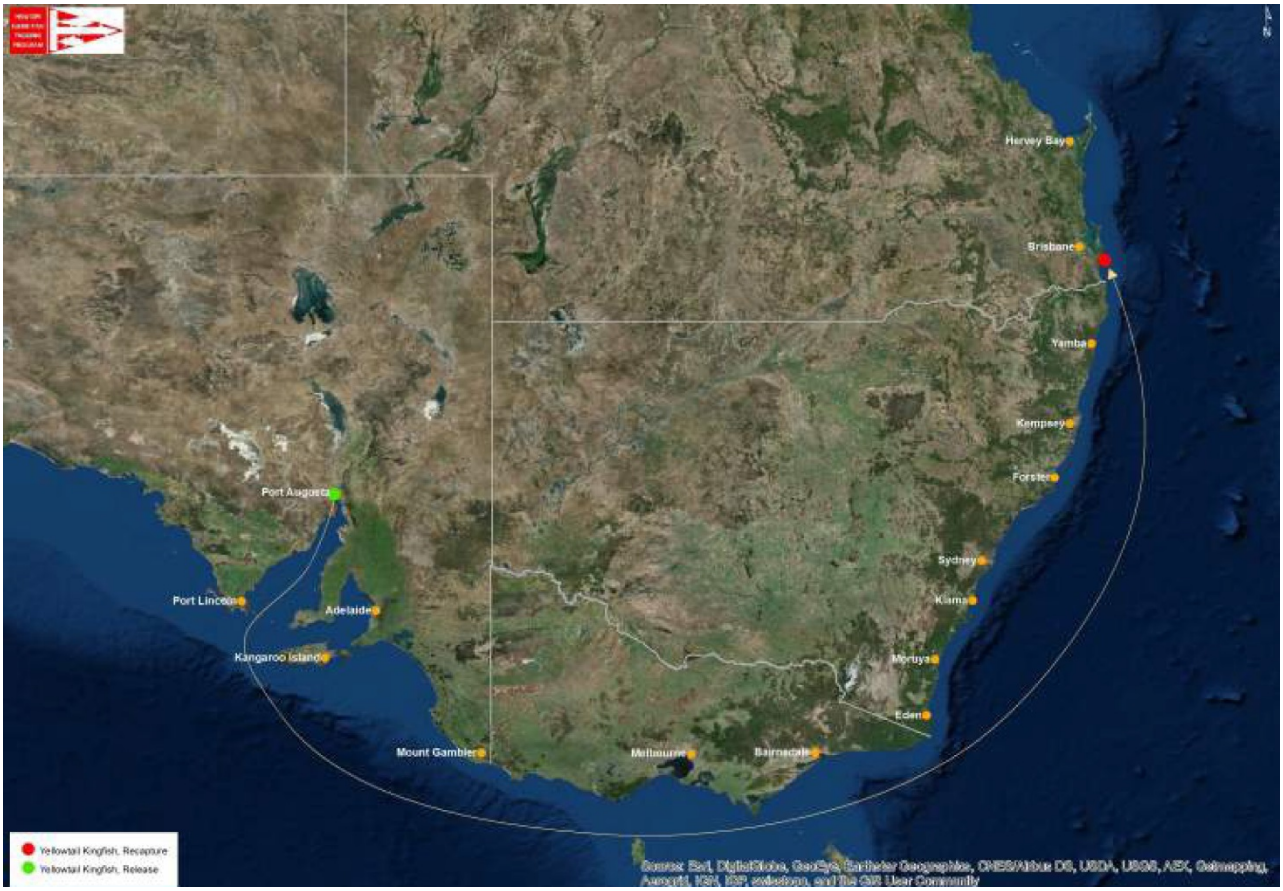
Albacore have been tagged in good numbers over the years and recaptures represent the only source of tagging data for the species for use in stock assessments in the western Pacific. This year, a single albacore was recaptured, but it proved to be of considerable interest. The fish tagged in October 2013 off Broken Bay, NSW, and was recaptured 850 days later by a longline vessel off the west coast of New Caledonia, a straight line distance of approximately 1,000 nautical miles. The fish was estimated at 15kg on release and at recapture, was estimated at 15-20kg. This supports slow growth rates for albacore discerned from other long term recaptures of the species over time.

Yellowtail kingfish

Following on from 2014/15 when 60 yellowtail kingfish recaptures were reported, a total of 69 were recaptured in 2015/16. Thirteen of these had been at liberty for more than a year, three for more than two years and one for just under three years. With respect to distances moved, just 11 fish had moved more than 100 nautical miles, ten of which had been tagged in South Australia, and were larger fish, ranging in size at release from 10 to 30 kg. The one exception was an estimated 2 kg fish released off Port Hacking, NSW and recaptured off Eden, NSW seven months later, where it was weighed at 4.2 kg. In contrast to the relatively few kingfish that moved significant distances, 49 of the recaptured fish were caught within 10 nautical miles of their release points (36 of those within 2 miles of release), six of those after a year or more.

The furthest distance moved by a kingfish this year was by a fish tagged off Port Augusta, SA and recaptured off Jumpinpin QLD after 2 years 4 months. This was the seventh Port Augusta tagged kingfish to swim around to the east coast and head north, beating by a fair margin the northernmost recapture set last year by a fish that was recaptured off Coffs Harbour, NSW. The kingfish had swum at least 1,600 nautical miles (3,087km) around the south and east coast of Australia and grew from 121cm to 127cm (16.25kg).

Figure 13 A long-distance record for yellowtail kingfish was set by a fish tagged off Port Augusta SA and recaptured 2.3 years later at Jumpinpin QLD.



One especially interesting recapture of a kingfish this year showed just how fast the species is capable of growing. This fish was tagged on the 12 mile reef off Sydney and measured 81 cm at the time. It was recaptured at the same location almost exactly 6 months later when it was measured at 110 cm, an amazing increase in length of 29 cm. There have also been a number of other 70-80cm kingfish previously tagged under the program that have grown around 20cm in 6-8 months, reinforcing the potential for fast growth rates of this important sport fish.

Figure 14 This yellowtail kingfish grew from 81 to 110 cm during the 6 months between tagging (left) and recapture (right).

Recaptures with no tag cards

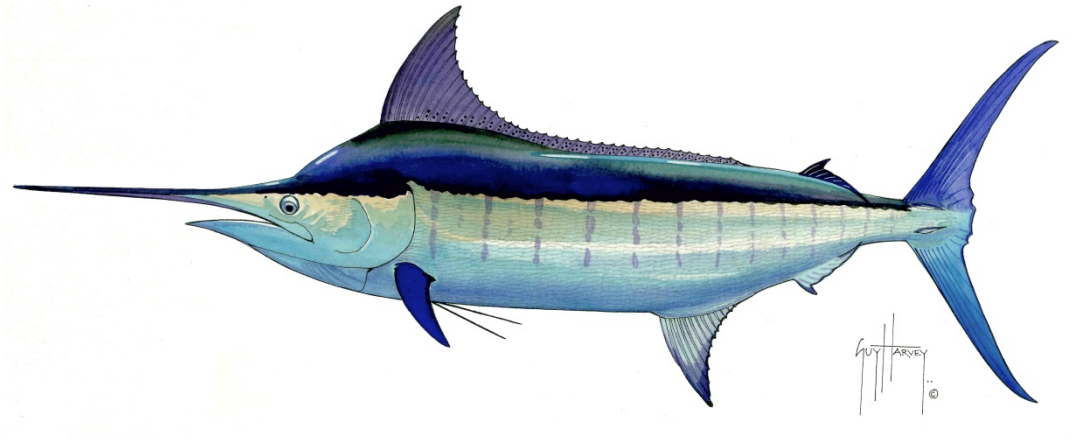
Each year, NSWDPI is notified of the recapture of some fish for which no tag card has been received. In many cases, the missing card is eventually sent, or is located by contacting club recorders or boat owners who have returned tag cards from the same batch of tags as the missing ones. In some cases though, cards are not received in which case, potentially valuable information is lost.

This year, information on five recaptures was received with no matching tag card, as yet, in the database. These are shown in the table 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.

Table 3 Fish recaptured in 2015/16 for which no tag card has been received

Tag No	Species	Where recaptured	Date recaptured	Est Wt (kg)
A506407	Australian salmon	Cockburn Sound WA	29/05/16	5
B106610	Black marlin	Dampier WA	1/08/15	30
B031478	Sailfish	Kuala Rompin, Malaysia	20/10/15	?
A590145	Yellowtail kingfish	Sydney Harbour	9/01/16	6.9
B101259	Black marlin	NSW Port Stephens NSW	20/2/16	25

Focus on: Blue marlin (*Makaira nigricans*)



Each year, the tagging report takes a look at the biology of key species tagged on the Program. The following summary of the biology of the blue marlin has been adapted from the book, *Fishes of the Open Ocean* by Julian Pepperell (UNSW Press). *Blue marlin illustration courtesy Guy Harvey.*

The blue marlin is a true giant of the ocean. Its confirmed maximum size of over 820kg makes it the second largest teleost (bony) fish, after the oceanic sunfish. Blue marlin occur in all three of the world's major oceans. The Indo-Pacific populations have always been regarded as a single species, but blue marlin of the Atlantic and the Indo-Pacific were considered by some scientists to be separate species – *Makaira nigricans* in the Atlantic and *Makaira mazara* in the Indo-Pacific. The most recent genetic studies, however, now consider the blue marlin to be a single global species, *Makaira nigricans*.

The blue marlin can be identified by its relatively high, pointed first dorsal fin (usually about two-thirds the maximum body depth), its folding pectoral fins and its proportionally large first anal fin. Other features are its relatively short lower jaw, and its gun-metal blue/grey color after death. A further feature to separate blue marlin from black marlin is that in the blue, the second dorsal fin is posterior to the second anal fin, whereas the relative fin positions are the other way round in the black marlin.

Geographic range

The distribution of blue marlin is circumtropical, extending in summer to about 45° latitude in both hemispheres. Blue marlin are the most tropical of the istiophorid billfishes, as well as the most oceanic. They are normally found near islands or in the open ocean throughout their range, not usually being strongly associated with continental shelves (as is the black marlin). They are, however, commonly caught wide of continental shelves, which is the case on both the east and west coasts of Australia.

Movements

Historically, the majority of blue marlin were tagged by recreational anglers in the Atlantic ocean, mainly off the eastern United States and in the Caribbean.

Tens of thousands of blue marlin have been tagged in the region, and hundreds recaptured. Movements of tagged fish have been extensive, with several trans- Atlantic crossings being recorded. The most startling recapture though was a fish tagged off South Carolina and recaptured three years later near Mauritius in the Indian Ocean – the first proven movement between two oceans for any billfish (Atlantic to Indian).

In the Pacific, tagging of blue marlin off southwestern United States and Hawaii has revealed some very extensive movements as well. The most notable of these was a blue marlin tagged off Hawaii that was recaptured near Taiwan. Off Australia, Papua New Guinea and some western Pacific islands, even though over 9,600 blue marlin have been tagged and released, there have only been 34 recaptures to date. Again, however, one of these was highly noteworthy. This was a blue marlin tagged off the Australian southeast coast, and recaptured 18 months later by a Japanese longliner 300 nautical miles south of Sri Lanka – the second inter-oceanic movement of a pelagic fish (Pacific to Indian) and again, a blue marlin.

Growth and size

The two largest billfish ever weighed and verified, both caught off Hawaii, were blue marlin. The largest weighed 1,805 pounds (820 kg) and was landed by a party of anglers aboard a charter boat off Honolulu in 1971, while the second heaviest billfish, also a blue marlin, weighed 1,656 pounds (753 kg) and was caught off Kona Hawaii in 1984. There are many anecdotal reports of blue marlin weighing in excess of 2,000 pounds (even as high as 2,600 pounds) being caught by commercial longline vessels, but it is not possible to verify any of these accounts.

By examining what are assumed to be daily growth rings on otoliths of very small fish, the early growth rate of blue marlin does appear to be very rapid, reaching 30 kg within the first year. It is theorized that all of the billfishes initially grow in length very quickly, presumably in order to be able to outswim predators as soon as possible. This is also an explanation for why very small billfish are rarely caught — it may simply be because they don't stay small for very long.

Reproduction

According to early Japanese studies, blue marlin apparently have extensive spawning areas throughout the tropical and sub-tropical Pacific, Indian and Atlantic oceans. This picture is based almost entirely on the occurrence of larval blue marlin over very broad areas of these three oceans, and also assumes that billfish larvae have been correctly identified in these surveys.

Spawning adult blue marlin do appear to be patchily distributed, and are mainly found in seasonal aggregations around isolated islands. Around Hawaii, nearly 80% of the blue marlin landed during summer are males, mostly less than 90 kg in size. Female fish caught at the same time cover a much greater size range, from as small as 22 kg to over 600 kg. Examination of the gonads of these fish has shown that spawning of blue marlin, at least at the latitude of Hawaii, is highly seasonal and predictable. Similar results have been obtained at Mauritius, indicating that blue marlin are apparently able to locate remote islands as the spawning season approaches.

A 400 kg blue marlin may produce as many as 150 million eggs, each a little over 1 mm in diameter. As is the case for other billfishes, fertilization is external, and hatching of the tiny larvae occurs at the surface within two days.

One recent study suggests that female blue marlin (as well as sailfish and white marlin) may spawn as many as four times in one season, but it is also speculated that spawning frequency may be much higher.

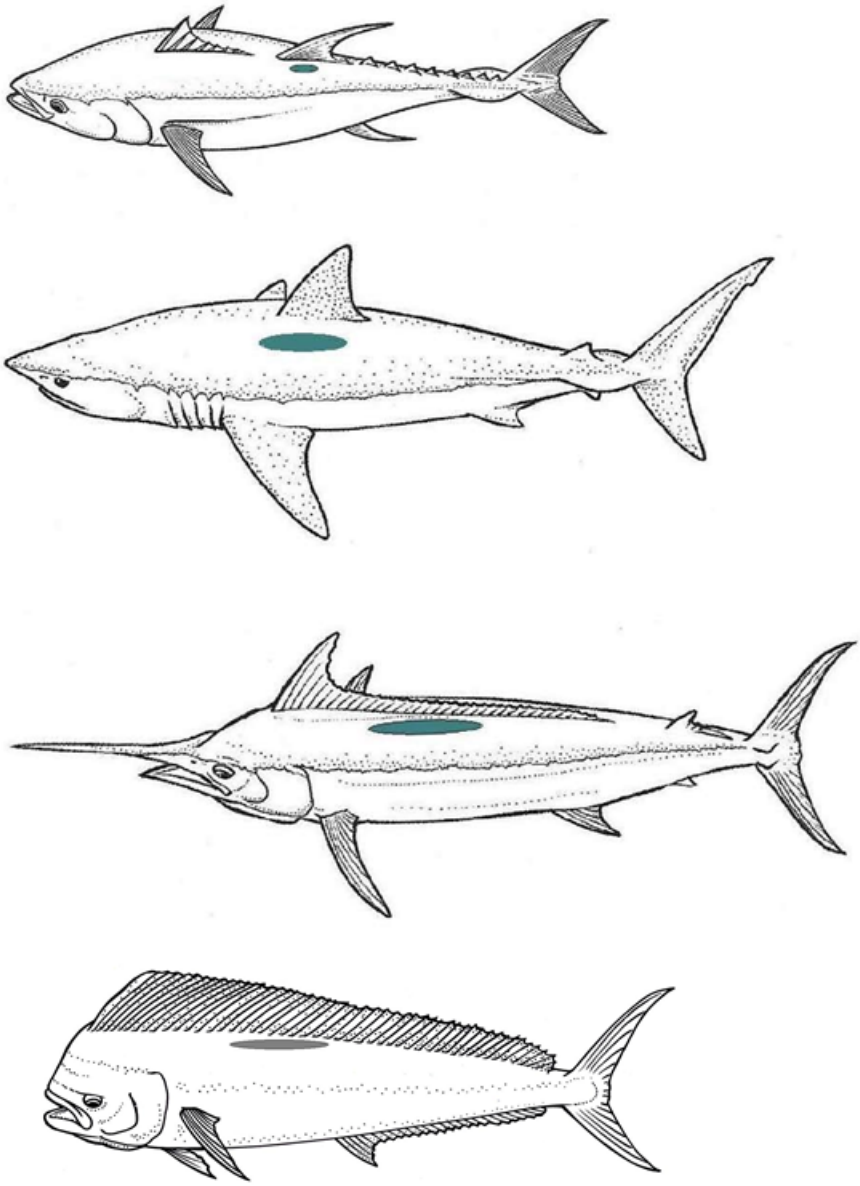
As blue marlin larvae and post larvae grow, they differ from all other billfishes in that they do not develop a bill until they reach quite a large size (over 5 kg and one metre in length). This feature suggests that all of the other billfishes (broadbill excluded) form a relatively closely related group, with blue marlin representing an offshoot or outlier species.

Fisheries

Like most of the other istiophorid billfishes, the blue marlin is an incidental by-catch of the tuna longline fleets of the world. In addition, significant numbers are also taken as a by-catch of purse seine vessels which set their nets around floating logs. Stock assessment studies in the Atlantic ocean strongly point to overexploitation of blue marlin in that region, but in the Pacific, it appears that blue marlin stocks may be stable.

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 by hand tagger or short pole, as 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 (ie 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 should the fish be kept for scientific examination? Unfortunately, there is no clear-cut answer, but generally speaking, if the tag looks very fresh (ie, bright yellow or orange with no growth) then it is probably a very recent tag and the fish can be returned after first either recording the tag number, or better, cutting off the tag and putting another into the fish.

If the fish is small enough to measure, then this should be done, ideally from the tip of the snout to the fork in the tail (or if a billfish, from the tip of the lower jaw to the tail fork). Alternatively, if the tag is fairly obviously an old one, usually identified by being faded and covered with at least some growth, then the best advice is to keep the fish, if possible, for later scientific examination. It should be wrapped in plastic and frozen, and a call made to NSW DPI Nowra, or your local Fisheries Department, for advice. Very useful information can be gathered from inspection of recaptured fish, including more accurate growth rates, condition of released fish and effectiveness of different types of tags and tagging sites.

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 (even though the tag number is unknown) and report the incident to NSW DPI (Fisheries) at Nowra 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) 4424 7423 or email gamefish.tagging@dpi.nsw.gov.au

Reference

Hill, N.J., A.J. Tobin, A.E. Reside, J.G. Pepperell and T.C.L. Bridge (2015). *Dynamic habitat suitability modelling reveals rapid poleward distribution shift in a mobile apex predator.* Global Change Biology (2015), doi: 10.1111/gcb.13129.

Appendix I: All Recaptures of Tagged Fish Reported in 2015/2016.

Species	Date tagged	Release location	Days at liberty	Distance moved (nmi)	Direction
Albacore	19/10/13	Broken Bay (NSW)	850	1,005	NE
Amberjack	7/11/14	Long Reef (NSW)	358	0	S
Australian salmon	20/05/16	Cockburn Sound (WA)	9	0	S
Australian salmon	12/04/16	Mewstone (WA)	38	0	NW
Australian salmon	24/04/16	Mewstone (WA)	21	26	SE
Australian salmon	28/08/15	Rowboat Rock (WA)	62	98	SW
Black marlin	26/01/16	Coffs Harbour (NSW)	17	270	SSW
Black marlin	12/01/16	Crescent Head (NSW)	56	372	SW
Black marlin	22/08/15	Fitzroy Island (QLD)	1	8	SSE
Black marlin	7/11/15	Fraser Island (QLD)	162	807	NW
Black marlin	12/11/15	Fraser Island (QLD)	128	639	SW
Black marlin	24/02/16	Gibber Reef (NSW)	4	1	S
Black marlin	21/02/16	Gibber Reef (NSW)	11	0	NW
Black marlin	11/03/16	Merimbula (NSW)	57	253	NNE
Black marlin	31/01/15	Mooloolaba (QLD)	358	363	SW
Black marlin	13/01/16	Moreton Island (QLD)	54	55	SE
Black marlin	13/01/16	Port Macquarie (NSW)	46	314	SSW
Black marlin	30/01/16	Port Stephens (NSW)	9	260	SSW
Black marlin	30/01/16	Seal Rocks (NSW)	0	0	NW
Black marlin	30/01/16	Seal Rocks (NSW)	19	7	WSW
Black marlin	30/01/16	Seal Rocks (NSW)	15	8	SW
Black marlin	18/01/15	Southport (QLD)	258	901	NNW
Black marlin	7/02/16	Ulladulla Canyons (NSW)	22	75	SSW
Blue marlin	6/06/14	Gold Coast (QLD)	633	533	SSW
Blue marlin	20/04/14	Gold Coast (QLD)	656	454	NE
Blue marlin	26/01/16	Newcastle Canyons (NSW)	20	1,473	N
Blue marlin	12/03/16	Redhead (NSW)	13	11	WSW
Bronze whaler	15/08/15	Coffs Harbour (NSW)	99	2	NNW
Bronze whaler	9/03/15	Greenly Island (SA)	408	748	W
Bronze whaler	14/02/16	Stenhouse Bay (SA)	57	9	ESE
Dolphinfish	23/01/16	Port Hacking (NSW)	1	0	NW
Dolphinfish	24/01/16	Port Hacking Wide (NSW)	7	0	S
Dolphinfish	23/01/16	Sydney South FAD (NSW)	11	12	NE
Dolphinfish	18/01/16	Sydney Wide (NSW)	3	0	N
Dolphinfish	10/01/16	Terrigal (NSW)	8	12	W
Gummy shark	30/12/13	Backstairs Passage (SA)	705	3	ESE
Gummy shark	22/01/15	Port Macdonell (SA)	160	6	NW
Hammerhead shark	26/11/15	Dampier Archipelago (WA)	0	0	NW
Hammerhead shark	21/02/16	Double Island Point (QLD)	46	26	SW
Mako shark	30/07/11	Botany Bay Wide (NSW)	1,485	54	SSW

Species	Date tagged	Release location	Days at liberty	Distance moved (nmi)	Direction
Mako shark	9/08/14	Browns Mountain (NSW)	356	5	NW
Mako shark	29/06/15	Gold Coast Wide (QLD)	108	207	WSW
Mulloway	29/08/15	Coorong (SA)	57	3	E
Mulloway	3/04/15	Coorong (SA)	288	0	S
Mulloway	3/04/15	Coorong (SA)	296	0	S
Sailfish	23/06/14	Barred Creek (WA)	374	0	N
Sailfish	28/07/15	Broome (WA)	73	4	NE
Sailfish	28/06/15	Broome (WA)	29	10	WNW
Sailfish	26/07/15	Cape Bowling Green (QLD)	39	0	NW
Sailfish	26/12/15	Cape Moreton (QLD)	57	238	S
Sailfish	8/11/15	Groote Eylandt (NT)	7	0	S
Sailfish	12/10/13	Groote Eylandt (NT)	749	1	S
Sailfish	20/10/15	Kuala Rompin	0	0	S
Sailfish	10/12/13	Port Moresby (PNG)	778	125	W
Sailfish	28/03/15	Port Moresby (PNG)	306	114	WSW
Sailfish	27/12/15	Surfers Paradise Wide (QLD)	90	11	ENE
Samson fish	6/08/15	Dawesville Cut (WA)	22	11	S
Samson fish	29/12/15	Rocky Island (SA)	93	9	NE
Samson fish	24/01/16	Rocky Island (SA)	53	2	SSW
Samson fish	24/01/16	Rocky Island (SA)	34	9	NE
Samson fish	29/12/15	Rocky Island (SA)	33	2	S
Samson fish	29/12/15	Rocky Island (SA)	49	9	NE
Samson fish	29/12/15	Rottnest Island (WA)	59	1	W
School shark	14/02/15	Stenhouse Bay (SA)	303	1,685	ESE
School shark	18/01/16	Stenhouse Bay (SA)	84	10	ESE
Snapper	6/05/16	Ardrossan (SA)	43	115	S
Snapper	22/03/15	Ardrossan (SA)	240	0	S
Snapper	16/12/15	ST Vincent Guls (SA)	0	0	NW
Southern bluefin tuna	19/12/14	Althorpe Islands (SA)	424	58	SSE
Southern bluefin tuna	30/12/15	Cabbage Patch (SA)	54	61	ESE
Southern bluefin tuna	16/03/15	Cabbage Patch (SA)	326	7	SW
Southern bluefin tuna	1/03/16	Cabbage Patch (SA)	16	0	NW
Southern bluefin tuna	17/01/16	Cabbage Patch (SA)	18	17	NW
Southern bluefin tuna	25/04/14	Hippolyte Rocks (TAS)	637	618	NW
Southern bluefin tuna	12/12/15	Pondalowie (SA)	60	15	SSE
Southern bluefin tuna	13/06/15	Port Fairy (VIC)	237	371	WNW
Southern bluefin tuna	13/06/14	Port Macdonell (SA)	571	308	WNW
Southern bluefin tuna	3/05/15	Port Macdonell (SA)	292	168	NW
Southern bluefin tuna	5/04/15	Port Macdonell (SA)	449	171	NNW
Southern bluefin tuna	3/05/15	Port Macdonell (SA)	399	196	NW
Southern bluefin tuna	2/05/15	Port Macdonell (SA)	285	244	WNW
Southern bluefin tuna	9/05/14	Port Macdonell (SA)	620	184	NW
Southern bluefin tuna	8/05/13	Port Macdonell (SA)	995	200	WNW

Species	Date tagged	Release location	Days at liberty	Distance moved (nmi)	Direction
Southern bluefin tuna	4/05/15	Port Macdonell (SA)	284	249	WNW
Southern bluefin tuna	7/05/16	Tasman Island (TAS)	35	117	NE
Southern bluefin tuna	31/01/16	Victor Harbour (SA)	150	150	NW
Southern bluefin tuna	30/12/15	Kangaroo Island (SA)	25	38	NE
Southern bluefin tuna	13/04/14	Warrnambool (VIC)	673	271	NW
Southern bluefin tuna	24/01/16	Wedge Island (SA)	18	19	SSE
Southern bluefin tuna	12/02/16	Wedge Island (SA)	6	24	SSE
Spanish mackerel	8/11/14	Fraser Island (QLD)	327	17	NW
Spotted mackerel	3/02/15	Grassy Head (NSW)	459	75	NE
Striped marlin	23/01/16	Bermagui 12 Mile (NSW)	15	106	NNE
Striped marlin	21/01/16	Bermagui Wide (NSW)	17	70	NNE
Striped marlin	30/03/15	Eden Wide (NSW)	394	120	NE
Striped marlin	11/03/16	Lakes Enterance (VIC)	89	752	NNE
Striped marlin	12/03/16	Merimbula Wide (NSW)	48	103	NNE
Striped marlin	10/01/16	Norah Head (NSW)	35	201	SSW
Striped marlin	1/01/16	Port Stephens (NSW)	68	251	SSW
Striped marlin	9/01/16	Port Stephens (NSW)	25	220	SSW
Striped marlin	29/03/15	Stanwell Park Wide (NSW)	104	0	
Striped marlin	31/12/15	Swansea (NSW)	43	141	SSW
Striped marlin	21/01/16	Sydney Wide (NSW)	51	163	SSW
Striped marlin	19/12/15	Sydney Wide (NSW)	46	175	SSW
Tiger shark	15/10/09	Delambre Island (WA)	2,441	40	WSW
Tiger shark	8/03/15	Karatha (WA)	396	0	NW
Whaler shark	16/01/16	Dampier Archipelago (WA)	0	10	N
Whaler shark	8/02/13	Kangaroo Island (SA)	887	52	WNW
Yellowfin tuna	15/01/11	Gold Coast Wide (QLD)	1,710	183	NNE
Yellowfin tuna	28/04/13	Stradbroke Island (QLD)	803	561	ENE
Yellowtail kingfish	29/09/15	Broughton Island (NSW)	21	2	E
Yellowtail kingfish	17/10/12	Coffin Bay (SA)	1,081	169	NE
Yellowtail kingfish	18/09/14	Coffin Bay (SA)	359	170	NE
Yellowtail kingfish	12/09/14	Coffin Bay (SA)	359	170	NE
Yellowtail kingfish	2/11/14	Coffin Bay (SA)	341	8	NW
Yellowtail kingfish	6/11/15	Coffin Bay (SA)	6	8	NW
Yellowtail kingfish	8/10/15	Dee Why (NSW)	18	0	S
Yellowtail kingfish	30/03/14	Greenly Island (SA)	556	202	ENE
Yellowtail kingfish	23/02/14	Greenly Island (SA)	592	195	NE
Yellowtail kingfish	8/03/15	Greenly Island (SA)	206	196	ENE
Yellowtail kingfish	27/03/15	The Hummocks (SA)	366	0	NW
Yellowtail kingfish	12/06/15	Long Reef (NSW)	116	0	N
Yellowtail kingfish	3/02/15	Long Reef (NSW)	242	14	SSE
Yellowtail kingfish	27/04/16	Long Reef (NSW)	17	0	NW

Species	Date tagged	Release location	Days at liberty	Distance moved (nmi)	Direction
Yellowtail kingfish	16/10/15	Manly (NSW)	17	3	N
Yellowtail kingfish	27/01/14	Maroubra (NSW)	623	10	E
Yellowtail kingfish	24/03/15	Jervis Bay Middle Ground (NS	W	29	NE
Yellowtail kingfish	5/11/15	Sydney Middle Harbour(NSW)	13	2	E
Yellowtail kingfish	18/11/14	Port Augusta (SA)	299	0	S
Yellowtail kingfish	8/10/14	Port Augusta (SA)	399	170	SW
Yellowtail kingfish	6/10/15	Port Augusta (SA)	32	0	S
Yellowtail kingfish	25/11/13	Port Augusta (SA)	866	866	NE
Yellowtail kingfish	26/11/13	Port Augusta (SA)	664	170	SW
Yellowtail kingfish	16/11/13	Port Augusta (SA)	811	190	SW
Yellowtail kingfish	27/06/15	Port Augusta (SA)	98	0	S
Yellowtail kingfish	24/06/15	Port Augusta (SA)	12	0	S
Yellowtail kingfish	4/07/15	Port Augusta (SA)	59	0	S
Yellowtail kingfish	7/07/15	Port Augusta (SA)	61	0	S
Yellowtail kingfish	14/08/15	Port Augusta (SA)	62	0	S
Yellowtail kingfish	3/10/15	Port Augusta (SA)	10	0	S
Yellowtail kingfish	4/10/15	Port Augusta (SA)	45	0	
Yellowtail kingfish	5/10/15	Port Augusta (SA)	18	0	S
Yellowtail kingfish	29/09/15	Port Hacking (NSW)	74	0	S
Yellowtail kingfish	29/09/15	Port Hacking (NSW)	63	0	S
Yellowtail kingfish	13/10/15	Port Hacking (NSW)	18	0	NW
Yellowtail kingfish	28/11/14	Port Hacking (NSW)	215	189	SSW
Yellowtail kingfish	4/10/15	Port Hacking (NSW)	37	1	S
Yellowtail kingfish	10/11/15	Port Hacking (NSW)	26	0	S
Yellowtail kingfish	3/10/15	Port Hacking (NSW)	0	0	S
Yellowtail kingfish	1/09/15	Port Hacking (NSW)	159	2	S
Yellowtail kingfish	6/10/15	Port Hacking (NSW)	27	0	N
Yellowtail kingfish	2/11/15	Port Hacking (NSW)	119	2	ENE
Yellowtail kingfish	1/10/15	Port Hacking (NSW)	45	2	S
Yellowtail kingfish	16/09/15	Port Hacking (NSW)	198	3	E
Yellowtail kingfish	29/09/14	Port Hacking (NSW)	409	0	S
Yellowtail kingfish	14/12/15	Port Hacking (NSW)	42	5	SSW
Yellowtail kingfish	16/10/15	Port Hacking (NSW)	208	3	E
Yellowtail kingfish	15/11/15	Port Hacking (NSW)	172	0	NW
Yellowtail kingfish	24/10/15	Port Hacking (NSW)	14	0	S
Yellowtail kingfish	24/10/15	Port Hacking (NSW)	14	0	N
Yellowtail kingfish	12/10/15	Port Kembla (NSW)	197	1	E
Yellowtail kingfish	30/10/15	Port Kembla (NSW)	15	0	S
Yellowtail kingfish	10/10/15	Seal Rocks (NSW)	8	3	ENE
Yellowtail kingfish	1/01/16	Sydney South Head (NSW)	43	3	NE
Yellowtail kingfish	16/10/14	South West Rocks (NSW)	408	1	W

Species	Date tagged	Release location	Days at liberty	Distance moved (nmi)	Direction
Yellowtail kingfish	15/08/15	Sydney (NSW)	14	10	E
Yellowtail kingfish	19/08/15	Sydney 12 Mile Reef (NSW)	17	0	S
Yellowtail kingfish	6/07/15	Sydney 12 Mile Reef (NSW)	43	0	N
Yellowtail kingfish	16/08/15	Sydney 12 Mile Reef (NSW)	276	6	WSW
Yellowtail kingfish	5/09/15	Sydney 12 Mile Reef (NSW)	113	49	SSW
Yellowtail kingfish	19/06/14	Sydney The Peak (NSW)	473	6	ENE
Yellowtail kingfish	16/04/15	Sydney The Peak (NSW)	169	43	NNE
Yellowtail kingfish	4/10/15	Sydney Harbour (NSW)	13	2	E
Yellowtail kingfish	8/03/16	Sydney Harbour (NSW)	5	1	N
Yellowtail kingfish	13/03/16	Sydney Harbour (NSW)	57	2	E
Yellowtail kingfish	1/10/15	The Banks (NSW	20	7	NW

Appendix II: NSW DPI Game Fish Tagging Program Top Tagging Boats and Anglers for 2015/2016

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 2014/2015 season. We will continue to develop these end of season summaries and acknowledge the strong supporters of the tagging program in future years.

Species	Top boat	Runner up boat
Billfish combined	92 –*Polaris* (NSW) Eden S&GFC	91 - *Freedom* (NSW) Central Coast GFC
Black Marlin	75 – *Freedom* (NSW) Central Coast GFC	47 – *The Wench* (WA) King Bay GFC
Blue Marlin (International)	60 – *Blue Marlin Magic* (Tonga) Vava'u SFC	14 – *Satisfaction* (PNG) Lae GFC
Blue Marlin (Australia)	33 – *Chaos* (QLD) Sunshine Coast GFC	18 – *Reel Teaser* (QLD) Gold Coast GFC
Striped Marlin	74 – *Polaris* (NSW) Eden S&GFC	59 – *Happy Hour* (VIC) Greenvale S&GFC
Sailfish	34 – *Pelagic Hooker* (WA) Exmouth GFC	32 – *Ora Banda* 3 (WA) Broome FC
Shortbill Spearfish	2 – *Blue Rider* (NSW), *Cookie* (NSW), *In Deep* (NSW), *Madness* (NSW), *Malolo* (NSW), *Offtap* (NSW), *Seababy* (NSW)	1 – (*34 Recreational Vessels*)
Swordfish	14 - *(Tagged by Commercial Vessel, QLD)*	2 – *Choona Chaser* (TAS), *Terminator* (TAS), *Commercial Vessel* (NSW)
Shark combined	63 – *Tantrum* (NSW) Sydney GFC	35 – *Casey* (NSW) Sydney GFC
Mako Shark	18 – *Casey* (NSW) Sydney GFC	8 – *Polaris* (NSW) Eden S&GFC
Blue Shark	11 – *Tantrum* (NSW) Sydney GFC	8 – *Obsession* (VIC) South Gippsland GFC
Tiger Shark	5 – *Frypan* (WA) King Bay GFC	4 – *French Maid* (WA) King Bay GFC
Whaler Shark	45 – *Tantrum* (NSW) Sydney GFC	17 – *Disco Prawn* (WA) King Bay GFC
Hammerhead Shark	10 – *Casey* (NSW) Sydney GFC	5 – *Rarely In* (NSW) Newcastle & Port Stephens GFC
Thresher Shark	1 – *Bustin Up* (NSW) Eden S&GFC, *Knee Sea* (SA) Adelaide GFC, *Landbased* (SA) GFC of SA	

Species	Top boat	Runner up boat
Tuna combined	656 – *Majessnik* (SA) GFC of SA	356 – *Spartacus* (SA) GFC of SA
Yellowfin Tuna	7 – *Tagged by Commercial Vessel* (NSW), 6 – *Aurora* (QLD) Gold Coast GFC	5 – *Relentless* (QLD) Gold Coast GFC
Southern Bluefin Tuna	656 – *Majessnik* (SA) GFC of SA	355 – *Spartacus* (SA) GFC of SA
Bigeye Tuna	7 – *Tagged by Commercial Vessel* (QLD)	1 - *Tagged by Commercial Vessel* (QLD), 1 - *Tagged by Comm Vessel* (NSW)
Albacore Tuna	17 – Obsession (VIC) South Gippsland GFC	15 – Sir Tease (TAS) GFC of Northern Tasmania
Longtail Tuna	8 – Mofo (QLD)	5 – Somewhere (QLD) Mackay GFC
Dogtooth Tuna	0 - Dogtooth Tuna Tagged	
Spanish Mackerel	28 – Mandalay (WA) Geraldton District Offshore Angling Club	19 – Allure (WA) Geraldton District Offshore Angling Club
Dolphinfish	24 – Avalon (NSW) Port Hacking GFC	15 – Bite Me (NSW) South Sydney AFA
Yellowtail Kingfish	47 – Oceanhunter (NSW) Ocean Hunter Sports Fishing Charters	36 – Lil Rudie (SA) Adelaide GFC
Billfish	41 – Chloe Laurence (NSW) Ulladulla GFC	35 – John Stehman (QLD) Gold Coast GFC
Shark	34 – Toby Mason (WA) King Bay GFC	27 – Patrick Shaw (NSW) Sydney GFC
Tuna	303 – Russel Bianco (SA) GFC of SA	235 – Mark Watson (TAS) Tuna Club of Tasmania