NSW DPI Game Fish Tagging Program

Report 2011-2012

Recreational Fishing Trusts

NSW GOVERNMENT Primary Industries

Pepperell Research
Marine Science & Recreational Fisheries

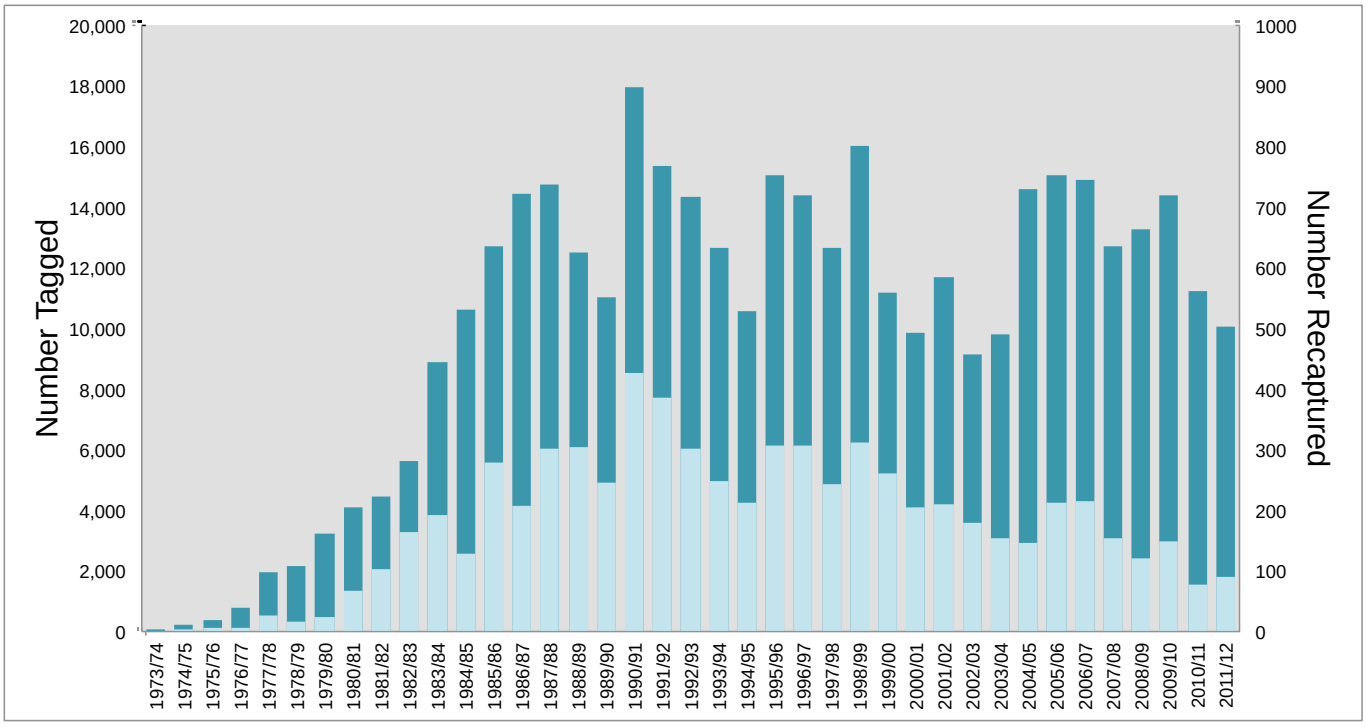
NSW DPI Game Fish Tagging Program

2011/2012

The number of fish tagged during the 2011/2012 tagging year was down from previous years. A total of 10,057 fish were tagged for the year and 91 recaptures were recorded. Figure 1 shows the number of fish tagged (and recaptured) on the program throughout its history, and indicates that the number of fish tagged in 2011/2012, even though relatively low for recent years, still surpassed 10,000 fish tagged for the eighth year in succession.

Total numbers of fish tagged each year vary depending on the availability of different species of fish at different times and locations; for example, the two peak tagging years of 1990/91 and 1997/98 coincided with strong La Nina conditions on the east coast of Australia, resulting in influxes of some species in the warmer currents. This year, as outlined further in the report, numbers of southern bluefin tuna tagged declined from the major peaks of the past three years, partly compensated for a bumper year on striped marlin off southeastern Australia. The numbers of total taggings (and recaptures) are also somewhat lower than previous highs is because we have discouraged the tagging of some species that tended to dominate earlier figures, such as small yellowtail kingfish, Australian salmon and silver trevally.

Figure 1. Numbers of fish tagged and recaptured by year, to 2011/2012.



The Program overall

Over the history of the program, the grand total of fish tagged and recaptured, as at the end of June 2012, stood at 396,294 and 6,913 respectively, continuing the program's status as one of the largest of its kind in the world (Table 1). This table summarises taggings and recaptures of the top species (or species groups) tagged, with all others tallied as 'all other species'.

The species tagged in the greatest numbers continues to be black marlin (just under 53,000 tagged, and representing 13.4% of all releases) followed by yellowfin tuna, yellowtail kingfish, sailfish, mahi mahi (dolphinfish) and striped marlin.

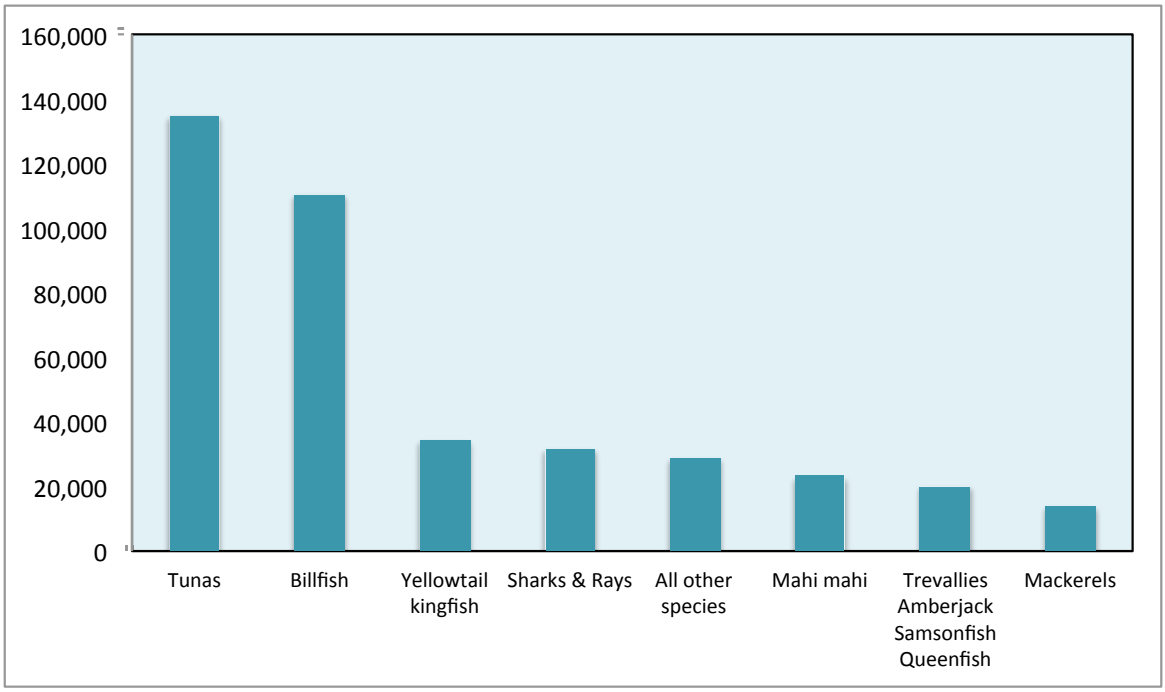
Table 1. Total numbers of fish tagged and recaptured: 1974-2012

Species	Total Tagged	Recaptures	% Recapt
BLACK MARLIN	52,944	405	0.76
YELLOWFIN TUNA	37,072	685	1.85
YELLOWTAIL KINGFISH	34,211	2166	6.33
SAILFISH	27,684	290	1.05
MAHI MAHI	22,926	211	0.92
STRIPED MARLIN	22,338	213	0.95
ALBACORE	20,531	161	0.78
SKIPJACK TUNA	20,297	68	0.34
MACKEREL TUNA	20,094	61	0.30
SOUTHERN BLUEFIN TUNA	15,262	120	0.79
BONITO	13,219	219	1.66
WHALER SHARKS	11,984	251	2.09
AUSTRALIAN SALMON*	9,573	609	6.36
SPANISH MACKEREL	8,365	78	0.93
MAKO SHARK	7,024	163	2.32
SILVER TREVALLY*	6,915	197	2.85
BLUE MARLIN	6,911	21	0.30
HAMMERHEAD SHARK	5,241	55	1.05
LONGTAIL TUNA	4,769	59	1.24
BLUE SHARK	4,418	74	1.67
TAILOR*	4,030	122	3.03
TREVALLY	3,345	31	0.93
BARRACUDA	3,133	5	0.16
MISCELLANEOUS	3,101	90	2.90
QUEENFISH	3,050	10	0.33
GIANT TREVALLY	2,518	34	1.35
ALL OTHER SPECIES	25,339	515	2.03
TOTAL	**396,294**	**6,913**	**1.74**

* 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.

Grouping the main species together, Figure 2 indicates that tunas remain the group tagged in the largest numbers (134,607 tagged, or 34% of the total) followed by billfish (110,366, or 28% of all fish tagged). Total numbers of sharks and rays (31,575 tagged) continues to represent about 8% of the total fish tagged.

Figure 2. Total numbers of fish tagged as species groupings, 1974-2012



Summary for 2011/2012

Table 2. Numbers of fish tagged and recaptured in 2011/2012

Species	Number	Recaptured
STRIPED MARLIN	1,715	31
BLACK MARLIN	1,209	3
SOUTHERN BLUEFIN TUNA	1,168	6
SAILFISH	1,164	5
BLUE MARLIN	680	4
SKIPJACK TUNA	562	
ALBACORE	530	1
MAHI MAHI	442	4
YELLOWFIN TUNA	345	3
MAKO SHARK	248	5
MACKEREL TUNA	216	1
SPANISH MACKEREL	216	2
YELLOWTAIL KINGFISH	188	7
WHALER SHARK	186	6
QUEENFISH	123	
BLUE SHARK	109	
BARRACUDA	86	
AUSTRALIAN SALMON	83	
TIGER SHARK	72	3
BRONZE WHALER	67	1
LONGTAIL TUNA	66	
HAMMERHEAD SHARK	64	
SAMSON FISH	43	2
GOLD SPOTTED TREVALLY	40	
COBIA	38	1
SPOTTED MACKEREL	38	
GIANT TREVALLY	28	
SHARK MACKEREL	27	
EAGLE RAY	26	
SNAPPER	26	
BLACKTIP SHARK	24	
BROAD BARRED MACKEREL	23	
WAHOO	22	
GOLDEN TREVALLY	21	
SHORTBILL SPEARFISH	18	
GUMMY SHARK	17	2
MULLOWAY	16	
SILVER TREVALLY	16	1
BONITO	13	
RAINBOW RUNNER	13	
TREVALLY	13	
BIGEYE TUNA	11	
BARRAMUNDI	10	1
SCHOOL SHARK	7	1
AMBERJACK	6	
SCHOOL MACKEREL	6	
THRESHER SHARK	6	
MISCELLANEOUS	5	
WHITETIP SHARK	3	
SWORDFISH	1	1
WATSONS LEAPING BONITO	1	
TOTAL	**10,057**	**91**

Table 2 indicates that striped marlin were tagged in the greatest numbers in 2011/2012, followed by black marlin and southern bluefin tuna. For the previous three years, southern bluefin tuna had been the dominant species tagged, with over 3,000 releases in each of those years but this year, the numbers of southern bluefin tagged declined to a little over 1,100 (still an historically high number, it should be said).

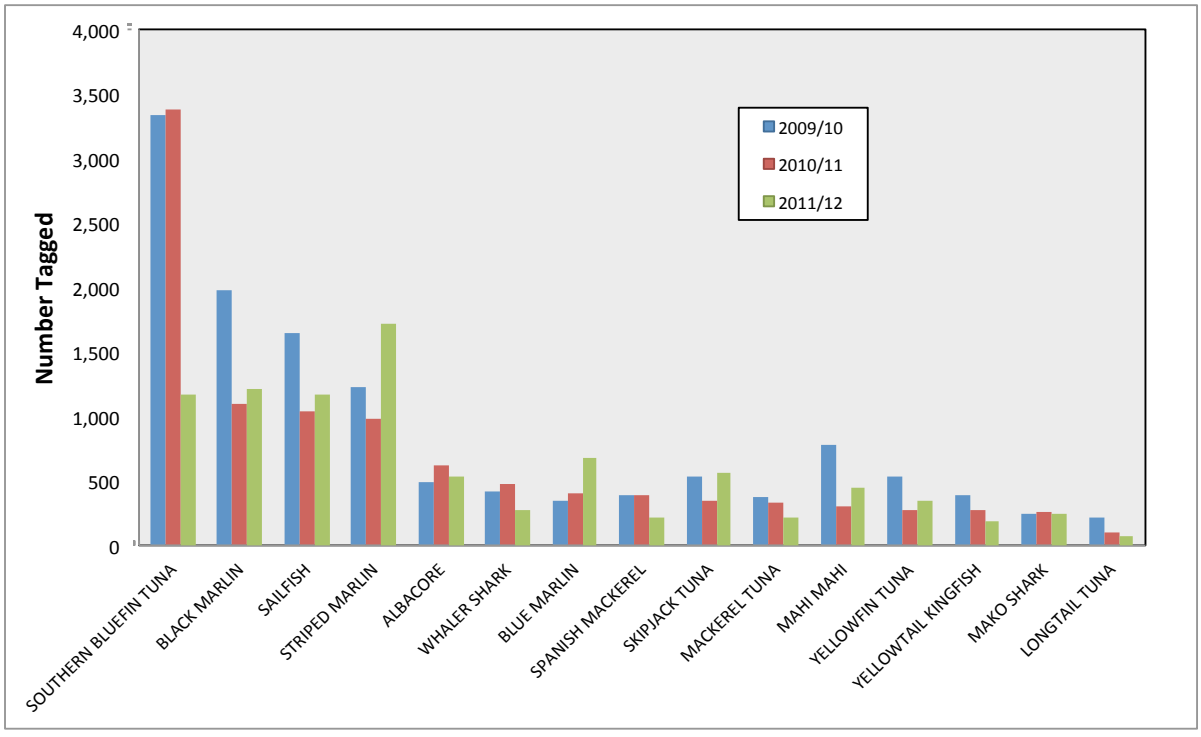
The number of striped marlin tagged this year (1,715) elevated that species to the top of the 'leader board', and was the third highest tally for the duration of the Program, only surpassed by twin peak years of 1998/1999 and 1999/2000 when 1,740 and 1,987 striped marlin were tagged respectively.

The number of blue marlin tagged in 2011/2012 (680) was a record for the Program, easily surpassing the previous high of 441 set in 1998/1999. The majority of these fish were tagged off eastern Australia, in particular off the Gold Coast, Coffs Harbour and Sydney, but significant numbers were also tagged off Exmouth WA, Papua New Guinea and Tonga.

As pointed out in previous reports, the real-time detection and quantification of such marked changes in either fishing practices of the recreational sector, or availability of fish, would be all but impossible in the absence of the tagging program.

Figure 3 shows a comparison of species or species groups tagged over the past three years. It also shows the big spikes in taggings of both striped and blue marlin, steady levels of tagging of black marlin, sailfish and mako sharks, and continued decrease in the numbers of yellowtail kingfish tagged, primarily due to our recommendations to reduce tagging of small kingfish.

Figure 3. Numbers of main species and species groups tagged in 2011/2012 and the previous two years.



Combining the species into groups, Figure 4a shows that, in 2011/2012 billfish constituted 40.8% of all fish tagged, which is considerably higher than last year (31%). With the dominance of southern bluefin tuna in the past three years, tuna had dominated taggings, but this year, tuna represented 23.7% of all fish tagged, of which, southern bluefin comprised about half. Sharks and rays combined represented about 8% of all fish tagged which is a typical figure over the course of the program in the last decade or more

Figure 4b shows the proportions of the major species groups tagged recaptured in 2011/2012, indicating quite different proportions to those tagged. While billfish still represent a high proportion of recaptures (44%), a higher recapture rate for sharks resulted in their comprising 19.8% of recaptures for the year. Tuna represented 11% of recaptures, with southern bluefin tuna topping the list within the group with six recaptures.

Figure 4a. Species groups tagged in 2011/2012

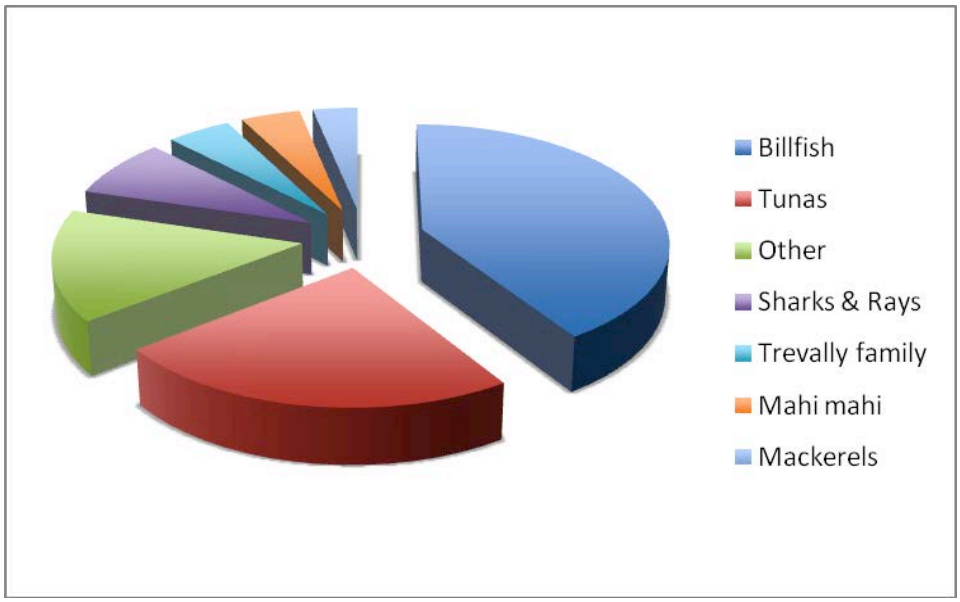
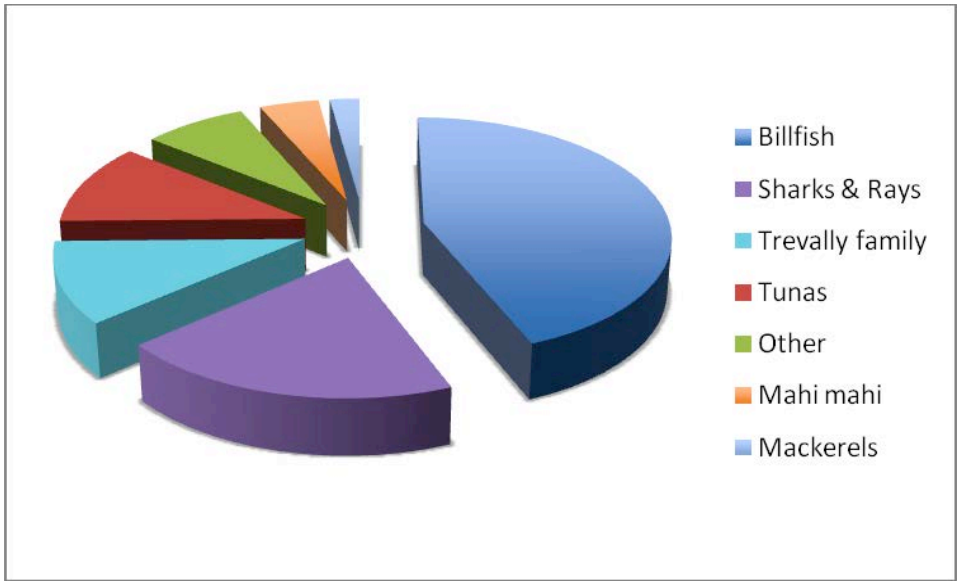


Figure 4b. Species groups recaptured in 2011/2012



Recapture highlights

All completed recaptures recorded in 2011/2012 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, but as such, are often exceptions to the rule. In fact, many tagged fish are recaptured relatively close to their points of release, often within relatively short times-at-liberty but it is important to realise that the information gained from these recaptures is just as important to our understanding of the movements and growth of game fish as longer term, longer distance recaptures.

Black marlin

There were only three recaptures of tagged black marlin this year, but each of these was interesting in its own right. The longest mover was a black marlin originally released off Port Stephens by Central Coast Game Fishing Club boat *Regulator* on 4 March 2011. (It was first caught on a circle-hook-rigged live bait). It was then recaptured (and retagged) on 10 November 2011 by an American angler trolling a lure over a sea mount wide of the Great Barrier Reef off Cairns aboard *Valkyrie*. Its weight when first released was estimated at 90kg and when recaptured was estimated to be 130kg. It had travelled a straight line distance of 1,005 nautical miles to perhaps join the annual spring spawning aggregation. At around 130 kg, it is likely that this fish was a mature male (females on the spawning grounds tend to be larger than 200 kg) completing its annual cycle of dispersing from, and then returning to the waters off the Great Barrier Reef.

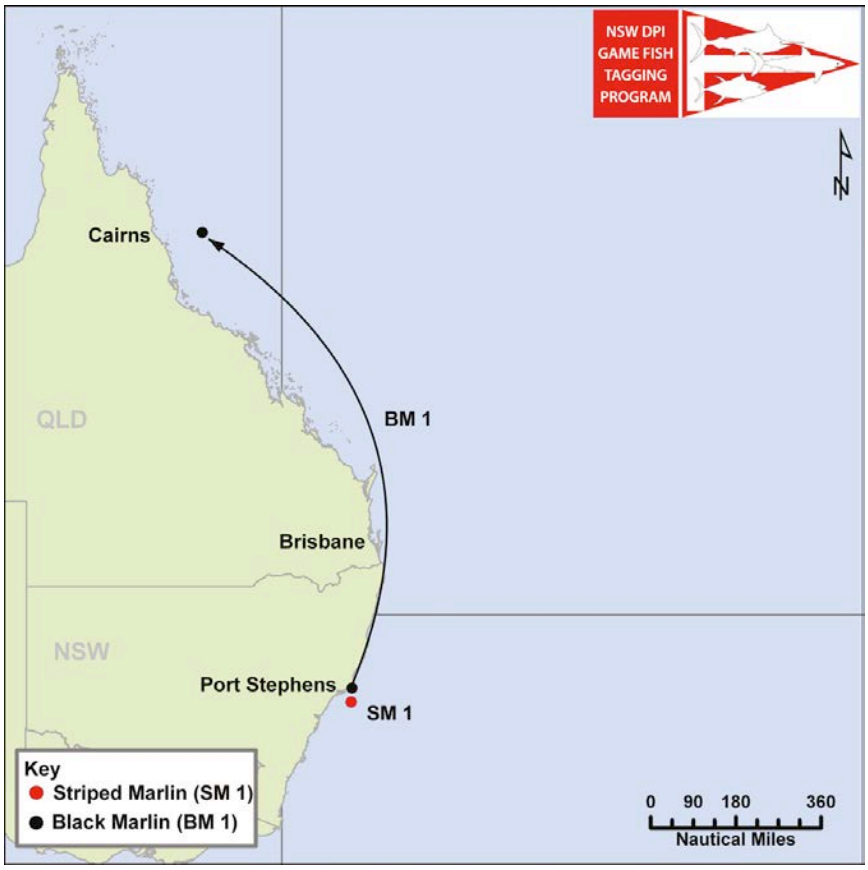


Figure 5. Movement of a black marlin, tagged in March off Port Stephens and recaptured near the spawning grounds in November.

The other two recaptures were of black marlin that were recaptured virtually where they were originally released, but both of which had been at liberty for many months. The first of these had been tagged off Port Stephens on 13 February 2011 and recaptured a year to the day later, just 2 nautical miles from its point of release! The second almost repeated this scenario, but in Western Australia. This was a small black marlin (estimated at 40 kg) that was tagged off Exmouth and recaptured just one nautical mile from where it was released nearly 11 months later. These recaptures add weight to previous results indicating that at least some black marlin home to the same areas on an annual basis (a behaviour known as philopatry).

Striped and Blue marlin

Marlin fishing at Port Stephens in the summer of 2011/2012 was simply spectacular. As usual, the fish were found amongst the huge bait schools located along the inside of the continental shelf, with many hundreds of fish tagged on the grounds known as the “Car Park.” Many boats tagged in excess of 10 marlin a day.

A total of 31 striped marlin completed recaptures were recorded for the year – a record for striped marlin in any year of the Program, and 11 more than the previous bumper striped marlin season of 2000, which recorded 20 striped marlin recaptures for the year.

The furthest distance travelled by any of these of these were 2 striped marlin that were tagged off Coffs Harbour in December as they travelled southwards with the East Australian Current. These fish clocked up a straight line distance of 168 and 189 nautical miles respectively before they were recaptured amongst the crowds fishing the Port Stephens grounds in February.

Quite a few of the tagged fish were recaptured in the same general location, presumably choosing to stay in the area because of the attraction of the huge quantity of slimy mackerel and cowanyoung (jack mackerel) that had gathered at the rich bait grounds off Port Stephens.

Two blue marlin recaptures that were reported to the tagging program were also of significance as they are the first and second blue marlin to be recaptured in NSW waters. One of the blues was released and recaptured at Port Stephens/ Newcastle, while the other was released off Kiama in April 2011 and recaptured at Port Stephens in February 2012. Interestingly, the prolific charter boat *Flying Fisher* was responsible for the release of one of the blue marlin and the recapture of the other (plus an additional two striped marlin recaptures and the tagging of a striped marlin that was later recaptured!). The boat finished the season with more than 110 marlin tagged.

Other individual boats that were involved with multiple numbers of recaptured marlin this year are; Broken Bay GFC boat *Murrifin* which tagged 4 striped marlin that were recaptured and the Victorian boat *Happy Hour* which tagged a striped marlin that was recaptured and recaptured a further two marlin, all on the same day in February. On that day, the boat tagged a total of 15 marlin!

Figure 6. Point to point movements of striped and blue marlin tagged and recaptured during 2011/2012

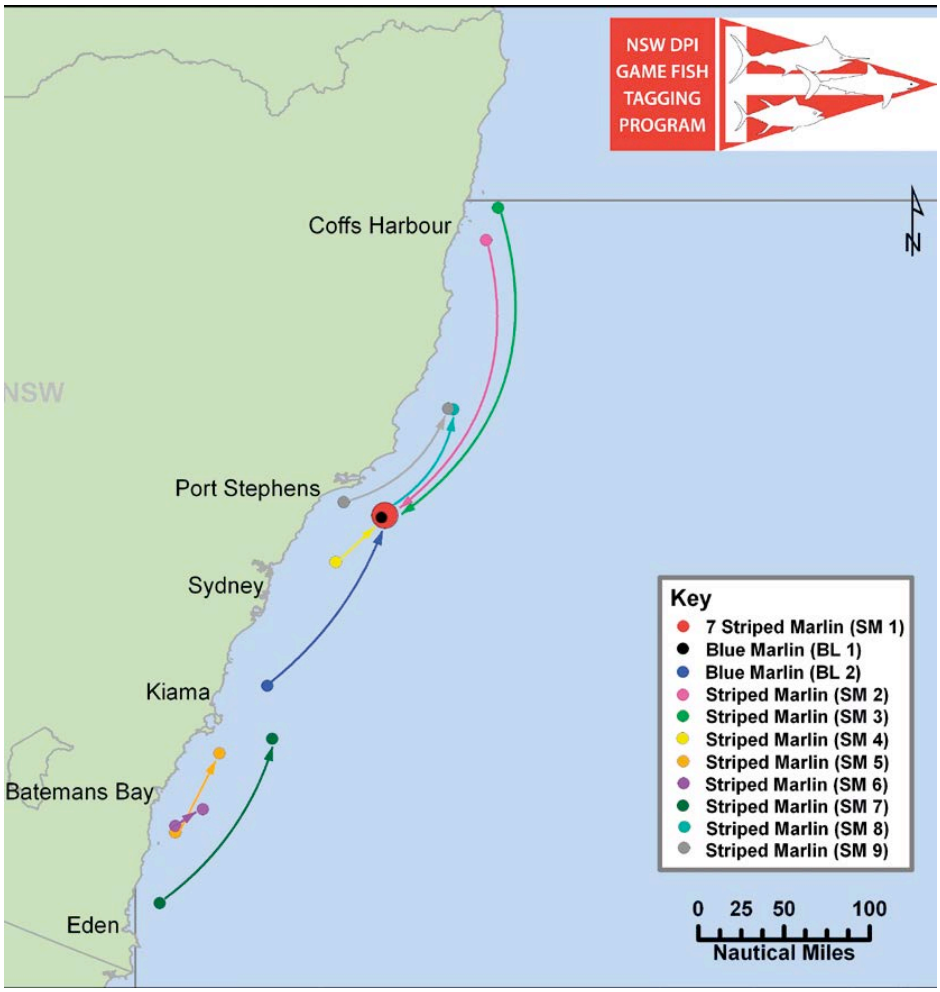


Table below: Details of recaptures of striped and blue marlin shown on the map.

Species	Release Date	Release Location	Est Rel. Length/Weight	Recapture Date	Recapture Location	Est Recapture Length/Weight	Days At Liberty	Approx. Distance Moved (NM)	Map Ref.
triped Marlin	1/01/2012	Port Stephens (Wide)	70kg	5/02/2012	Port Stephens (Wide)	70kg	35	0	SM 1
triped Marlin	5/02/2012	Port Stephens (Wide)	65kg	9/02/2012	Port Stephens (Wide)	65kg	4	1	SM 1
triped Marlin	14/01/2012	Port Stephens (Wide)	100kg	5/02/2012	Port Stephens (Wide)	95kg	22	9	SM 1
triped Marlin	7/01/2012	Newcastle (East)	210cm / 60kg	5/02/2012	Port Stephens (Wide)	90kg	29	1	SM 1
triped Marlin	5/02/2012	Port Stephens (Wide)	120kg	12/02/2012	Port Stephens (Wide)	210cm/75kg	7	1	SM 1
triped Marlin	18/02/2012	Port Stephens (Wide)	120kg	31/03/2012	Port Stephens (Wide)	240cm/120kg	42	3	SM 1
triped Marlin	5/02/2012	Port Stephens (Wide)	60kg	16/02/2012	Port Stephens (Wide)	60kg	11	2	SM 1
triped Marlin	24/12/2011	Coffs Harbour Canyons	–	23/02/2012	Port Stephens (Wide)	220cm/75kg	61	168	SM 2
triped Marlin	10/12/2011	Coffs Harbour (Wide)	220cm / 75kg	26/02/2012	Port Stephens (Wide)	220cm/70kg	78	189	SM 3
triped Marlin	20/11/2011	Norah Head Canyons	210cm / 55kg	5/02/2012	Port Stephens (Wide)	73.5kg	77	37	SM 4
triped Marlin	29/12/2011	Tuross Heads (East)	210cm / 60kg	13/02/2012	Ulladulla Canyons	230cm/65kg	46	51	SM 5
triped Marlin	28/01/2012	Tuross Heads (East)	210cm / 70kg	23/03/2012	Moruya Canyons	74kg	55	16	SM 6
triped Marlin	1/01/2012	Merimbula (Wide)	220cm	24/02/2012	Sussex Inlet (Wide)	115kg	54	110	SM 7
triped Marlin	25/02/2012	Port Stephens (Wide)	75kg	15/04/2012	Old Bar (Wide)	80kg	50	63	SM 8
triped Marlin	12/02/2012	Port Stephens (Wide)	80kg	15/04/2012	Old Bar (Wide)	95kg	63	76	SM 9
Blue Marlin	9/04/2011	Kiama (East)	–	29/02/2012	Port Stephens (Wide)	240cm/130kg	326	117	BL 1
Blue Marlin	29/02/2012	Port Stephens (Wide)	110kg	11/03/2012	Newcastle (East)	300cm TL	11	5	BL 2

The following highlights of recaptures of other species are summarised in the table and maps below.

Broadbill swordfish

A small tagged swordfish was originally released by charter boat *Hotshot* off Bermagui in May 2011 and was recaptured by a local longliner off Batemans Bay in January 2012. In its 240 days at liberty it had grown from an estimated weight of 5kg to approximately 12kg. There have been a total of 88 swordfish tagged by anglers participating in the Game Fish Tagging Program, and this latest result brings the number of recaptured swordfish to three, all of which were recorded in NSW, and all at a relatively small size (about 8 to 12kg).

Southern bluefin tuna

A southern bluefin tuna originally released off Port MacDonnell South Australia was recaptured more than five years later off the west coast of New Zealand's South Island. This fish broke the Program record for time at liberty for this species, and is the furthest east a recaptured southern bluefin has been recorded for the tagging program. It was recaptured approximately 100 nautical miles west of Westport in April 2012, over 1,300 nautical miles distant from its 2007 release location. It had grown from an estimated 14kg to approximately 85kg over this period.

Yellowfin tuna

Two recaptured yellowfin tuna were reported by a longliner fishing wide of Tuross, NSW. The first was tagged and released off Coffs Harbour by Coffs Harbour GFC boat *Roughy* in November 2007. When tagged it was estimated at 10kg and more than four years later was found to weigh approximately 95kg. This is by far the largest recaptured yellowfin on record, beating the previous best which stood at 62kg. The second recaptured yellowfin was released by Eden Sport and Game Fishing Club boat *Shockwave* in February 2011, and during its 15 months at liberty had grown from an estimated 6kg to approximately 20kg.

Mako shark

An estimated 50kg mako shark released off Jervis Bay by *Reel Shattered* in November 2011 was recaptured by a longliner fishing Bellona Reefs in the Coral Sea, almost halfway between Gladstone (QLD) and New Caledonia. It had been at liberty for over six months and had covered a straight-line distance of 893 nautical miles. Interestingly, two mako sharks tagged with satellite tags in South Australia have travelled to the Coral Sea (and back) suggesting that the species may regularly migrate to the tropics, at least for short periods.

Yellowtail kingfish

A kingfish released in 2006 by *Mighty Dragon* of Eden Sport and Game Fishing Club was recaptured in February 2012. The fish was originally tagged off Mowarry Point when it measured 53cm and was recaptured over five years later by a spear fisherman off Seal Rocks in northern NSW. The fish measured 130cm on recapture and weighed over 16kg. This is the 62nd kingfish tagged by *Mighty Dragon* to be reported as a recapture and represents the fifth-longest time at liberty for any recaptured kingfish. The record is held by a fish tagged off Sydney and recaptured off South West Rocks over seven years later.

Table showing details of interesting recaptures in 2011/2012. Refer also to maps below

Species	Release Date	Release Location	Estimated Release Length/Weight	Recapture Date	Recapture Location	Recapture Length/Weight	Days At Liberty	Approx. Distance Moved (NM)	Map Ref.
Swordfish	16/05/2011	Bermagui (Wide)	5kg	01/01/2012	Batemans Bay (Wide)	12kg	230	37	SW
Southern Bluefin Tuna	31/03/2007	Port MacDonnell (SA)	95cm / 14kg	26/04/2012	Westport (NZ)	85kg	1853	1356	SBT
Yellowfin Tuna	11/11/2007	Coffs Harbour (East)	80cm / 10kg	23/05/2012	Tuross (Wide)	95kg	1655	374	YF 1
Yellowfin Tuna	26/02/2011	Eden (East)	65cm / 6kg	23/05/2012	Tuross (Wide)	20kg	452	58	YF 2
Mako Shark	25/11/2011	Jervis Bay (Wide)	165cm / 50kg	21/06/2012	Bellona Reefs (Pacific Ocean)	200cm / 90kg	209	893	MS
Yellowtail Kingfish	11/11/2006	Mowarry Point (NSW)	53cm / 0.9kg	25/02/2012	Seal Rocks (NSW)	130cm / 16.3kg	1932	307	YTK

Figure 7. Release and recapture locations of individual southern bluefin tuna and a mako shark recaptured in 2011/2012.

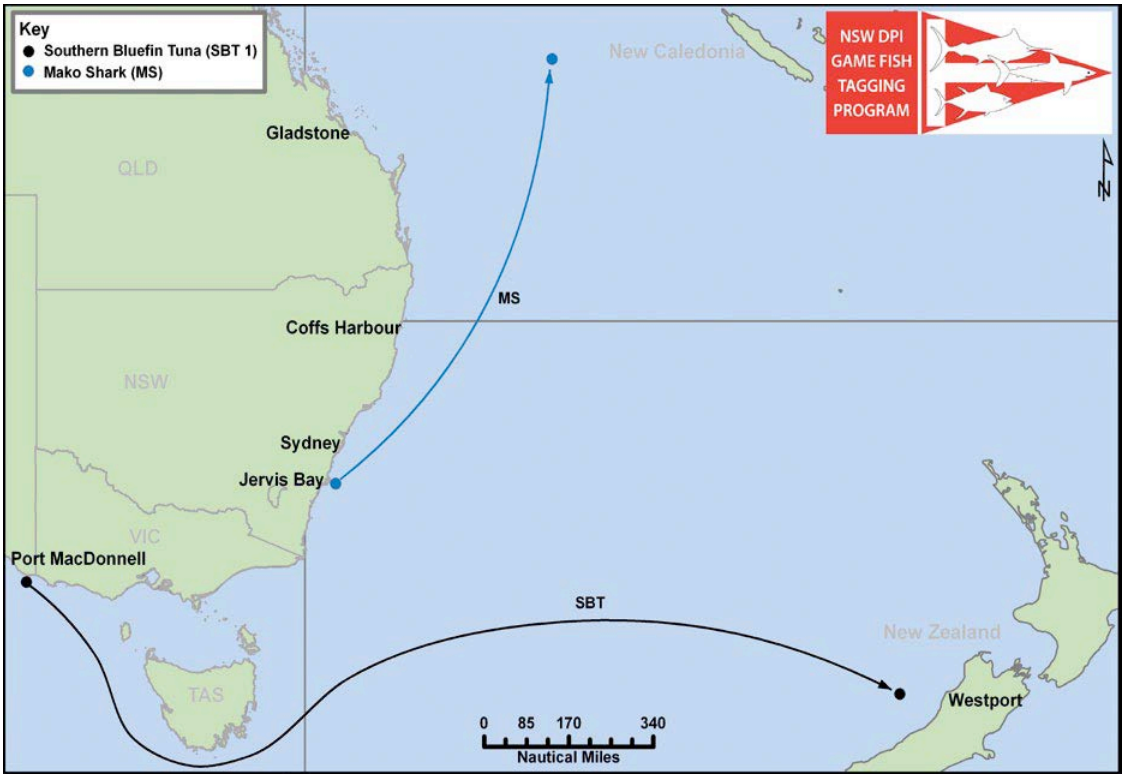
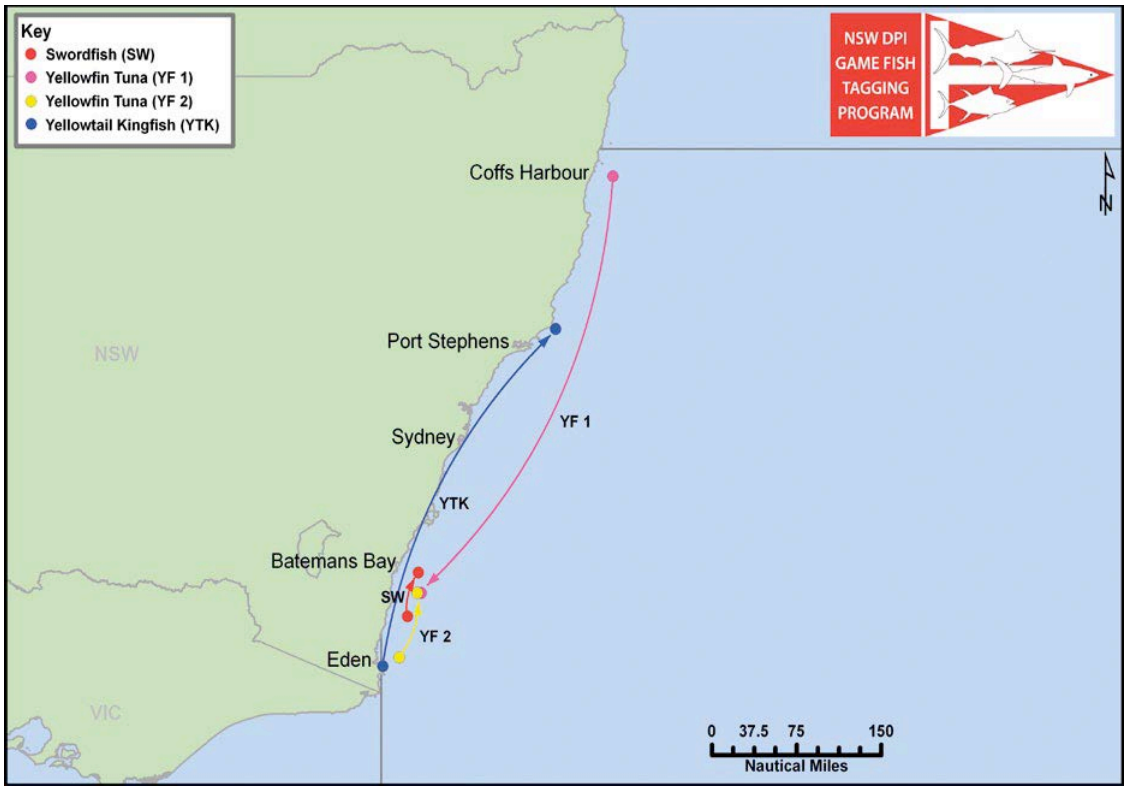
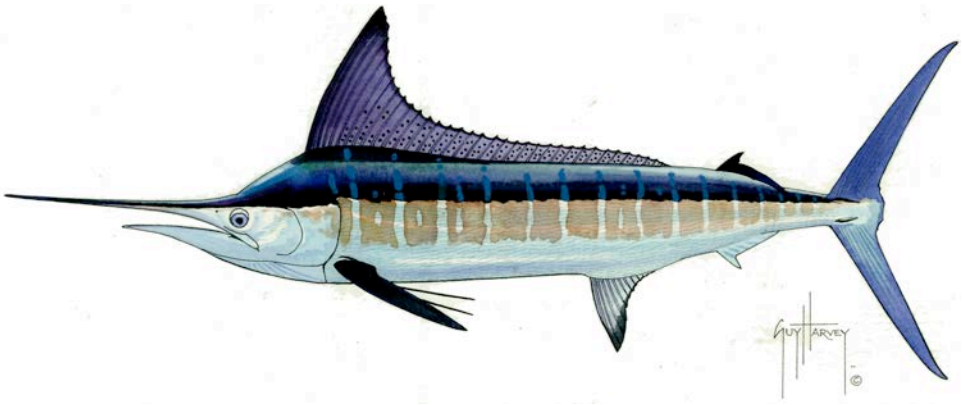


Figure 8. Release and recapture locations of various species recaptured in 2011/2012



Focus on: Striped marlin (*Kajikia audax*)



The following summary of the biology of the striped marlin has been adapted from the book, ‘Fishes of the Open Ocean’ by Julian Pepperell (UNSW Press).

The striped marlin is a beautifully steamlined fish with a high dorsal fin and slender bill and lower jaw. In life, the striped marlin is one of the more spectacular denizens of the open ocean. It nearly always shows vivid vertical bars, which, when feeding, can change color and intensity with remarkable rapidity. Most of the billfishes show vertical bars at least some of the time, but the striped marlin often reverses its pattern, sometimes showing dark purple stripes on a pale blue/silver background, changing instantly to phosphorescent blue stripes on a black/purple background.

Identification

The main features which distinguish the striped marlin from other billfish are: the height of the first dorsal fin is equal to or slightly less than the greatest body depth (dorsal fins of blue and black marlin are two thirds to half the body depth), and the ratio of the lengths from the tip of the lower jaw to the caudal fork and the rear of the eye orbit to the caudal fork lies between 0.83 and 0.86, reflecting the relatively long lower jaw of striped marlin compared with blue and black marlin. This latter feature is particularly useful in distinguishing the striped marlin from the blue marlin, in which the ratio lies between 0.86 and 0.89. Additionally, striped marlin are more slender, or laterally compressed, than blue and black marlin, such that the weight of a striped will nearly always be less than a blue or a black of the same length.

Geographic range

The striped marlin is distributed throughout the Indian and Pacific Oceans. In the Pacific, its distribution has a curious 'horseshoe' shape, with an apparent gap in the central western Pacific. Through analysis of size data from Japanese catches, scientists originally thought that there was one Pacific-wide stock of striped marlin. More recently, however, genetic studies on fish collected from widely separated sites around the Pacific have shown that there are at least four separate stocks of Pacific striped marlin – One in the eastern Pacific, one in the south central Pacific, one in the southwestern Pacific and the fourth in the northwestern Pacific. Adding weight to this finding is that these stocks each corresponds with a known discrete spawning ground of the species.

Striped marlin prefer cooler temperatures than the other istiophorid billfishes, showing a preference off southern California, for example, for surface temperatures of 21 to 26°C. This also seems to be the preferred range for striped marlin in the western Pacific, although they are sometimes caught in much warmer water. In 'La Nina' years, when the western Pacific warms more than normal, striped marlin are sometimes caught as far south as the northeast coast of Tasmania, Australia, and in those years, it is at least theoretically possible that striped marlin may move between the Pacific and Indian oceans via the Southern Ocean.

Movements

Many thousands of striped marlin have been tagged by recreational anglers off southern California and Baja California. Some recaptures of tagged fish have demonstrated lengthy movements as far away as Hawaii and the Marquesas, but the majority of tagged fish have been recaptured within a few hundred miles of their release points. Striped marlin have also been tagged in good numbers off northern New Zealand, also indicating some site fidelity, but with a number of extensive movements as far as Fiji, and in one case, the Marquesas Islands. Recaptures of striped marlin tagged off eastern Australia have mainly indicated relatively short, coastal movements, with some longer distances recorded, but all within the boundaries of the Coral Sea and New Zealand.

As a result of these tagging studies, it is now becoming clear that striped marlin do not undertake as extensive movements as black and probably blue marlin. The tagging results are also supporting the conclusions of the genetic studies, substantiating that there are separate stocks of striped marlin on either side of the Pacific ocean.

Growth and size

Striped marlin probably grow relatively quickly, although few measurements of their growth rate have been attempted or validated. It has been estimated that striped marlin reach about 90 kg by their third year of life, and that their maximum life span may be about 16 years. Because knowledge of a species' growth rate is essential for understanding its ability to respond to fishing pressure, it is very important that definitive studies on striped marlin growth rates are undertaken in the near future.

Striped marlin do not grow nearly as large as blue or black marlin, both of which may attain weights in excess of 700 kg. The largest striped marlin caught on rod and reel weighed 250 kg and was landed off New Zealand in 1995. This specimen was a remarkable 26 kg heavier than the official IGFA record, and because of its size, its identification was in doubt until it was able to be positively identified**.**

Reproduction

The major spawning grounds of striped marlin in the southwestern Pacific appear to be over an extensive undersea mountain chain or ridge between New Zealand and New Caledonia. Spawning is also known to occur in the eastern Pacific, the northern Pacific and the south central Pacific, as noted, adding weight to the likelihood of four distinct stocks within the Pacific basin. Larvae have also been collected in the Banda and Timor seas of the Indian Ocean, so it is likely that at least one genetic stock also occurs in the Indian Ocean. Based on the occurrence of ripe ovaries in female fish, spawning over the southwestern Pacific undersea ridge occurs throughout summer.

Adult females may contain as many as 29 million eggs at any one time during a spawning season. Pairs of fish have been observed during spawning times, and recreational anglers have reported that when a striped marlin is hooked, its partner may stay close until the fish is caught or released. It has not been proven however that this behaviour is due to pair bonding or feeding interest.

Behaviour

More recently, electronic satellite tags have been used to study striped marlin off Mexico, Ecuador, Australia and New Zealand. Popup satellite tags were deployed on nearly 250 striped marlin spread among all these locations. The average duration that tags stayed on fish was between two and three months, and in that time, there was strong evidence for broad regional fidelity. As an example, one fish tagged off New Zealand moved north, made a circuit of New Caledonia and returned to New Zealand waters eight months later. In another novel experiment, scientists attached ‘spot’ tags to the upper tail lobe of striped marlin released off northern New Zealand. These showed that some fish stayed in the general region, but that others moved away from release sites in seemingly purposeful directions. A number of these were noted to track directly over an undersea ridge which extends north of New Zealand towards Fiji. This suggests that the surface oriented marlin could detect the deep underwater features, presumably via an upwelling effect.

Fisheries

The striped marlin is not the most common of the istiophorid billfishes in the Pacific ocean, but it is the most valuable, and as a consequence, has become a target species in some longline fisheries. Global catches of striped marlin peaked at around 24,000 tonnes in the 1960s but in the 2000s, have only averaged about 8,000 tonnes. Nominal catch rates (fish per hook) have also declined and there is now some concern regarding status of the stock of striped marlin in the central and western Pacific. Recreationally, striped marlin support active charter fisheries in many regions including Mexico, New Zealand, southeastern Australia and Kenya.

Tagging Tips

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

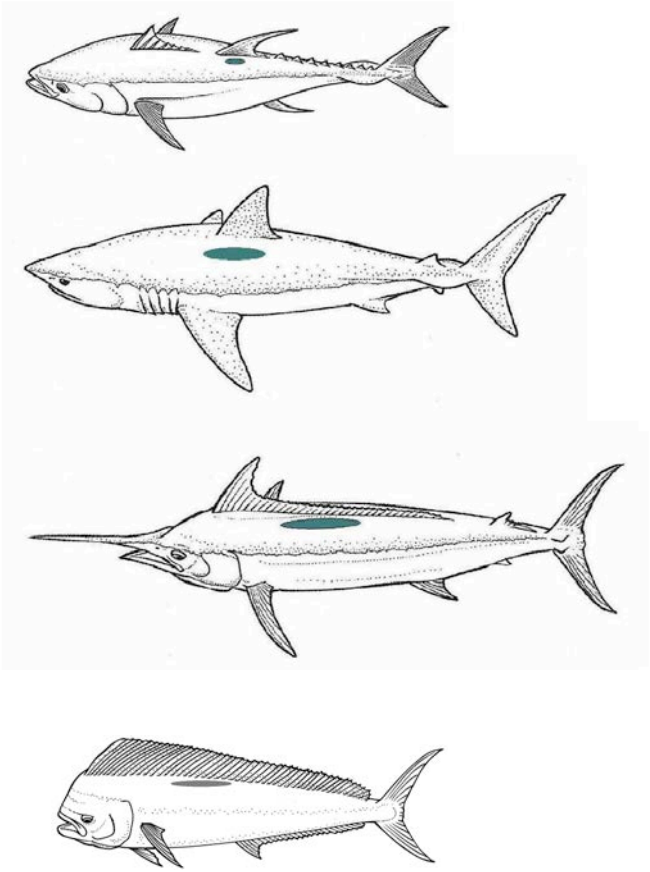
Smaller pelagic species may be removed from the water before tagging. This enables improved accuracy of tagging and may simplify hook removal. Often holding the fish on its back will lessen its 'flapping'. Try to prevent the fish damaging itself on hard, hot, or dry surfaces. A wet foam mat or similar is ideal (or a wet towel will suffice) for on-boat tagging. Where possible, try to place the tag at an angle of at least 45° to reduce water friction on the tag.

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 area is shown below. It is better to release the fish without tagging, if accurate tag placement is not possible.

Recommended tagging areas



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 clearcut 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 Cronulla, 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 Cronulla 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(0)2 9527 8411 or email game fish.tagging@dpi.nsw.gov.au.

Acknowledgements

The Game Fish Tagging Program is generously supported by the NSW Recreational Fishing Trust through funds raised from the Recreational Fishing Fee 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.

Appendix I: All Recaptures of Tagged Fish Reported in 2011/2012

Species	Release Date	Release Locality	Days at Liberty	Distance moved (n.mi)	Direction
Albacore	27/06/09	Bermagui	969	414	SW
Barramundi	20/12/10	Karratha (WA)	397	0	N
Black Marlin	10/09/10	Dampier (WA)	326	1	SE
Black Marlin	4/03/11	Port Stephens (shelf)	251	1005	NNW
Black Marlin	13/02/11	Port Stephens	365	2	N
Blue Marlin	3/07/11	Madang PNG	69	4	NW
Blue Marlin	23/03/11	Exmouth (WA)	270	661	N
Blue Marlin	9/04/11	Kiama (wide)	326	117	NNE
Blue Marlin	29/02/12	Port Stephens (wide)	11	5	SSW
Bronze Whaler	4/02/11	American River (SA)	408	74	SE
Cobia	9/08/11	Dampier Archipelago	50	1	W
Gummy Shark	12/03/11	Robe (SA)	207	12	ESE
Gummy Shark	21/02/10	Kangaroo Island (SA)	804	511	ESE
Mackerel Tuna	21/05/06	Delta 3 (png)	2225	14	WNW
Mahi Mahi	16/02/12	Ballina Fad	3	0	N
Mahi Mahi	25/03/12	Port Stephens Fad	6	0	N
Mahi Mahi	25/03/12	Port Stephens Fad	6	0	N
Mahi Mahi	18/03/12	Broken Bay (wide)	15	12	NNW
Mako Shark	18/09/10	Port Hacking (wide)	330	8	ENE
Mako Shark	17/09/11	Wollongong (18 Nm E)	25	79	NNE
Mako Shark	21/01/12	Port Welshpool (VIC)	7	7	WSW
Mako Shark	27/02/11	Inverloch (VIC)	336	22	NW
Mako Shark	25/11/11	Jervis Bay (shelf)	209	893	NNE
Sailfish	5/06/10	Dampier	420	14	NNE
Sailfish	23/10/09	Exmouth (WA)	735	16	NW
Sailfish	3/01/12	Exmouth (WA)	109	170	ENE
Sailfish	30/10/11	Exmouth (WA)	189	157	ENE
Sailfish	1/05/12	Dampier (WA)	5	1	E
Samson Fish	6/04/08	Greenly Island (SA)	1443	16	WSW
Samson Fish	19/02/06	Rottnest Island (sw)	2283	223	SSE
School Shark	18/04/11	Pennington Bay (K'roo Is)	362	45	SW
Silver Trevally	23/12/11	The Shallows	1	0	N
Southern Bluefin Tun	28/05/11	Cape Nelson	263	422	WNW
Southern Bluefin Tun	15/05/11	Port Macdonnell (SA)	276	378	WNW
Southern Bluefin Tun	19/05/11	Port Macdonnell (SA)	272	381	WNW
Southern Bluefin Tun	22/06/11	Pedra Branca	238	801	WNW
Southern Bluefin Tun	30/04/11	Port Macdonnell (SA)	308	70	WNW
Southern Bluefin Tun	31/03/07	Port Macdonnell (18 Nm S)	1853	1356	ESE
Spanish Mackerel	13/09/08	Cape Bowling Green	1040	23	NW
Spanish Mackerel	2/04/10	Lae (bravo 6) Png	506	5	W

Species	Release Date	Release Locality	Days at Liberty	Distance moved (n.mi)	Direction
Striped Marlin	1/01/12	Port Stephens (wide)	35	0	N
Striped Marlin	14/01/12	Port Stephens (wide)	22	9	SSW
Striped Marlin	7/01/12	Newcastle (east)	29	1	E
Striped Marlin	20/11/11	The Entrance (22 Nm E)	77	37	NE
Striped Marlin	17/01/12	Norah Head Canyons	21	121	SW
Striped Marlin	19/01/12	Batemans Bay (wide)	20	35	SE
Striped Marlin	5/02/12	Port Stephens (wide)	4	1	N
Striped Marlin	7/12/11	Norah Head Canyons (sth)	64	111	SSW
Striped Marlin	10/12/11	Port Stephens	63	16	SSW
Striped Marlin	5/02/12	Port Stephens	7	1	N
Striped Marlin	29/12/11	Tuross (east)	46	51	NNE
Striped Marlin	5/02/12	Port Stephens (wide)	11	2	WSW
Striped Marlin	31/12/11	Port Stephens	49	6	SE
Striped Marlin	5/02/12	Port Stephens (wide)	13	1	E
Striped Marlin	13/01/12	Port Stephens (wide)	37	25	NE
Striped Marlin	24/12/11	Coffs Harbour Canyons	61	168	SSW
Striped Marlin	19/02/12	Port Stephens (wide)	4	19	WSW
Striped Marlin	1/01/12	Merimbula (wide)	54	110	NNE
Striped Marlin	15/02/12	Port Stephens (wide)	11	0	N
Striped Marlin	10/12/11	Coffs Harbour	78	189	SSW
Striped Marlin	5/02/12	Port Stephens (wide)	25	204	SSW
Striped Marlin	30/12/11	Broken Bay East	62	156	SW
Striped Marlin	18/02/12	Port Stephens (wide)	12	3	NNW
Striped Marlin	25/02/12	Bermagui (wide)	15	53	NNE
Striped Marlin	28/01/12	Tuross Heads (east)	55	16	ENE
Striped Marlin	7/01/12	Noosa (east)	83	397	SW
Striped Marlin	18/02/12	Port Stephens (wide)	42	3	SSW
Striped Marlin	25/02/12	Port Stephens (wide)	50	63	NNE
Striped Marlin	12/02/12	Port Stephens	63	76	NE
Striped Marlin	31/03/12	Sydney (wide)	38	74	SSW
Striped Marlin	27/02/12	Port Stephens	86	294	NNE
Swordfish	16/05/11	Bermagui (wide)	230	37	NNE
Tiger Shark	16/04/10	Nickol Bay	470	19	NE
Tiger Shark	7/01/12	Broken Bay (wide)	38	143	NNE
Tiger Shark	30/04/12	Nickol Bay	0	0	S
Whaler Shark	27/03/10	Huon Gulf (PNG)	519	1048	WNW
Whaler Shark	19/11/07	St Kilda (black Pole)	1440	0	S
Whaler Shark	28/03/10	The Banks	670	162	NNE
Whaler Shark	22/11/11	The Banks	67	1	E
Whaler Shark	12/03/12	Exmouth (WA)	3	3	NE
Whaler Shark	15/03/12	Exmouth (WA)	63	0	S
Yellowfin Tuna	27/10/07	The Banks Wide	1479	5123	NE
Yellowfin Tuna	11/11/07	Sawtell NSW (17 Nm E)	1655	374	SSW
Yellowfin Tuna	26/02/11	Eden (east)	452	58	NE
Yellowtail Kingfish	1/05/11	Port Augusta (SA)	108	0	S
Yellowtail Kingfish	16/01/05	The Banks	2524	94	NNE
Yellowtail Kingfish	19/11/11	Point Perpendicular	68	2	WSW
Yellowtail Kingfish	11/11/06	Mowarry Point	1932	307	NNE
Yellowtail Kingfish	25/01/12	Manly	69	0	E
Yellowtail Kingfish	9/04/11	Green Cape	364	80	NE
Yellowtail Kingfish	22/04/12	Quakers Hat Point (NSW)	20	0	S

Appendix II: NSW DPI Game Fish Tagging Program Top Taggers for 2011/2012

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 can be seen in the table below with the numbers of fish that they tagged over the 2011/2012 season.

Species	Top boat	Runner up boat
Billfish combined	99 – *Flying Fisher* (NSW) Central Coast GFC and Haven Sport Fishing Charters	91 – *No More Favours* (NT) Groote Eylandt G & SFC
Blue Marlin (International)	38 – *Reel Addiction* (Tonga) Vava'u SFC / Reel Addiction Charters.	28 – *Stephanie* (PNG) New Britain GFC
Blue Marlin (Australia)	28 – *Mistress* (QLD) Gold Coast GFC / Mistress Sportfishing Charters	18 – *Jugs* (QLD) Gold Coast GFC
Black Marlin	39 – *Flying Fisher* (NSW) Central Coast GFC and Haven Sport Fishing Charters	29 – *Maverick* (QLD) Townsville GFC
Striped Marlin	56 – *Flying Fisher* (NSW) Central Coast GFC and Haven Sport Fishing Charters	55 – *Gunrunner* (NSW) Newcastle & Port Stephens GFC
Sailfish	83 – *No More Favours* (NT) Groote Eylandt G & SFC	61 – *Diamond Time* (NT) Groote Eylandt G & SFC
Shortbill Spearfish	2 – *Tantrum* (NSW), *Steakout* (NSW) and *Hot Deal* (QLD)	1 – 10 boats from NSW and QLD
Swordfish	1 – *Swoopa* (VIC) Victorian GFC	-
Shark combined	35 – *Tourettes* (WA) Nickol Bay SFC	29 – *Everwilling* (NSW) Sydney GFC
Mako Shark	19 – *Aquaholic II* (NSW) Canberra GFC	10 – *Greyhounder* (NSW)
Blue Shark	6 – *Reckless* (NSW) Shellharbour GFC and *Anna* (NSW) Merimbula BG & LAC	5 – *Aquaholic II* (NSW) Canberra GFC
Tiger Shark	29 – *Tourettes* (WA) Nickol Bay GFC	3 – *Blood N Guts* (NSW), *Childs Play* (NSW), *Raddler* (WA), *The Big Boat* (WA)
Whaler Shark	29 – *Everwilling* (NSW) Sydney GFC	8 – *Catchit* (WA) King Bay GFC
Hammerhead Shark	5 – *Alcatraz* (NSW) Port Macquarie GFC	4 – *Woz Fishing* (NSW)
Thresher Shark	3 – *Flying Dutchman* (NSW) Eden S & GFC	1 – *Southern Blue* (SA), *Shock Wave* (NSW) and *Ranger Brown* (VIC)

Tuna combined	81 – *Hill Bill One* (TAS) St Helens GFC	80 – *Ruby Mc* (SA) Port MacDonnell OAC
Yellowfin Tuna	19 – *Satisfaction* (PNG) Lae GFC and *Em Nau* (PNG) Lae GFC	17 – *Manta* (PNG) Lae GFC
Southern Bluefin Tuna	60 – *Navis II* (SA) GFC of South Australia	57 – *Ruby Mc* (SA) Port MacDonnell OAC
Bigeye Tuna	7 – *Break Free* (PNG) New Britain GFC	-
Albacore Tuna	26 – *Polaris* (NSW) Eden S & GFC	22 – *Diversion* (TAS) Tuna Club of Tasmania and *Red Boat* (VIC) Bass Strait GFC
Longtail Tuna	11 – *Top Shelf* (WA) King Bay GFC	10 – *Black Label* (WA) King Bay GFC
Dogtooth Tuna	-	-
Spanish Mackerel	32 – *Black Label* (WA) King Bay GFC	22 – *Big Mac* (NT) Groote Eylandt G & SFC
Mahi Mahi	23 – *Purple Haze* (NSW) Port Macquarie GFC	20 – *Express* (QLD) Surfers Paradise G & SFC
Yellowtail Kingfish	25 – *Sea Jay* (SA) Adelaide GFC	19 – *Strikezone* (NSW)

Species	**Top individual**	**Runner up individual**
Billfish	39 – Gavin Goodwin (NT) Groote Eylandt G & SFC	37 – Barry Alty (QLD) Gold Coast GFC and Bart Portelli (NSW) Sydney GFC
Shark	21 – Kevin Deacon (WA) Nickol Bay SFC	14 – Cody Wright (WA) Exmouth GFC
Tuna	81 – Mitchell Hill (TAS) St Helens GFC	49 – Matthew Hunt Fishing Services (VIC)