

NSW DPI Game Fish Tagging Program Report 2009/2010



Primary
Industries



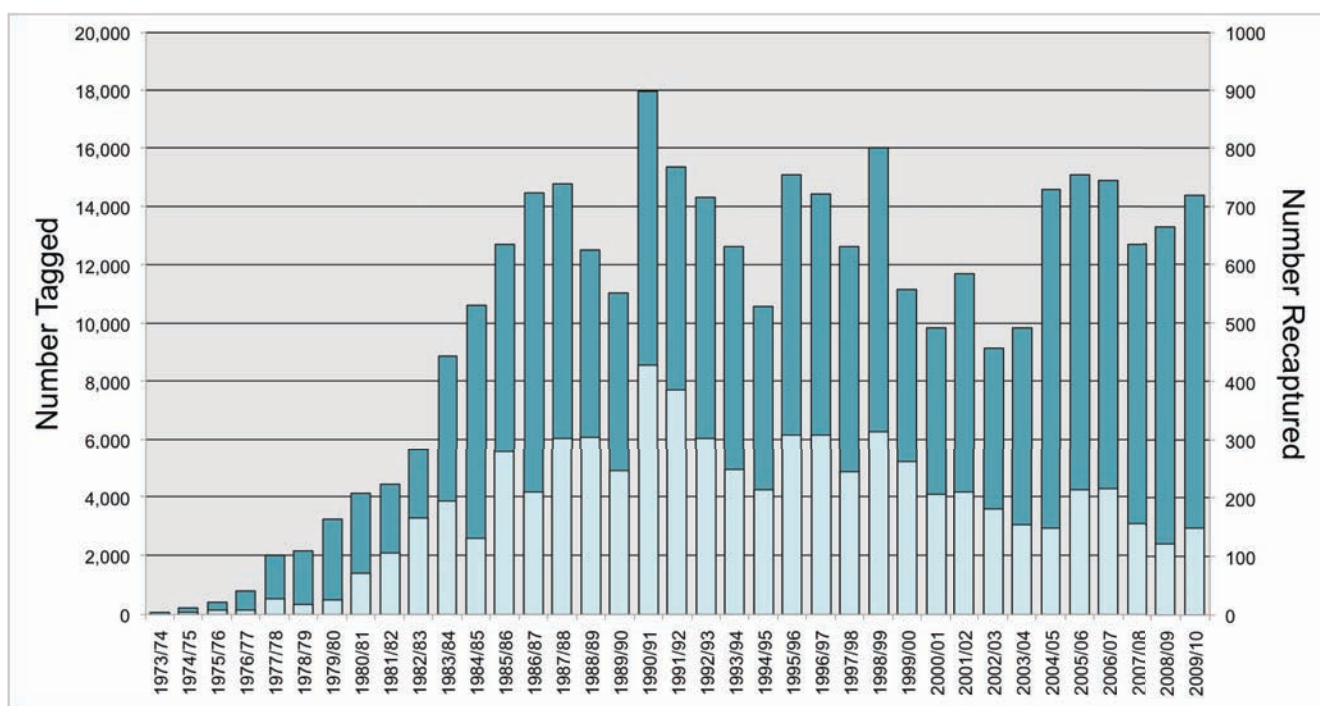
NSW DPI Game Fish Tagging Program

2009/2010

The 2009/2010 tagging year was very successful, recording a total of 14,370 fish tagged for the year and 149 recaptured. 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 2009/10 was greater than the previous two seasons and similar to the high numbers tagged during the mid 2000s. With such sustained effort, each year, the tagging program, operated since 1973 by NSW Fisheries (now NSW DPI), accumulates additional valuable information on movements, growth and numbers of releases through time of billfish, tunas, sharks and other game fish.

Not surprisingly, the numbers of fish tagged each year has fluctuated, although following steady growth to the mid 1980s, in nearly all years since then, the total tagged has exceeded 10,000 (Figure 1). Total numbers of fish tagged each year vary depending on the availability of different species of fish at different times and locations. Thus, in some years, black marlin might appear in large numbers off the eastern Australian coast, while in others, sailfish off northwestern Australia may constitute a larger proportion of the numbers of fish tagged, or as unexpectedly happened over the past two seasons, southern bluefin tuna might dominate releases.

Figure 1. Numbers of fish tagged and recaptured by year, to 2009/2010.



The Program overall

Over the history of the program, the grand total of fish tagged and recaptured, as at the end of June 2010, stood at 373,517 and 6,790 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 25 species (or species groups) tagged, with all others lumped as 'all other species'.

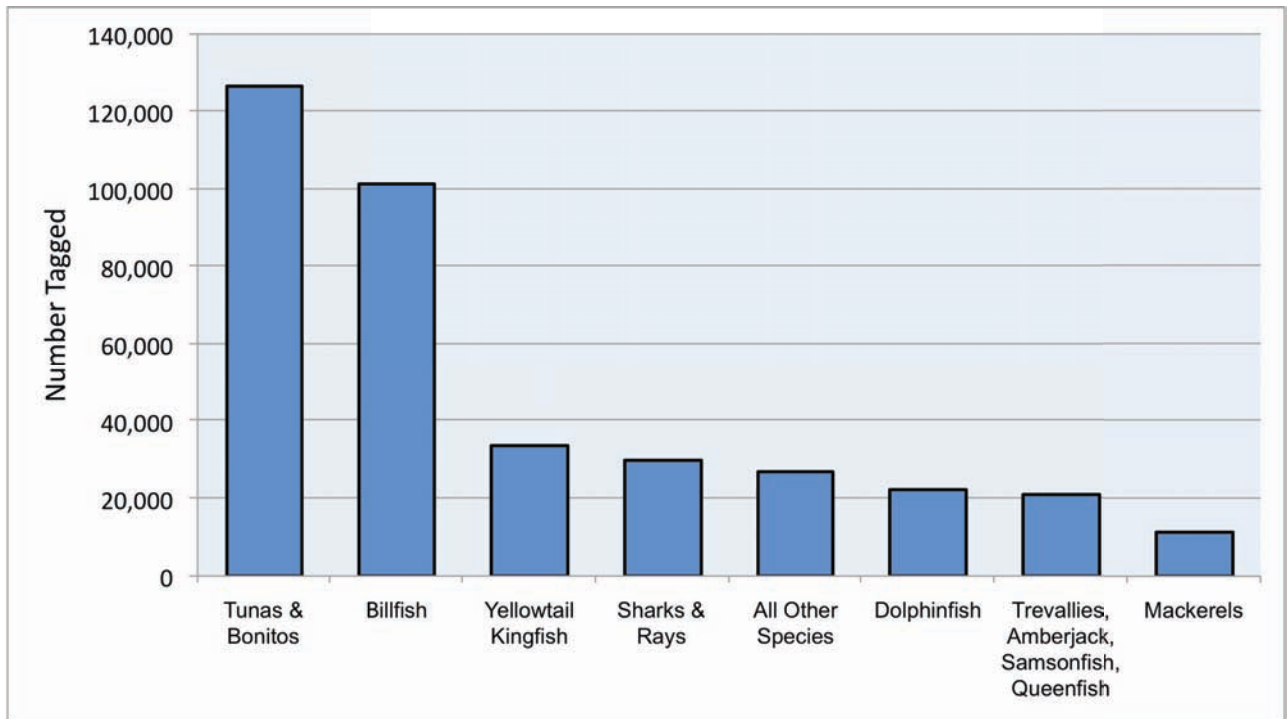
The species tagged in the greatest numbers continues to be black marlin (over 50,000 tagged, and representing 13.5% of all releases) followed by yellowfin tuna, yellowtail kingfish, sailfish and dolphinfish.

Table 1. Total numbers of fish tagged and recaptured: 1974-2010

Species	No. Tagged	No. Recap	% Recap
BLACK MARLIN	50,289	393	0.78
YELLOWFIN TUNA	36,313	683	1.88
YELLOWTAIL KINGFISH	33,740	2,156	6.39
SAILFISH	25,366	268	1.06
DOLPHINFISH	22,386	205	0.92
STRIPED MARLIN	19,591	180	0.92
MACKEREL TUNA	19,413	61	0.31
ALBACORE	19,339	158	0.82
SKIPJACK TUNA	19,308	67	0.35
BONITO	13,169	219	1.66
SOUTHERN BLUEFIN TUNA	10,681	112	1.05
AUSTRALIAN SALMON	9,359	605	6.46
SPANISH MACKEREL	7,636	73	0.96
SILVER TREVALLY	6,892	196	2.84
MAKO SHARK	6,404	152	2.37
BLUE MARLIN	5,790	17	0.29
WHALER SHARKS	5,747	100	1.74
HAMMERHEAD SHARKS	5,067	55	1.09
LONGTAIL TUNA	4,575	57	1.25
BRONZE WHALER	4,299	97	2.26
BLUE SHARK	4,136	74	1.79
TAILOR	4,030	122	3.03
TREVALLY	3,327	31	0.93
BARRACUDA	2,910	5	0.17
QUEENFISH	2,811	10	0.36
ALL OTHER SPECIES	30,939	694	2.24
TOTAL	373,517	6,790	1.82

Lumping the main species or species groups together, Figure 2 shows that tunas remain the group tagged in the largest numbers (126,725 tagged, or 33.9% of the total) followed by billfish (101,474, or 27.2% of all fish tagged). Perhaps surprisingly, sharks (29,657 tagged) only represent 7.9% of all tagged fish while yellowtail kingfish, with 33,740, represents 9.0% of all taggings.

Figure 2. Total numbers of fish tagged as species groupings or species, 1974-2010



Summary for 2009/2010

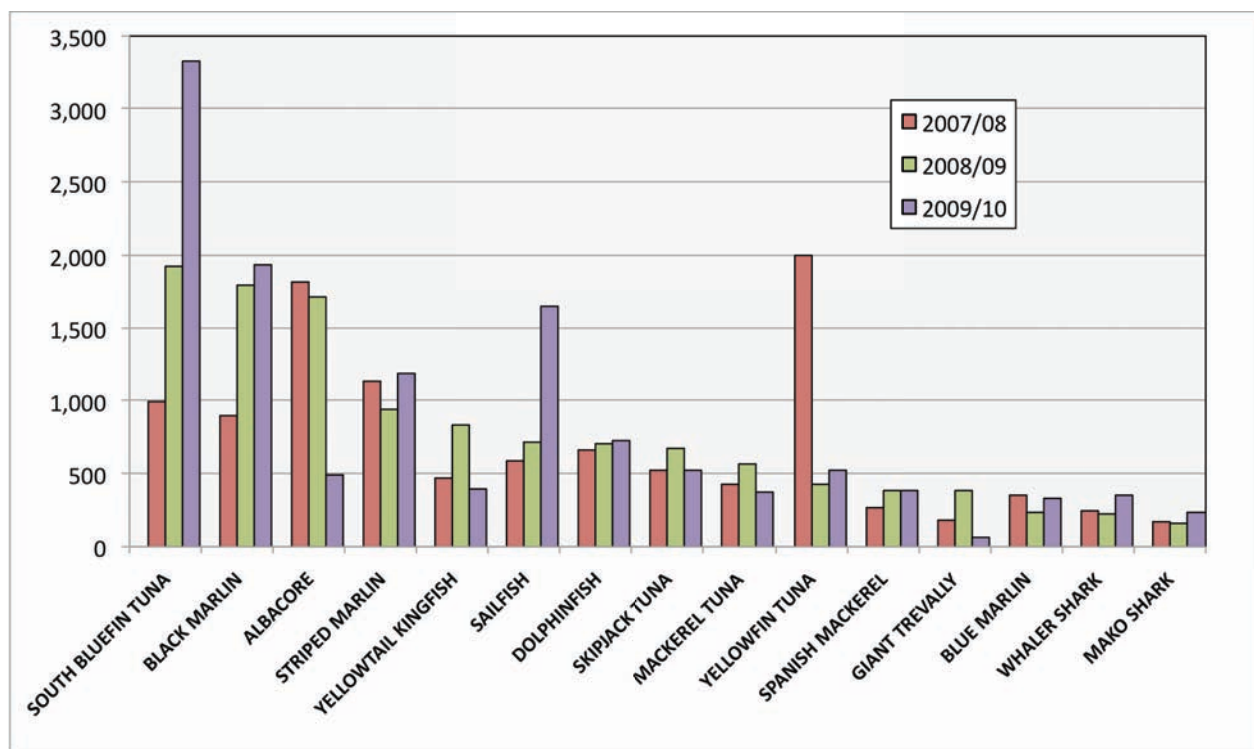
Table 2. Numbers of fish tagged and recaptured in 2009/2010

Species	Tagged	Recaptured
SOUTHERN BLUEFIN TUNA	3,329	3
BLACK MARLIN	1,933	24
SAILFISH	1,644	32
STRIPED MARLIN	1,187	6
DOLPHINFISH	725	3
YELLOWFIN TUNA	527	3
SKIPJACK TUNA	520	2
ALBACORE	492	
YELLOWTAIL KINGFISH	394	30
SPANISH MACKEREL	383	
MACKEREL TUNA	376	1
WHALER SHARKS	356	1
BLUE MARLIN	336	
MAKO SHARK	240	9
LONGTAIL TUNA	215	
BARRACUDA	189	
SAMSON FISH	137	1
AUSTRALIAN SALMON	134	2
SNAPPER	124	3
QUEENFISH	102	1
SCALY MACKEREL	100	
BLUE SHARK	89	2
EAGLE RAY	89	1
BONITO	85	
HAMMERHEAD SHARKS	68	1
GIANT TREVALLY	65	3
TIGER SHARK	52	3
WAHOO	48	
GUMMY SHARK	44	2
BRONZE WHALER	35	7
SPOTTED MACKEREL	34	
RAINBOW RUNNER	32	
AMBERJACK	31	2
BLACKTIP SHARK	31	1
BROAD BARRED MACKEREL	28	
BARRAMUNDI	26	
GOLDEN TREVALLY	25	
GOLD SPOTTED TREVALLY	24	
SILVER TREVALLY	21	1
COBIA	20	
SCHOOL SHARK	17	1
SHORTBILL SPEARFISH	14	
MISCELLANEOUS	9	
THREADFIN SALMON	7	
TREVALLY	7	
DOGTOTH TUNA	5	
BIGEYE TREVALLY	4	
MULLOWAY	4	3
WHITETIP SHARK	4	
BIGEYE TUNA	3	
BROADBILL SWORDFISH	2	
SCHOOL MACKEREL	2	1
FRIGATE MACKEREL	1	
THRESHER SHARK	1	
TOTALS	14,370	149

This table shows that, in 2009/2010, the species tagged in by far the highest numbers was southern bluefin tuna (SBT), 3,329 releases. This is the second year in succession that SBT have topped the tagging list (the only two years when this has happened), and sets a new record for the number of this species tagged in any year. In fact, the number of SBT tagged in this single year represents 31.1% of the total tagged since the program began in 1973. Such has been the recent increase in taggings of SBT that the total number tagged over the past four years (7,649) constitutes 71.6% of the total tagged for the entire 37 years of the program. As pointed out in last year's report, 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.

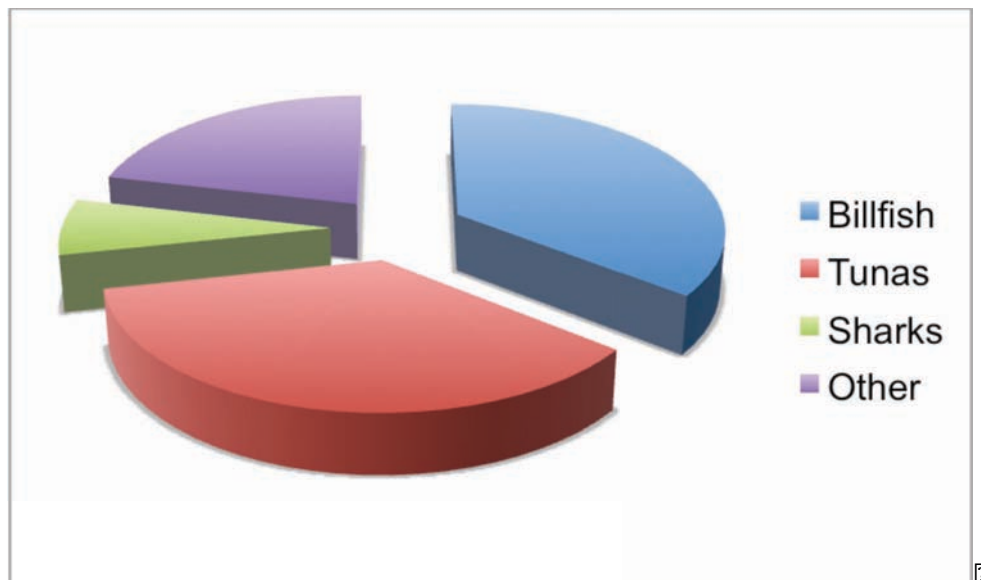
Figure 3 shows a comparison of species or species groups tagged over the past three years. This again shows the remarkable increase in numbers of southern bluefin tuna tagged, and also highlights a marked increase in taggings of sailfish. The majority of these sailfish were tagged off Dampier, Western Australia where the fishery experienced its best season on record. On the other side of the ledger, yellowfin tuna taggings were down to historically low levels for the second year in succession. Numbers of albacore tagged also dropped markedly this year. Species tagged in similar numbers to previous years included black marlin (following a very poor year in 2007/08), striped marlin, dolphinfish, blue marlin and mako shark.

Figure 3. Numbers of main species and species groups tagged in 2009/2010 and the previous two years.



Combining the species into groups, Figure 4 shows that, in 2009/2010, the proportion of billfish to all fish tagged was 35.6% – an increase from 27.9% last year. This increase was largely due to the marked increase in taggings of sailfish in Western Australia mentioned above.

Figure 4. Species groups tagged in 2009/2010



Recapture highlights

All of the recaptures recorded in 2009/2010 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, are often exceptions to the rule. In fact, many fish are recaptured relatively close to their points of release, often within relatively short times and 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

2009/2010 was another good year for reports of recaptured black marlin. This year, information was received for 24 recaptures of tagged black marlin, 17 of which had originally been released off southeast Queensland, between the Gold Coast and Noosa. Figure 5 shows most of the longer distance movements of black marlin recaptures for this year.

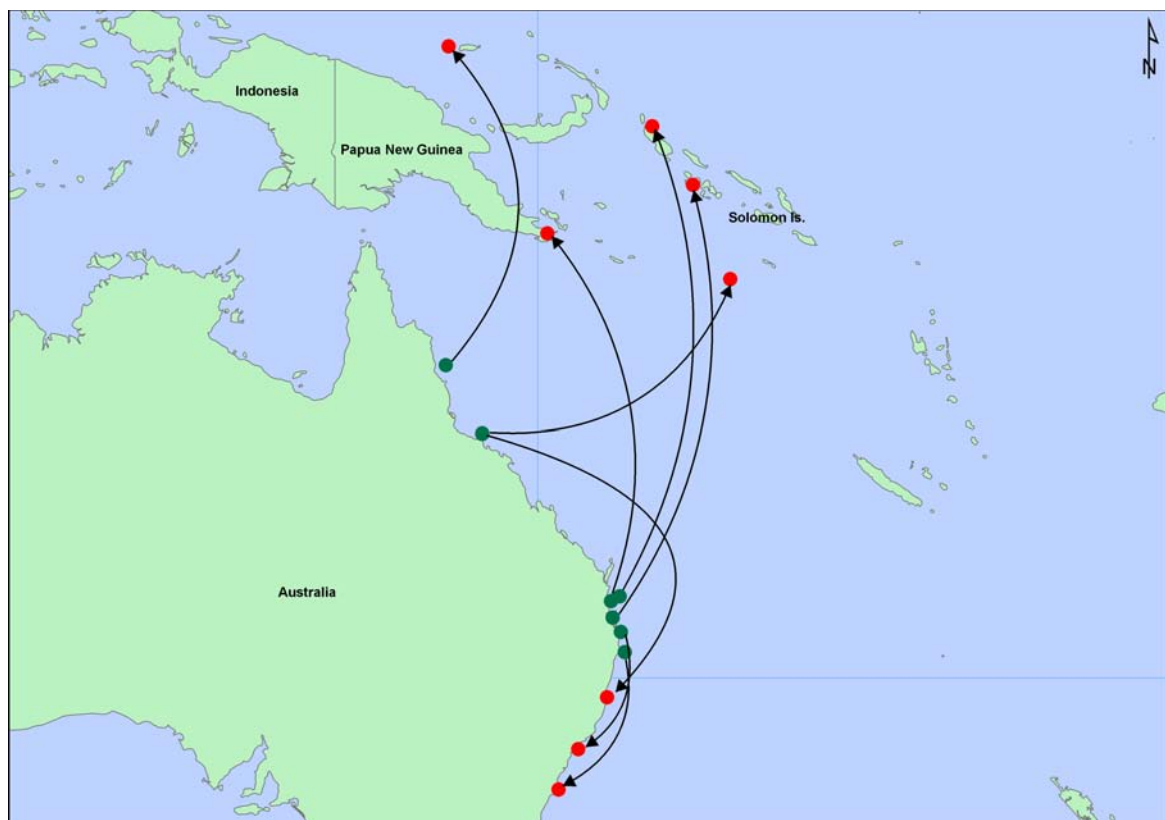


Figure 5. Long-distance recaptures of black marlin – 2009/2010

The longest distance moved by any of these was by a juvenile black marlin tagged off Noosa Qld in March 2009. Estimated at 30 kg, it was subsequently recaptured 287 days later off the northeast coast of Bougainville, a distance of 1,250 nmi. At recapture, the fish weighed 58 kg. The longest time-at-liberty for a black marlin this year was achieved by a fish tagged off Moreton Island on Australia Day 2006. Estimated at just 18 kg at the time, It was recaptured near Ghizo Island in the Solomons 3 years 163 days later – a minimum distance moved of 1168 nmi. The report of the recapture of this fish is of interest.

This stated that “the local fisherman was towing line behind him and the fish dragged him for over an hour before he secured it to the canoe”. With such a long time at liberty, it would have been very interesting to have good measurements of this fish at recapture, but unfortunately, only an estimated length of about 2 metres was given.

A similar movement was recorded by another estimated 18 kg black marlin tagged off Mooloolaba Qld in December 2008. It was recaptured off Alotau on the northeast coast Papua New Guinea 306 days after release. Again, the fisherman who recaptured the fish caught it while trolling a live bait behind his outrigger canoe. This time size of the fish was estimated at 70 kg.

Also demonstrating the strong link for black marlin between Australia and the Papua New Guinea / Solomons region were two recaptures of fish tagged off northern Queensland. The first of these was only 10 kg when released off Cape Bowling Green in September 2008, but when it was recaptured 170 nmi southwest of Guadalcanal, Solomon Islands eleven months later, it had grown to 38 kg (confirming estimates of rapid early growth rate for the species). And lastly, a larger fish (estimated at 250 lb – 136 kg) tagged off Opal Ridge, northeast of Cairns in late October 2007 was recaptured almost exactly two years later at Manus Island, northern PNG where its weight, calculated from its length measurement, approximated 160 kg. A somewhat faster growth rate might have been expected if this was a female fish, which grow to over 600 kg, but in cases such as this, it is reasonable to speculate that this was most probably a male fish, since the maximum size of male black marlin is about 180 kg.

A juvenile black marlin held at the side of the boat prior to placing a tag in its shoulder. This year, 1,796 black marlin were tagged. Photo: Faiz Karim



Striped marlin

There have now been 180 striped marlin recaptured on the program. This year, six of these were reported, adding to the overall findings that striped marlin are not nearly as migratory, or mobile as either blue or black marlin. All six recaptured fish were tagged off New South Wales, from Port Stephens to Eden. Figure 6 shows the minimum distances moved by all striped marlin recaptured in 2009/10.

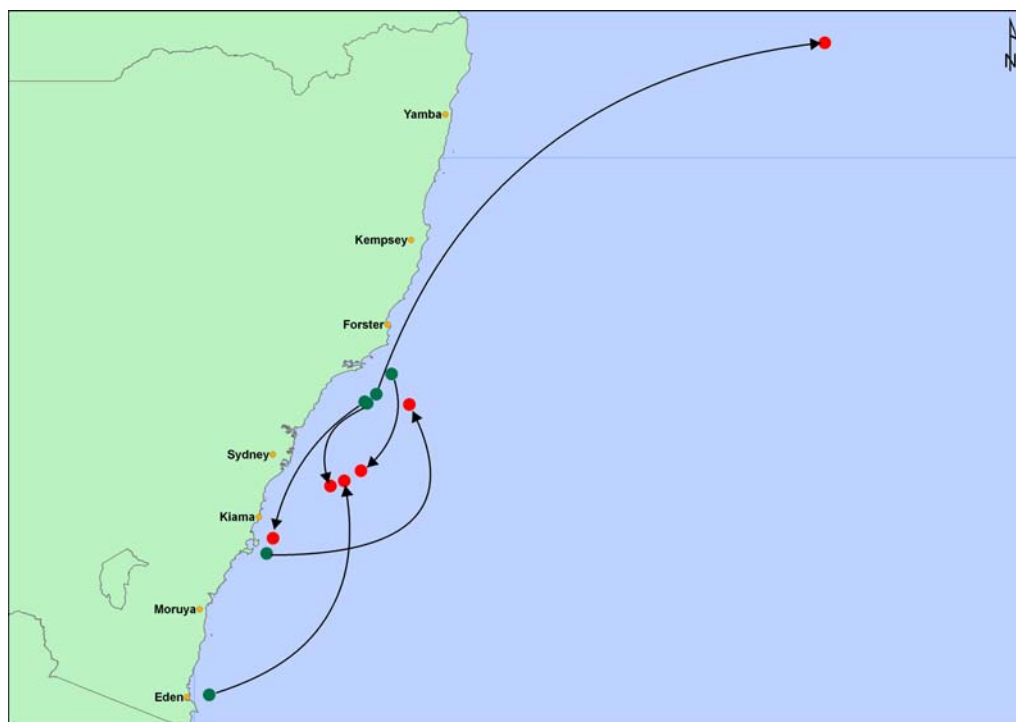


Figure 6. All recaptures of striped marlin – 2009/2010

The furthest distance moved was by a striped marlin released off Port Stephens in January 2009 and recaptured 177 days later, 245 nmi east of the Gold Coast. In contrast, the striped marlin at liberty for the longest period (490 days) had only moved an apparent distance of 79 nmi from its release point, again off Port Stephens. As a matter of interest, this was one of the longer times-at-liberty for striped marlin tagged on the program, most recaptures being reported within 12 months of release. Why this is so is somewhat of a mystery, since times-at-liberty for other marlin and game fish species have been much greater, and it is known that striped marlin live for at least 8 to 10 years. One explanation could be that striped marlin have a greater ability to reject tags, but this would be very difficult to prove.

Mako shark

In contrast to the previous season when only two mako sharks were recaptured, a total of nine were reported in 2009/2010. Three of these were released off New South Wales, between Sydney and Kiama, two being recaptured shortly after release (1 and 5 days) while the third, having been tagged off Stanwell Park in September 2009, was recaptured off Flinders Island, Bass Strait 110 days later. The other six recaptured makos were all tagged in Victorian waters. The furthest distance travelled by any of these was by a 50 kg shark tagged in Bass Strait in January 2010 which was recaptured 114 days later by a Japanese longliner about 615 nmi to the east in the Tasman Sea. Three of the other Victorian-tagged makos

had been at liberty for 295, 342 and 347 days before recapture, but had only moved minimum distances of 14, 19 and 20 nmi in the interim.

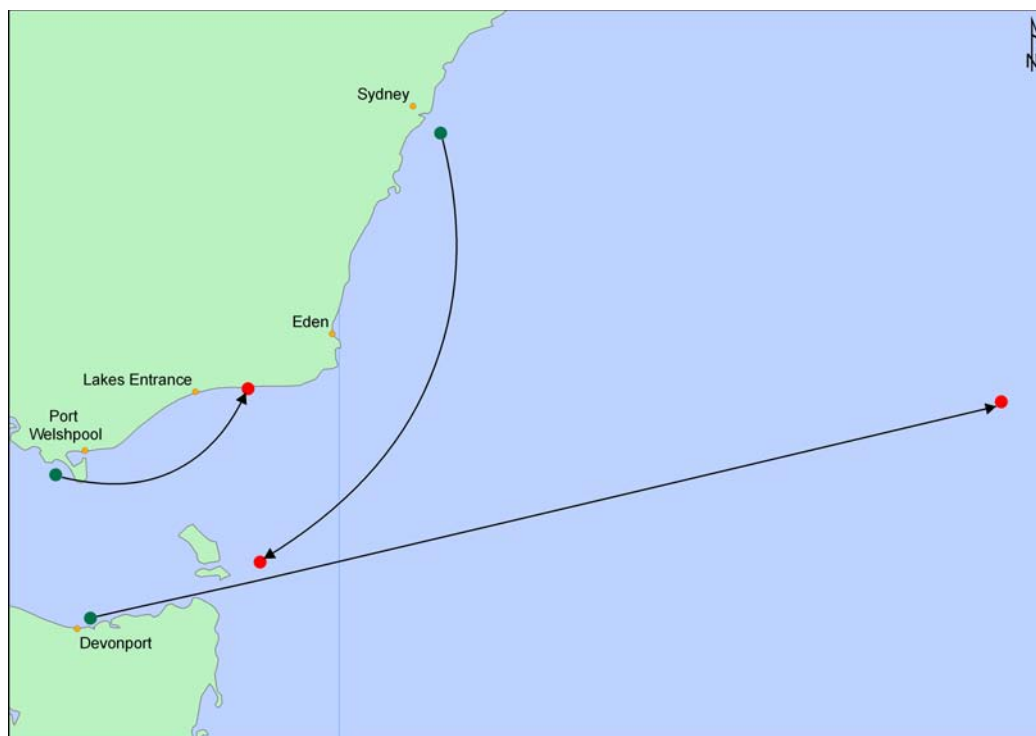


Figure 7. Longest distance recaptures of mako sharks – 2009/2010

Sailfish

Over the course of the tagging program, recapture rates for sailfish tagged off Western Australia have been consistently low – much less than one percent, in fact. On the other hand, when tagged in some locations off the east coast, recapture rates have usually been much higher – up to 6% in one season off the Sunshine Coast Qld. One likely explanation for the difference is that the population of sailfish off Western Australian hotspots is probably much greater than off the east coast, meaning that tagged fish there are, as it were, ‘diluted’ to a greater extent among the untagged population (in other words, the chances of recapturing a tagged fish are theoretically much lower). In 2009/2010, however, the number of recaptures of sailfish increased markedly. Thirty three recaptures were reported, of which, 30 were sailfish released off Dampier, Broome or Exmouth. And of those 30 fish, 29 had moved no further than 19 nmi after time-at-liberty of up to 266 days. The one exception was the sailfish that was at liberty for the longest time – a fish tagged off Exmouth in late August 2008 and recaptured 374 days later off Dampier, about 164 nmi up the coast.

The three other recaptured sailfish had all been tagged off Mooloolaba Qld and were all recaptured within 10 nmi of where they were released. A surprising aspect in this case, though, was that one of these fish had been at liberty for nearly exactly four years. Lack of apparent movement of sailfish has been a consistent result in all areas that the species has been tagged off both the east and west coasts, and while this suggests that individual fish do not stray very far over long periods of time, it could also be the case that fish do move, but return to the same area on an annual basis (coinciding with the recreational fishing season each time).



Unhooking a sailfish prior to release off Broome, WA. The tag is on the far side of the fish. Photo: Peter Strain

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Southern bluefin tuna

In contrast to last year when eight recaptures of southern bluefin tuna (SBT) were reported, only three recaptures were recorded in 2009/10. Two of these were relatively long distance recoveries, confirming some movement patterns shown previously for the species. The first was a 15 kg tuna tagged off Port McDonnell, South Australia in June 2008, recaptured 463 days later by a Japanese longliner at a point about 640 nmi southwest of Cape Leeuwin. At recapture, its gilled-and-gutted weight was 21 kg. The second was tagged off southern Tasmania (Pedro Branca), also at an estimated size of 15 kg, and recaptured in the Great Australian Bight 213 days after release.

Blue shark

As has become clear over the course of this tagging program (and collaborated by other tagging programs), blue sharks are true ocean wanderers. This year, two tagged blue sharks were recaptured, one of which had travelled a great distance. When tagged off Port Macdonnell, SA, it was estimated at just 9 kg, one of the smallest blue sharks tagged on the program. Released on 20 May 2005, it was recaptured by a South African longline vessel just 23 days short of five years later about 80 miles from Port Elizabeth, South Africa. The straight-line distance between its release and recapture points was 5,073 nautical miles and when recaptured, it weighed 47 kg and was reported to be male.

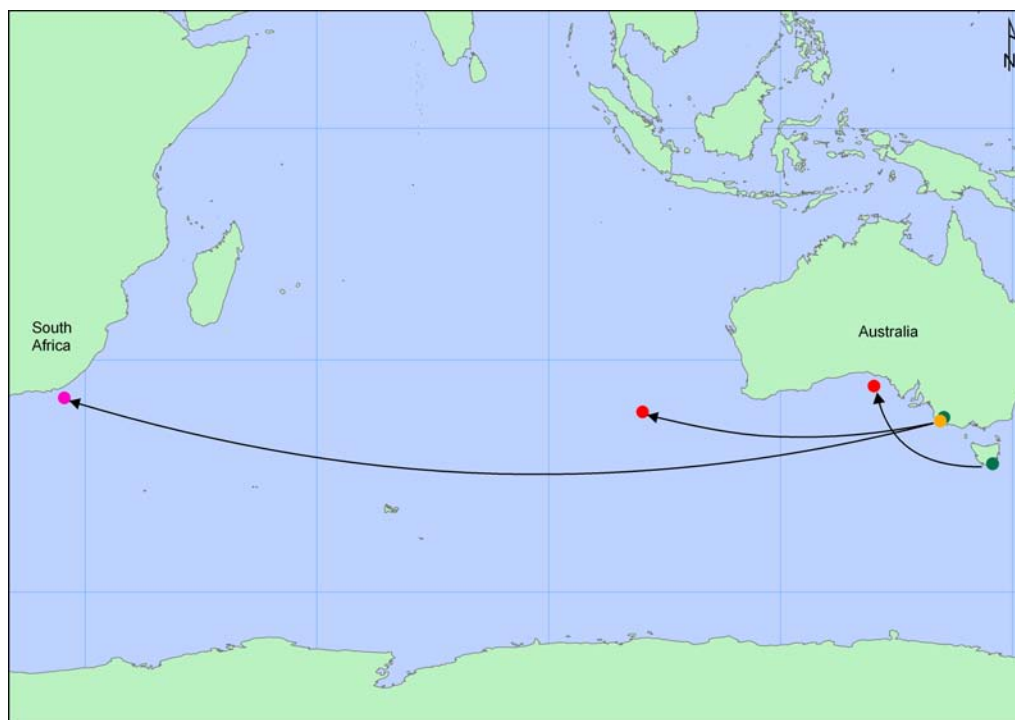


Figure 8. Longest distance recaptures of southern bluefin tuna (green circles at release, red circles at recapture) and blue shark (yellow circle at release, pink circle at recapture) – 2009/2010

Bronze whaler shark

Whaler sharks (family Carcharhinidae) are notoriously difficult to tell apart. Many species have very similar body shapes, fin placement and coloration, so for the purposes of the Game Fish Tagging Program, sharks in this family are usually lumped under the generic term 'whaler sharks'. The exception to this rule, however, is the separation of whalers tagged in the vicinity of Adelaide, South Australia, and environs, as bronze whalers, since it is very likely that most of these are indeed the true bronze whaler shark, *Carcharhinus brachyurus*.

This year, seven recaptured bronze whaler sharks were reported, six of which were tagged off South Australia, most having been at liberty for considerable periods. The longest time-at-liberty was for a bronze whaler tagged off St Kilda, Adelaide in late December 2004 and recaptured 5 years 93 days later just 52 nmi from its release point. Unfortunately the size of this shark at release was not recorded. However, showing just how slow growing bronze whalers can be, another shark tagged in St Vincent Gulf in December 2007 and recaptured nearby 23 months later had grown from an estimated weight of just 3 kg, to about 7 kg. And at the other end of the spectrum, a large bronze whaler, estimated at 140 kg, tagged off St Kilda, Adelaide, was recaptured just 52 nmi away nearly three years later. It was landed, and weighed in at 185 kg, and is the current 8 kg line-class Australian record for whaler sharks.

One other recapture this year, listed as a bronze whaler, is of considerable interest. This shark was tagged near the Neptune Islands, South Australia in November 2009 and subsequently recaptured 478 days later at Augusta, on the southwestern tip of Western Australia – a distance of 1,010 nmi.

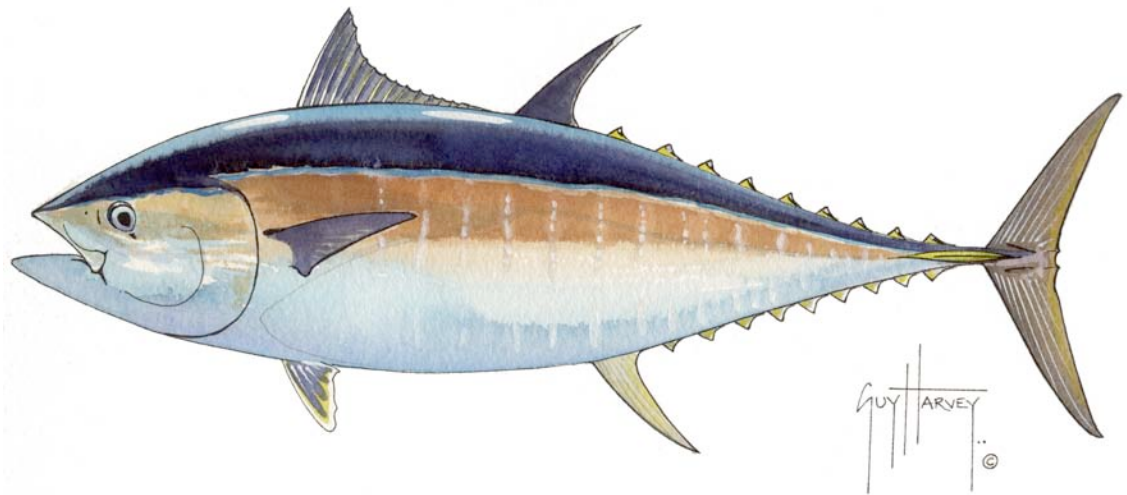
This was also a relatively large shark, estimated at 200 kg at release, and measuring 192 cm (total length) at recapture. But to indicate the difficulties of identification of whaler sharks, the Western Australian commercial fisherman who recaptured it identified it as a dusky whaler (*Carcharhinus obscurus*). Because historically, dusky whalers have been targeted in Western Australian commercial shark fisheries, the chances are that this identification is correct, however, without verification from an expert, its true identity must remain uncertain.



More than 1,300 wahoo have been tagged over the course of the Program, even though they are rated an excellent table fish. Photo: Glen Booth.



Focus on: Southern bluefin tuna (*Thunnus maccoyii*)



The following summary of the biology of the southern bluefin tuna has been adapted from the book, 'Fishes of the Open Ocean' by Julian Pepperell (UNSW Press).

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

Identification

The bluefin tunas are distinguished from most other tunas within their geographic range by their relatively short pectoral fins – usually measuring less than 80% of the head length, and their general lack of body patterning or colouration. The southern bluefin is also a robust tuna compared with the somewhat similar, but more slender longtail tuna, *Thunnus tonggol*.

Occasionally, northern Pacific bluefin tuna (*Thunnus orientalis*) overlap in their distribution with southern bluefin, especially off western New Zealand and sometimes off southeastern Australia. To distinguish between Pacific bluefin and southern bluefin, firstly, look at the caudal keels (these are the horizontal projections on either side of caudal peduncle, or tail 'wrist'). If they are yellow then the fish is a southern bluefin. Sometimes, though, southern bluefin may have dark keels and even experts can make mistakes in telling the two species apart. There are also some rather obscure internal characters used by taxonomists to split these two bluefins. However, to be absolutely certain, a small muscle sample should be taken for DNA analysis.

Geographic range

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

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

Electronic archival tags retrieved from juvenile southern bluefin reveal that preferred water temperatures are generally between about 7°C and 15°C, but may extend up to 22°C during long-distance movements.

Movements

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

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

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

Growth and size

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

Reproduction

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

Behaviour

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

Fisheries

The catch history of southern bluefin is not a happy one. Historically, world catches of southern bluefin tuna peaked at about 80,000 tonnes in 1960/61, the bulk being taken by Japanese longliners. During the 1960s, 70s and 80s, the total catch declined steeply and steadily, dipping below 20,000 tonnes by the late 1980s. During the late 1980s and mid 1990s, quotas (total catch limits) were steadily imposed on all components of the fishery. Unfortunately, it has since come to light that not all countries agreeing to the quotas maintained their catches at or below those levels did so, resulting in higher catches than were considered sustainable. Real fears are now held for the long term recovery of the stocks, which are now thought to be as low as 7-15% of the original parental biomass.

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

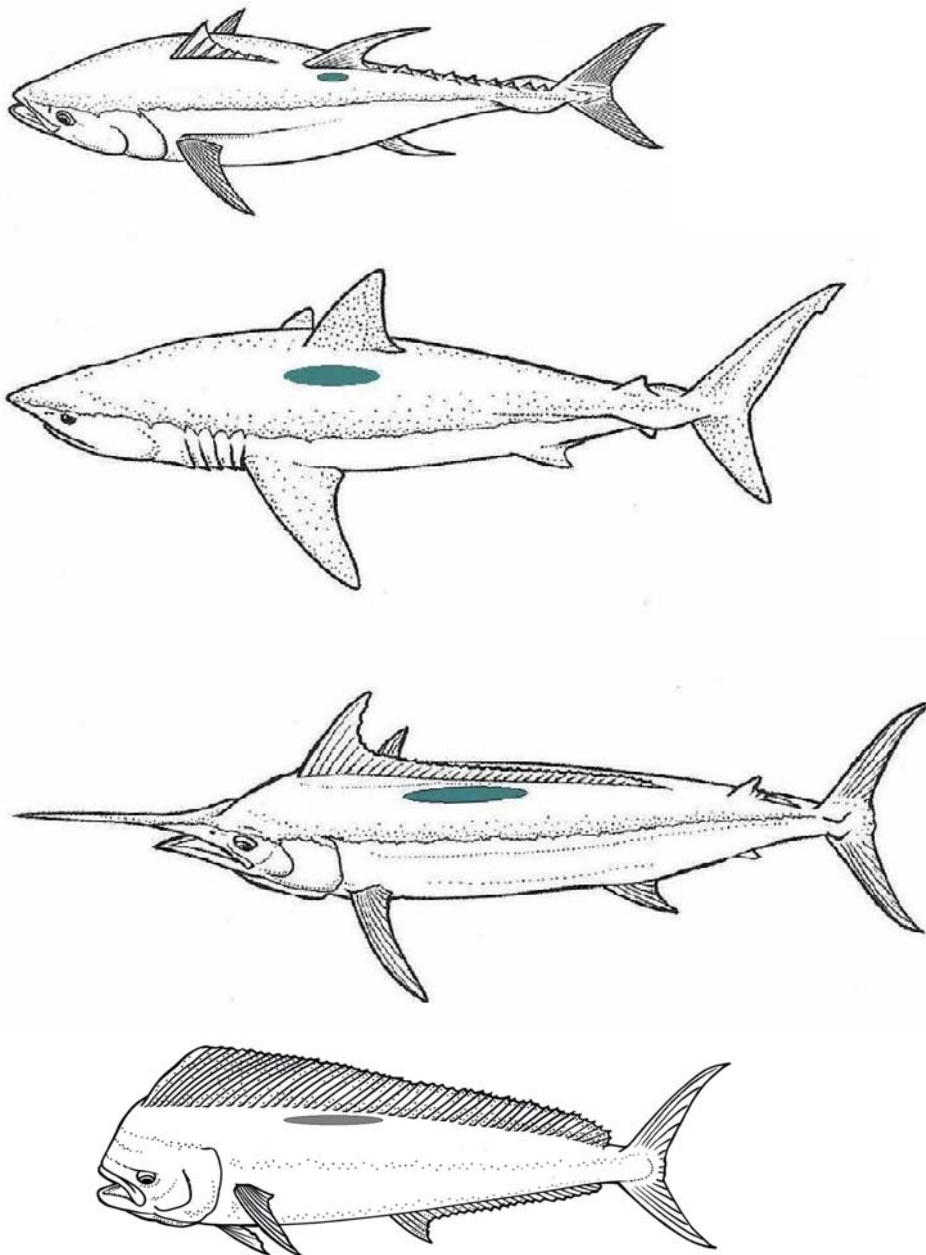
Smaller pelagic species may be removed from the water before tagging. This enables improved accuracy of tagging and may simplify hook removal. Often holding the fish on its back will lessen its 'flapping'. Try to prevent the fish damaging itself on hard, hot, or dry surfaces. A wet foam mat or similar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

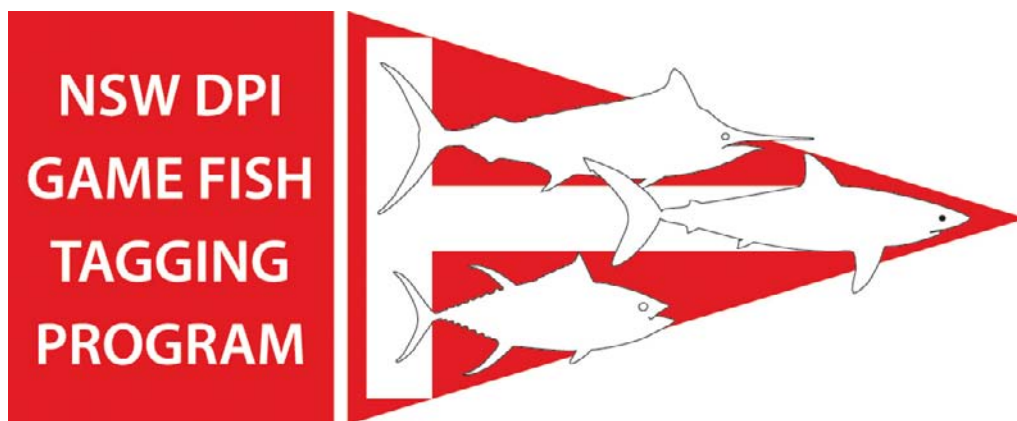
If you would like to contact the game fish tagging program either to obtain further information on the program, tags, or to report a recapture directly, call +61(0)2 9527 8411 or email game.fish.tagging@dpi.nsw.gov.au.

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Appendix I: All Recaptures of Tagged Fish Reported in 2009/2010 (note: blanks indicate incomplete data)

Species	Release Date	Release Locality	Days at Liberty	Distance Moved	Direction
Amberjack	13/06/2009	Gold Coast QLD	370	4	SE
Amberjack	15/08/2009	Gold Coast QLD	91	28	NW
Australian Salmon	12/04/2009	Kangaroo Island SA	237	0	N
Australian Salmon	19/07/2009	Swansea NSW	247	167	SSW
Black Marlin	11/01/2010	Gold Coast QLD	24	7	SSW
Black Marlin	13/12/2008	Mooloolaba QLD	306	990	NW
Black Marlin	15/01/2010	Gold Coast QLD	31	84	NW
Black Marlin	15/01/2010	Jumpinpin QLD	21	15	ESE
Black Marlin	15/01/2010	Jumpinpin QLD	75	69	NW
Black Marlin	15/01/2010	Mooloolaba QLD	85	11	NNW
Black Marlin	15/01/2010	South Stradbroke Is. QLD	30	71	NW
Black Marlin	15/01/2010	South Stradbroke Is. QLD	22	69	NW
Black Marlin	16/01/2010	Gold Coast QLD	70	327	SSW
Black Marlin	19/01/2010	Gold Coast QLD	3	19	SSE
Black Marlin	2/08/2009	Dampier WA	66	3	ESE
Black Marlin	2/08/2009	Dampier WA	67	13	SE
Black Marlin	20/09/2008	Cape Bowling Green QLD	330	755	ENE
Black Marlin	22/12/2009	Ballina NSW	85	394	SSW
Black Marlin	24/01/2010	Cape Moreton QLD	44	20	NNW
Black Marlin	24/04/2010	Mooloolaba QLD	9	4	NE
Black Marlin	24/10/2009	Fraser Island QLD	136	134	S
Black Marlin	26/01/2006	Moreton Island QLD	1258	1168	NE
Black Marlin	26/03/2010	Exmouth WA	73	161	ENE
Black Marlin	26/10/2007	Cairns QLD	752	848	N
Black Marlin	27/03/2010	Mooloolaba QLD	4	1	SE
Black Marlin	3/03/2009	Noosa	287	1252	N
Black Marlin	5/02/2010	Mooloolaba QLD	18	2	NNE
Black Marlin	8/09/2008	Cape Bowling Green QLD	504	762	SSE
Blacktip Shark	24/01/2010	Exmouth WA	8	0	E
Blue Shark	20/05/2005	Port Macdonnell SA	1802	5073	SW
Blue Shark	27/02/2010	Port Stephens NSW	0	4	ESE
Bronze Whaler	14/11/2009	Goolwa Beach SA	32	1	N
Bronze Whaler	17/11/2007	Mount Hunter VIC	744	11	NE
Bronze Whaler	23/02/2009	Neptune Islands SA	478	1010	W
Bronze Whaler	25/11/2006	St Kilda SA	1078	5	WNW
Bronze Whaler	27/12/2004	St Kilda SA	1918	52	WSW
Bronze Whaler	28/12/2007	St Vincent Gulf SA	704	18	ESE
Bronze Whaler	7/02/2009	Kangaroo Island SA	193	48	WSW
Dolphinfish	10/02/2010	Port Stephens NSW	1	3	WNW
Dolphinfish	22/12/2009	Coffs Harbour NSW	55	163	SW
Dolphinfish	3/05/2010	Port Stephens NSW	5	0	E
Eagle Ray	25/10/2009	Port River SA	87	3	SSW
Giant Trevally	10/04/2009	Great Barrier Reef QLD	111	4	NW
Giant Trevally	23/05/2009	Airlie Beach QLD	58	0	S
Giant Trevally	6/04/2009	Great Barrier Reef QLD	121	5	ENE
Gummy Shark	17/10/2009	Cape Coutts SA	109	44	SE
Gummy Shark	3/01/2010	Kangaroo Island SA	37	4	NNE
Hammerhead Shark	16/03/2010	Kiama NSW	4	15	SE
Mackerel Tuna	16/09/2007	Cape Bowling Green QLD	720	3	WNW

			Days		
Species	Release	Release Locality	at	Distance	Direction
	Date		Liberty	Moved	
Mako Shark	1/08/2009	Sydney NSW	1	1	E
Mako Shark	18/01/2009	Wilsons Promontory VIC	342	19	NNE
Mako Shark	20/09/2009	Stanwell Park wide NSW	110	379	SSW
Mako Shark	21/03/2009	Bass Strait VIC	295	14	WNW
Mako Shark	22/01/2010	Cape Liptrap VIC	3	145	ENE
Mako Shark	22/02/2009	Cape Schanck VIC	347	20	WNW
Mako Shark	22/08/2009	Kiama Canyons NSW	0	5	SW
Mako Shark	23/12/2009	Inverloch VIC	5	53	WNW
Mako Shark	9/01/2010	Bass Strait VIC	114	614	NE
Mulloway	26/06/2009	Port River SA	186	3	SE
Mulloway	4/01/2007	Scotts Bay SA	997	31	WNW
Mulloway	6/09/2009	Port River SA	126	1	SSE
Queenfish	26/02/2010	Alyangula NT	39	2	WNW
Sailfish	1/05/2009	Exmouth WA	176	19	SE
Sailfish	1/06/2009	Dampier WA	80	4	NW
Sailfish	1/08/2009	Dampier WA	6	1	SW
Sailfish	1/08/2009	Dampier WA	15	17	NNW
Sailfish	11/08/2009	Dampier WA	24	3	NNE
Sailfish	15/08/2009	Broome WA	2	11	NW
Sailfish	17/08/2009	Broome WA	2	0	S
Sailfish	17/10/2009	Exmouth WA	1	1	W
Sailfish	2/08/2009	Dampier WA	4	5	SE
Sailfish	2/08/2009	Dampier WA	14	1	S
Sailfish	2/08/2009	Dampier WA	4	4	SE
Sailfish	2/08/2009	Dampier WA	6	3	E
Sailfish	2/08/2009	Dampier WA	18	16	NNW
Sailfish	24/10/2009	Exmouth WA	1	1	W
Sailfish	25/09/2009	Mooloolaba QLD	194	3	WSW
Sailfish	26/08/2008	Exmouth WA	374	164	ENE
Sailfish	27/01/2010	Exmouth WA	55	5	ESE
Sailfish	27/06/2009	Dampier WA	42	3	WNW
Sailfish	28/03/2009	Dampier WA	145	3	NNW
Sailfish	28/04/2006	Mooloolaba QLD	1445	10	NW
Sailfish	3/08/2009	Dampier WA	6	0	S
Sailfish	3/08/2009	Dampier WA	6	2	ESE
Sailfish	3/08/2009	Dampier WA	29	3	E
Sailfish	30/04/2010	Dampier WA	10	0	
Sailfish	31/05/2009	Dampier WA	68	6	NNW
Sailfish	31/07/2009	Dampier WA	16	1	E
Sailfish	5/04/2010	Mooloolaba QLD	4	1	E
Sailfish	5/07/2009	Dampier WA	35	14	SSE
Sailfish	7/03/2009	Dampier WA	153	4	NNW
Sailfish	7/08/2009	Dampier WA	1	0	S
Sailfish	7/08/2009	Dampier WA	266	2	ESE
Sailfish	9/08/2009	Dampier WA	82	7	WSW
Samson Fish	10/03/2007	Geographe Bay WA	1069	8	SE
School Mackerel	14/06/2009	Airlie Beach QLD	132	0	S
School Shark	26/08/2009	Kangaroo Island SA	219	40	ESE
Silver Trevally	20/03/2010	Busselton WA	28	9	SSW
Snapper	1/12/2009	Port Broughton SA	2	0	S
Snapper	18/04/2010	St Vincent Gulf SA	11	4	NNW
Snapper	30/11/2009	Port Broughton SA	3	0	S
Sth Bluefin Tuna	15/06/2008	Port Macdonnell SA	463	1826	SW

			Days		
Species	Release	Release Locality	at	Distance	Direction
	Date		Liberty	Moved	
Sth Bluefin Tuna	21/06/2009	Pedra Branca TAS	213	937	WNW
Sth Bluefin Tuna	31/05/2008	Port Macdonnell SA	447	0	
Striped Marlin	1/02/2009	Jervis Bay Canyons NSW	226	149	NNE
Striped Marlin	15/02/2009	Port Stephens NSW	490	79	SW
Striped Marlin	18/01/2009	Port Stephens NSW	177	409	NE
Striped Marlin	21/01/2010	Norah Head Canyons NSW	64	122	SSW
Striped Marlin	27/02/2010	Eden NSW	19	189	NNE
Striped Marlin	28/02/2010	Swansea NSW	15	69	SSW
Striped Tuna	26/10/2008	Lae PNG	520	329	NNW
Striped Tuna	8/04/2006	Lae PNG	1433	314	NNE
Tiger Shark	15/03/2009	Dampier WA	443	17	E
Tiger Shark	16/04/2010	Dampier WA	0	0	E
Tiger Shark	28/05/2010	Dampier WA	0	0	E
Whaler Shark	9/05/2009	The Banks NSW	322	0	N
Yellowfin Tuna	10/02/2008	Batemans Bay NSW	554	650	NE
Yellowfin Tuna	20/07/2008	Lae PNG	364	0	
Yellowfin Tuna	9/04/2009	Madang PNG	120	317	NNE
Yellowtail Kingfish	1/02/2009	Long Reef NSW	201	74	SW
Yellowtail Kingfish	10/01/2009	Shellharbour NSW	204	19	S
Yellowtail Kingfish	10/01/2009	Coffs Harbour NSW	465	7	NW
Yellowtail Kingfish	10/04/2010	Mowarry Point NSW	39	54	NE
Yellowtail Kingfish	14/04/2006	Mowarry Point NSW	1401	12	NW
Yellowtail Kingfish	14/06/2009	Ulladulla NSW	28	0	
Yellowtail Kingfish	15/08/2009	Green Cape NSW	101	4	E
Yellowtail Kingfish	17/10/2009	Hutchison Shoals QLD	14	1	N
Yellowtail Kingfish	19/04/2009	Green Cape NSW	315	2	WNW
Yellowtail Kingfish	19/07/2009	Sydney NSW	27	0	S
Yellowtail Kingfish	19/08/2006	Mowarry Point NSW	1131	820	NE
Yellowtail Kingfish	20/11/2006	Ballina NSW	958	10	WNW
Yellowtail Kingfish	23/09/2007	Split Solitary Island NSW	915	445	SSW
Yellowtail Kingfish	24/01/2009	Jibbon Point NSW	207	52	SW
Yellowtail Kingfish	24/03/2009	Rottneest Island WA	110	0	E
Yellowtail Kingfish	25/01/2009	Botany Bay NSW	267	58	SW
Yellowtail Kingfish	27/02/2010	Fremantle WA	2	0	E
Yellowtail Kingfish	27/10/2007	Mowarry Point NSW	617	571	NNE
Yellowtail Kingfish	27/12/2008	Shellharbour NSW	257	43	NNE
Yellowtail Kingfish	27/12/2008	Shellharbour NSW	236	21	SE
Yellowtail Kingfish	28/12/2008	Wollongong NSW	327	111	SSW
Yellowtail Kingfish	29/11/2008	Point Perpendicular NSW	244	13	NNE
Yellowtail Kingfish	29/12/2009	Long Reef NSW	10	0	S
Yellowtail Kingfish	29/12/2009	Long Reef NSW	23	0	S
Yellowtail Kingfish	30/11/2008	Point Perpendicular NSW	264	13	NE
Yellowtail Kingfish	30/11/2008	Point Perpendicular NSW	406	75	SSW
Yellowtail Kingfish	6/12/2008	Coffs Harbour NSW	287	9	N
Yellowtail Kingfish	7/10/2007	Mowarry Point NSW	792	139	NNE
Yellowtail Kingfish	8/03/2009	Montague Island NSW	223	85	NNE
Yellowtail Kingfish	9/02/2009	Rottneest Island WA	165	0	E