NSW DPI Game Fish Tagging Program

Report

2008/2009

Recreational Fishing Trusts

NSW GOVERNMENT Primary Industries

Pepperell Research
Marine Science & Recreational Fisheries

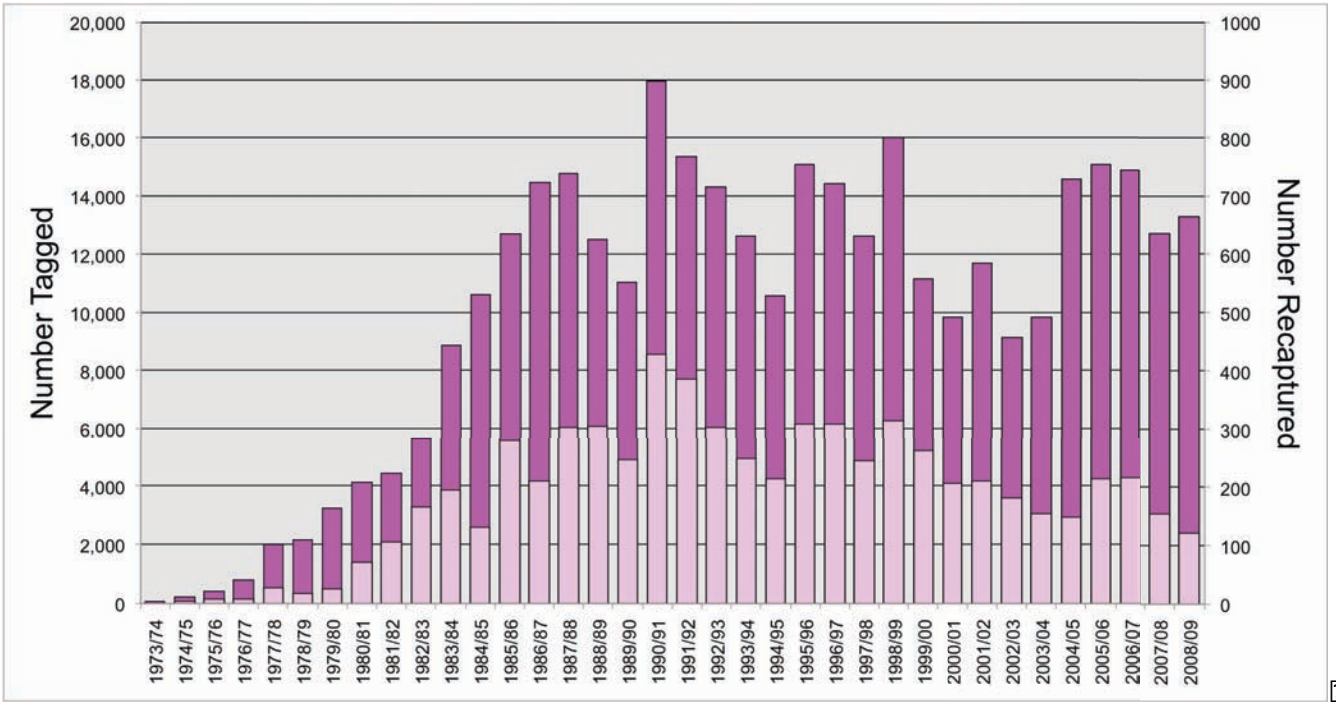
NSW DPI Game Fish Tagging Program

2008/2009

The game fish tagging program continued strongly in 2008/2009, with a total of 13,289 fish tagged for the year and 121 recaptures of tagged fish reported. Figure 1 plots the number of fish tagged (and recaptured) on the program throughout its history, and shows that the numbers tagged in 2008/09 continued an increase over the past three seasons to match the number of fish tagged in the mid 2000s. The Program, which has been operated since 1973 by NSW Fisheries (now NSW DPI), continues to accumulate valuable information on movements, growth and catches through time of billfish, tunas, sharks and other game fish.

As might be expected over such a long period, the number 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). The number of fish tagged each year is, of course, dependent on the availability of different species of fish at different times and locations. In some years, large numbers of juvenile black marlin might appear 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 happened this year, southern bluefin tuna might dominate releases.

Figure 1. Numbers of fish tagged and recaptured by year, to 2008/2009.



The Program overall

The grand totals of all fish tagged and recaptured on the Program to the end of June 2009 stood at 359,147 and 6,641 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'.

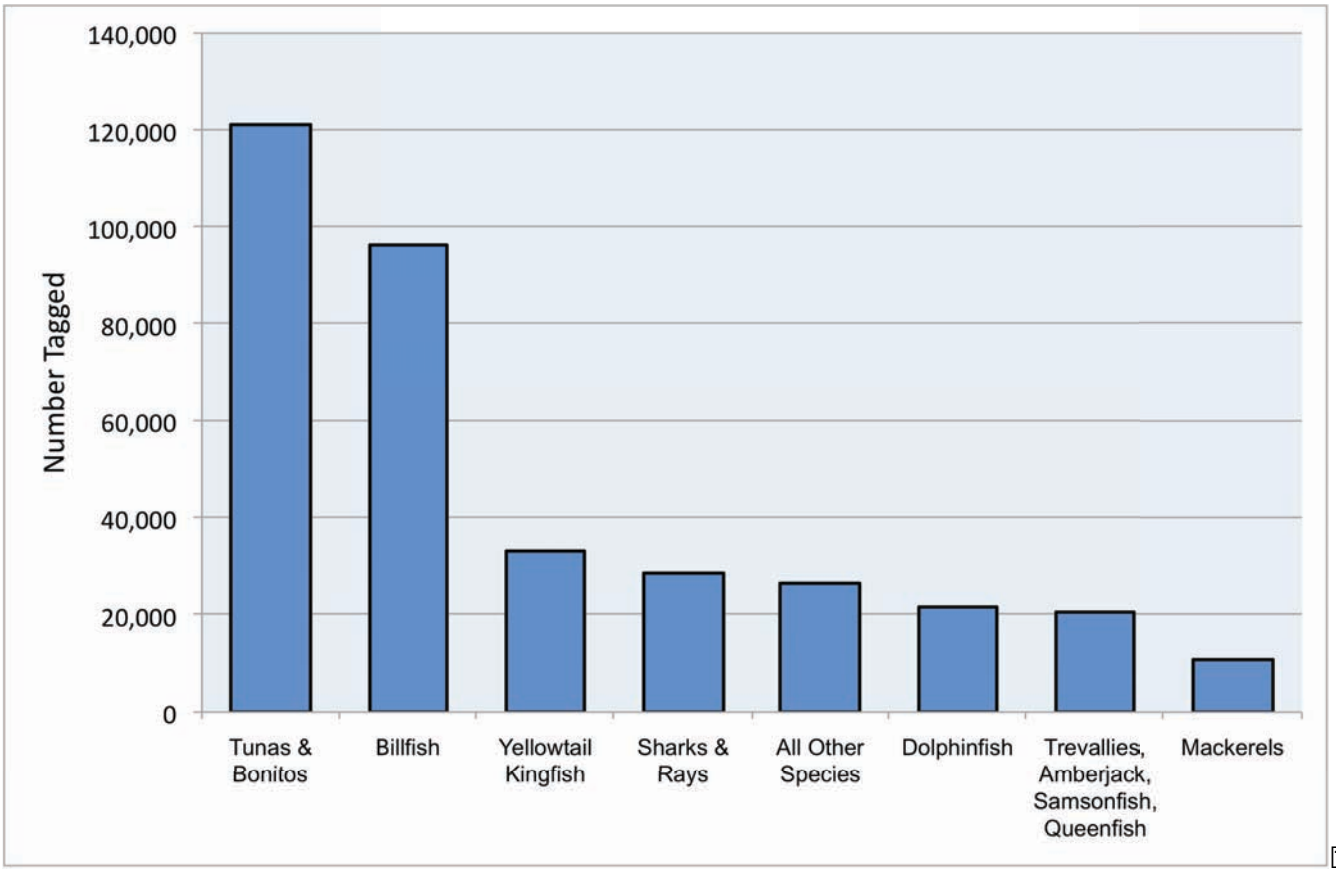
The species tagged in the greatest numbers overall continues to be black marlin (over 48,350 tagged, representing 13.5% of all releases) followed by yellowfin tuna, yellowtail kingfish, sailfish and dolphinfish.

Table 1. Total numbers of fish tagged and recaptured, 1974-2009

Species	No. Tagged	No. Recap	% Recap
BLACK MARLIN	48,356	369	0.76
YELLOWFIN TUNA	35,786	680	1.90
YELLOWTAIL KINGFISH	33,346	2,126	6.38
SAILFISH	23,722	236	0.99
DOLPHINFISH	21,661	202	0.93
MACKEREL TUNA	19,037	60	0.32
ALBACORE	18,847	158	0.84
SKIPJACK TUNA	18,788	65	0.35
STRIPED MARLIN	18,404	174	0.95
BONITO	13,084	219	1.67
AUSTRALIAN SALMON	9,225	603	6.54
SOUTHERN BLUEFIN TUNA	7,352	109	1.48
SPANISH MACKEREL	7,253	73	1.01
SILVER TREVALLY	6,871	195	2.84
MAKO SHARK	6,164	143	2.32
BLUE MARLIN	5,454	17	0.31
WHALER SHARKS	5,391	99	1.84
HAMMERHEAD SHARKS	4,999	54	1.08
LONGTAIL TUNA	4,360	57	1.31
BRONZE WHALER	4,264	90	2.11
BLUE SHARK	4,047	72	1.78
TAILOR	4,030	122	3.03
TREVALLY	3,320	31	0.93
BARRACUDA	2,721	5	0.18
QUEENFISH	2,709	9	0.33
ALL OTHER SPECIES	29,956	673	2.25
TOTAL	359,147	6,641	1.85

Lumping the main species or species groups together, Figure 2 shows that tunas remain the group tagged in the largest numbers (over 121,000 tagged, or 33.7% of the total) followed by billfish (over 96,000, or 26.8% of all fish tagged). Perhaps surprisingly, sharks plus rays (28,600 tagged) only represent 8.0% of all tagged fish while yellowtail kingfish, a single species, represent 9.3% of all taggings.

Figure 2. Total numbers of fish tagged as species groupings or species, 1974-2009



Summary for 2008/2009

Table 2. Numbers of fish tagged and recaptured in 2008/2009

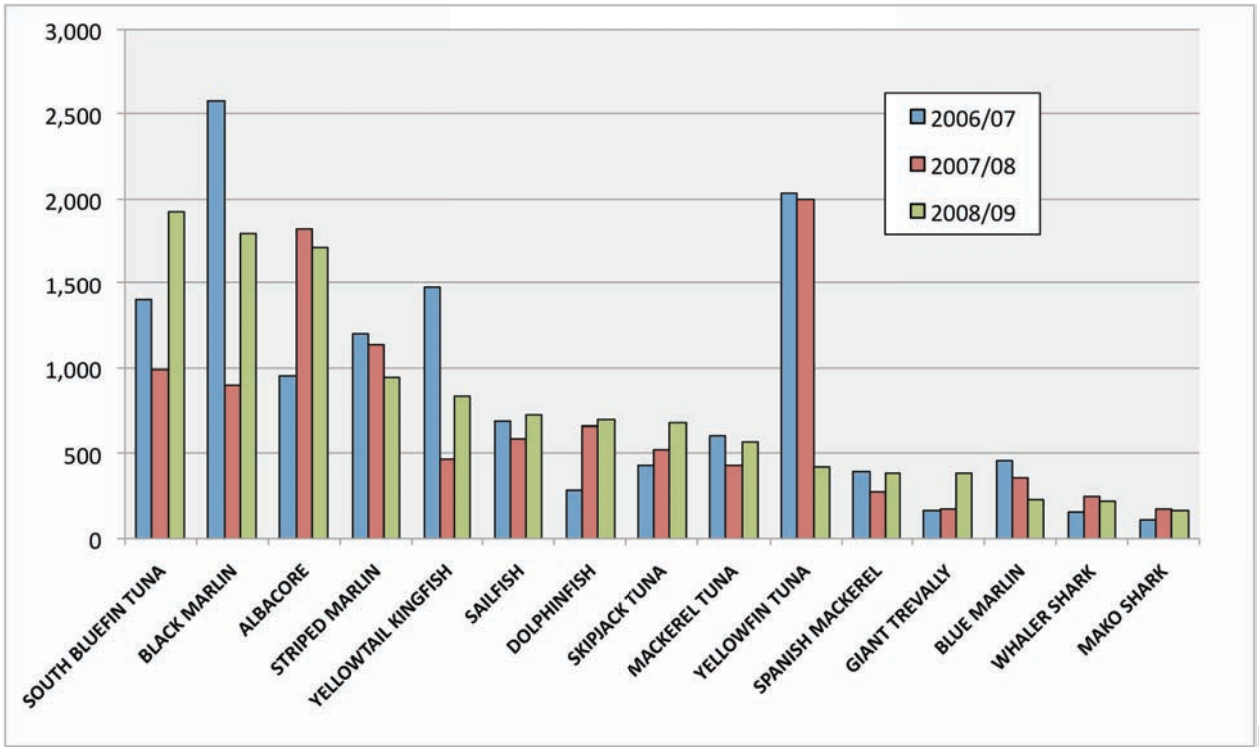
Species	Tagged	Recaptured
SOUTHERN BLUEFIN TUNA	1,925	8
BLACK MARLIN	1,796	15
ALBACORE	1,711	2
STRIPED MARLIN	941	6
YELLOWTAIL KINGFISH	831	22
SAILFISH	721	4
DOLPHINFISH	701	2
SKIPJACK TUNA	676	3
MACKEREL TUNA	570	
YELLOWFIN TUNA	424	17
SPANISH MACKEREL	384	6
GIANT TREVALLY	383	4
BLUE MARLIN	233	1
WHALER SHARKS	222	2
MAKO SHARK	164	2
AUSTRALIAN SALMON	136	5
SAMSON FISH	132	
LONGTAIL TUNA	104	
BARRAMUNDI	103	
EAGLE RAY	99	1
BLUE SHARK	97	1
MISCELLANEOUS	84	1
SCALY MACKEREL	82	
SNAPPER	78	5
QUEENFISH	68	
BARRACUDA	66	
DOGTOOTH TUNA	66	2
SILVER TREVALLY	62	
HAMMERHEAD SHARKS	56	
MULLOWAY	43	
SHORTBILL SPEARFISH	32	1
BRONZE WHALER	30	3
TIGER SHARK	30	1
WAHOO	30	
SPOTTED MACKEREL	28	
AMBERJACK	24	3
GUMMY SHARK	23	
COBIA	20	
BROAD BARRED MACKEREL	19	
RAINBOW RUNNER	17	2
THREADFIN SALMON	12	1
GOLDEN TREVALLY	11	
BONITO	10	
SCHOOL MACKEREL	10	
GOLD SPOTTED TREVALLY	8	
BLACKTIP SHARK	7	
BIGEYE TUNA	5	1
TREVALLY	5	
BIGEYE TREVALLY	3	
SCHOOL SHARK	3	
BROADBILL SWORDFISH	1	
TAILOR	1	
THRESHER SHARK	1	
WHITETIP SHARK	1	
TOTALS	13,289	121

In 2008/2009, the top species tagged, for the first time ever, was southern bluefin tuna (SBT), with 1,925 tagged. This is even more remarkable when it is realised that the number of SBT tagged this year was 26% of the total number of the species tagged since the program commenced in 1973. The majority of these were released off South Australia – over 1,100 from coastal waters off Port MacDonnell. The other area of substantial tagging activity of SBT was southeastern Tasmania. The number of SBT being tagged on the program has not just increased this year, though. Over the past three seasons combined, over 4,200 have been tagged, which represents over 57% of all SBT tagged. This presents a good example of the value of the ongoing tagging program since this relative increase in southern bluefin tuna catches-and-releases by the recreational fishery would not have been quantified without the release data from tag cards.

The species tagged in the second highest numbers in 2008/2009 was black marlin (1,796), closely followed by albacore (1,711). Black marlin releases were nearly double those of the previous year, which had been the lowest on record for that species. Albacore releases were very slightly down on the previous year.

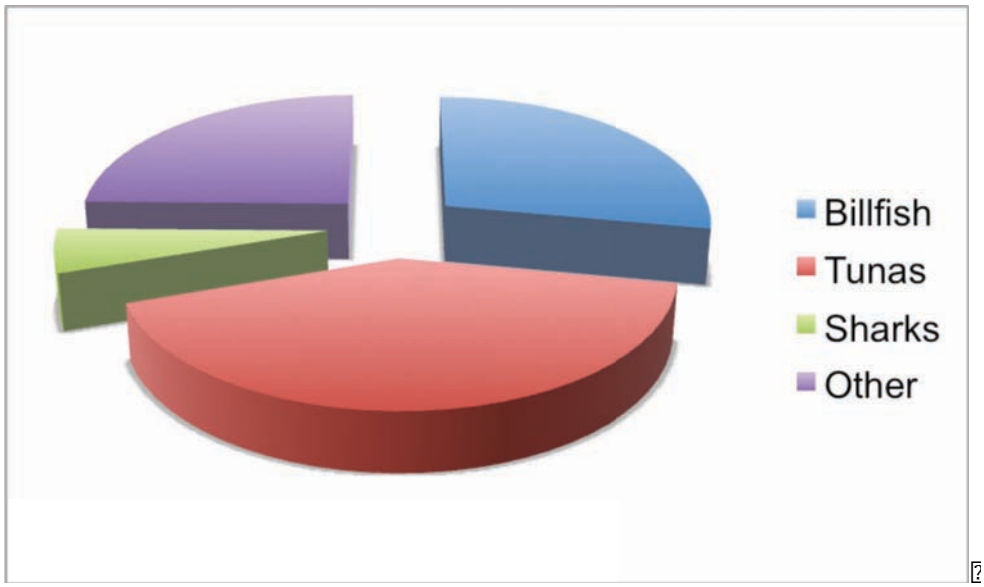
Figure 3 presents a comparison of species or species groups tagged over the past three years. The main features to note here are, as mentioned, the peak of southern bluefin tagging this year, a return to higher numbers tagged by both black marlin and albacore, a small decrease in releases of striped marlin and a dramatic decrease in the number of yellowfin tuna tagged this year (424 compared with about 2,000 in each of the past two years).

Figure 3. Numbers of main species and species groups tagged in 2008/2009 and the previous two years.



Combining the species into groups, Figures 4 shows that billfish constituted 27.9% of all fish tagged. Tuna represented 41.8% of total taggings (southern bluefin tuna contributing over half of that total) while sharks constituted only 5.5% of all taggings.

Figure 4. Species groups tagged in 2008/2009



Recapture highlights

All of the recaptures recorded in 2008/2009 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

Sixteen black marlin were recaptured during the year, adding to the already impressive database on this species. When tagged, all of these were quite small fish, ranging in estimated size from 10 to 120 kg (14 of the 16 were estimated at 10 to 30 kg).

The longest distance between release and recapture was for a fish tagged off Exmouth WA. Tagged in March 2008 at an estimated size of 30 kg, this fish was recaptured 149 days later off the southeast coast of India, a minimum distance of 2,720 nautical miles (nmi) from its release point. This was a significant recapture since so little is known about movements of billfish in the Indian ocean.

Other long distance movements of black marlin included an estimated 25 kg fish tagged off the Sunshine Coast, Qld that was recaptured northwest of Irian Jaya, a straight line distance of 2,124 nmi. If land masses are taken into account, the minimum displacement of this fish would be closer to 2,500 nmi. The time-at-liberty of the fish was 3 years 275 days and its weight at recapture was given as 60 kg, although it is likely that this was a ‘dressed’ weight, that is, headed, gilled and gutted.

Another small (30 kg) black marlin, tagged off Mooloolaba Qld was recaptured 95 days later at Woodlark Island, PNG, a minimum distance of 1,082 nautical miles.

As has been the case in previous years, a number of juvenile black marlin tagged in northern Queensland waters were recaptured at various locations along the southeast Queensland and New South Wales coast. These included four fish tagged at Cape Bowling Green, off Townsville, in August/September 2008. They were recaptured after very similar times-at-liberty (113 to 117 days) off the Town of 1770, Mooloolaba, Surfers Paradise and the Gold Coast Seaway. And just to prove there are always exceptions to the rule, a fifth juvenile black marlin tagged off Cape Bowling Green at the same time was recaptured just three days later off the Ribbon Reefs, 270 nmi to the north – a very rapid swim averaging 90 nmi per day.

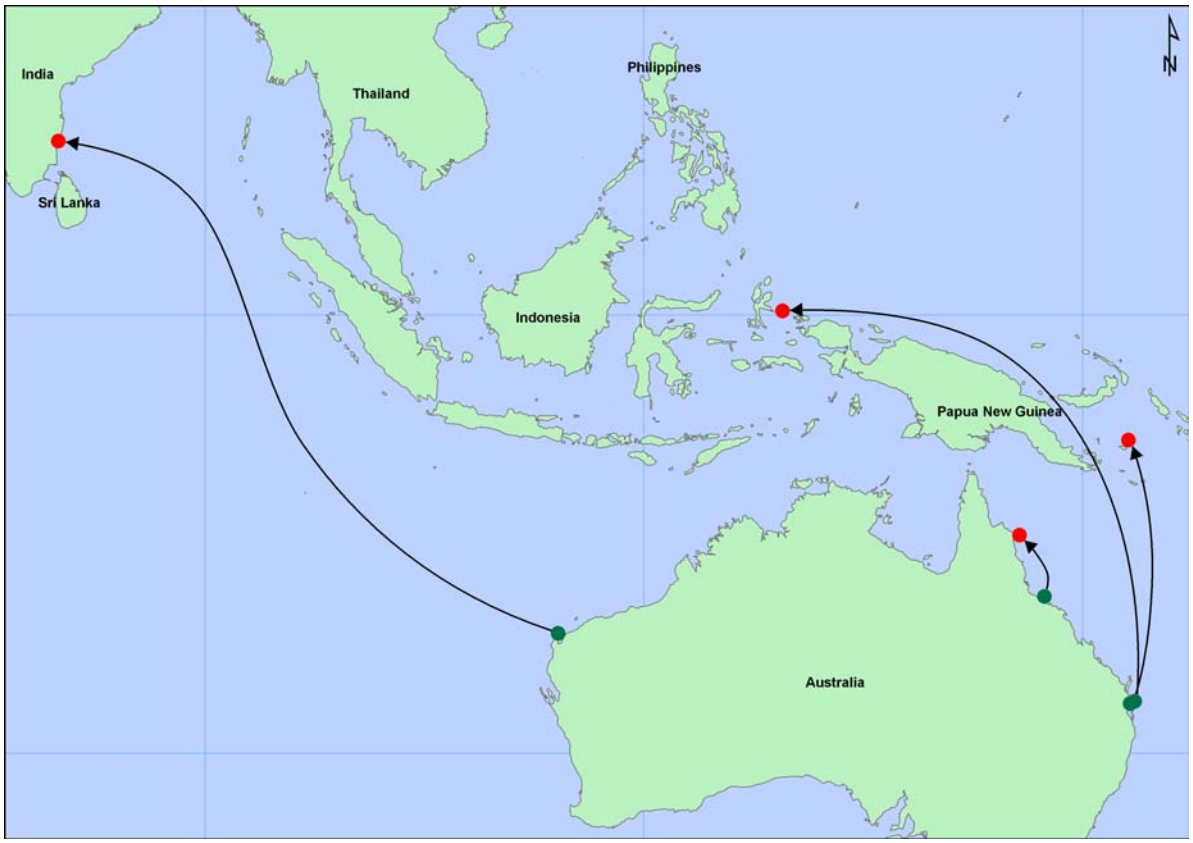


Figure 5. Long distance northerly directed movements of black marlin – 2008/2009.

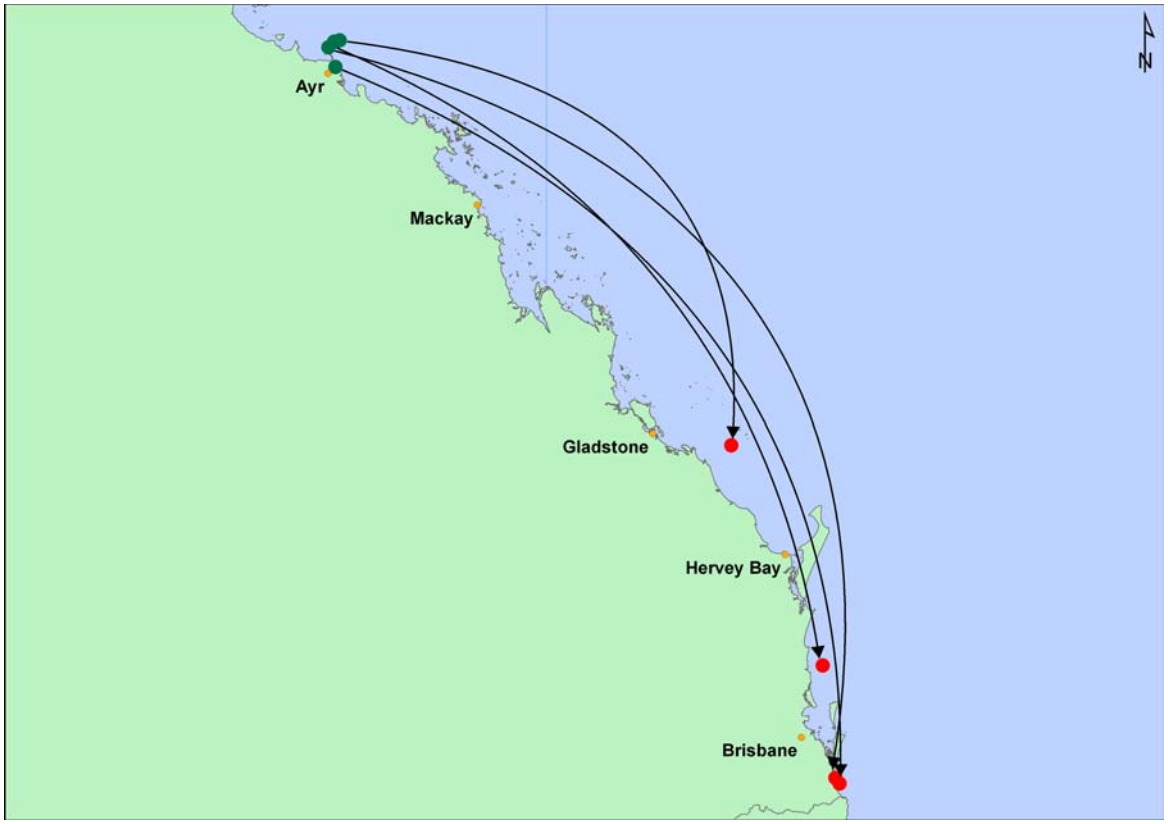


Figure 6. Long distance southerly directed movements of black marlin – 2008/2009. All were juvenile fish (10 to 22 kg) released near Cape Bowling Green, northern Queensland (green circles).

Blue marlin

Three blue marlin were recaptured during the year – an unusual occurrence on the program for this species. All had been tagged off northern Papua New Guinea, two off Lae and one off Madang. Amazingly, two of these recaptures set successive time-at-liberty records for blue marlin tagged on the program. The first was recaptured on 1 April 2009 by an Indonesian handliner fishing near one of thousands of anchored FADs off Irian Jaya (close to, and by the same method that the black marlin mentioned above was recaptured). The fish had been tagged in the Huon Gulf, off Lae 7 years, 73 days before, setting a new record. Then, on 25 May 2009, another tagged blue marlin was recaptured by the same method in the same general area. This one had been tagged 7 years 210 days earlier, this time off Madang, PNG. The minimum distances moved by these fish – 1,076 and 805 nautical miles respectively – were relatively small, considering the times at liberty, but of course, the fish may well have covered a lot more 'ground' between their release and recapture. Regarding the sizes and apparent growth of these fish, the blue marlin tagged off Lae was estimated at 80 kg at release, and at recapture, its reported weight (headed, gilled and gutted) was 129 kg which converts to about 165–170 kg whole. This relatively small increase in weight over seven years is probably due to the fish being a male (although that was not confirmed). The fish tagged off Madang was estimated at 85 kg at release, but at recapture, only a length measurement was given – 274 cm. Unfortunately, we do not know whether this included the bill, or was measured from the lower jaw, the eye or was the trunked length.

The third recaptured blue marlin, tagged off Lae, had been at liberty for 102 days but had only moved an apparent 15 nautical miles from its release point. Interestingly, popup satellite tagging of blue marlin off Lae in 2006 also showed similar tendency for fish to stay in the general area, at least for several months. For example, in that experiment, two tags popped up after 52 and 60 days, but had only moved 67 and 6 nautical miles respectively

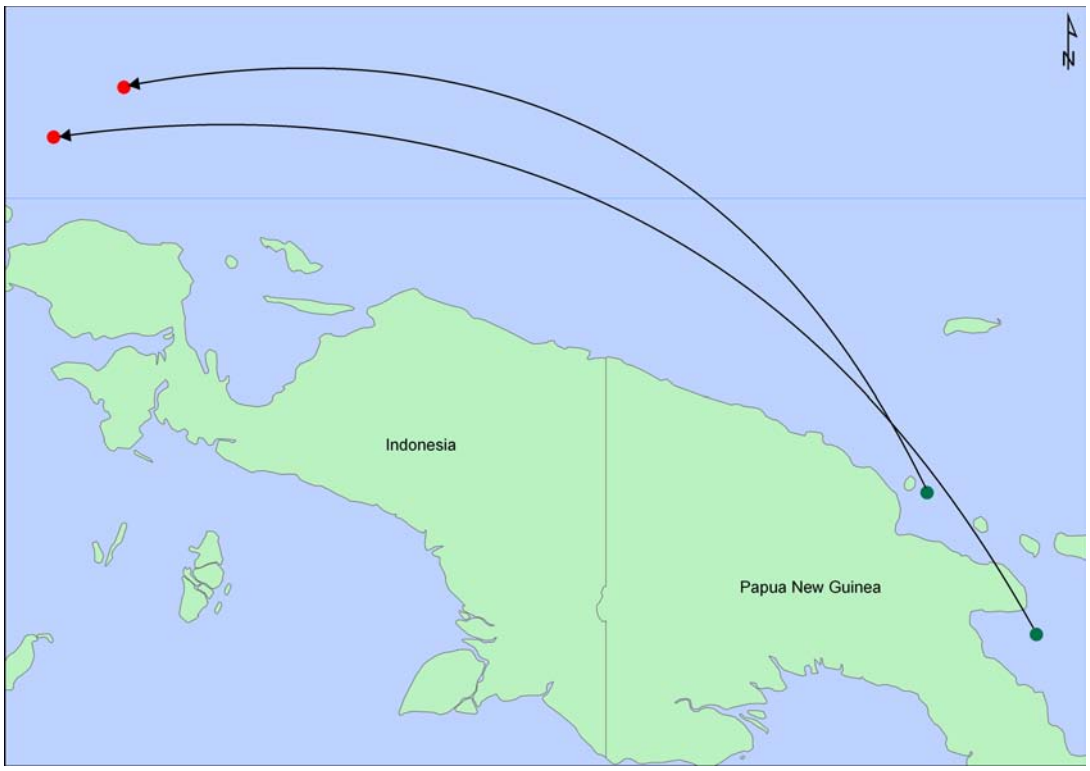


Figure 7. Long distance movements of blue marlin – 2008/2009.

A blue marlin being released off Coffs Harbour. Note the deformed pectoral fin (which apparently did not impede the fish's swimming ability). Photo: Glen Booth

Bigeye tuna

It is most unusual to report on a recaptured tagged bigeye tuna on the program, mainly because bigeye tuna are quite rare in recreational catches off Australia. However, a genuine and most interesting recapture of a bigeye tuna was recorded this year. Originally tagged off Eden NSW in March 2005, at an estimated size of just 3 kg, the tuna was recaptured 3 years 173 days later to the southwest of Fiji by a local longline vessel. Its weight was given at 40 kg, but it is unknown if this was a whole, or gilled and gutted weight. Because of the uncertainty of identification of bigeye versus yellowfin tuna, a recapture such as this would normally cause some doubt as to the veracity of identification at both release and recapture. Fortunately in this case, however, photos of the fish were taken at both release and recapture, proving that this was indeed a bigeye tuna.

This recapture is the fourth confirmed for bigeye tuna on the program. Two previous recaptures were summarised in the 2006 to 2008 report of the program. Both of those were also tagged off the south coast of NSW in 2005, one at liberty for 15 months, the other, tagged off Eden at the same size and at the same time as the one outlined above. The previous Eden-tagged bigeye was at liberty for almost exactly three years, and weighed 41 kg, so the latest recapture confirmed a very similar growth rate for the two fish.

These recapture are all important since they prove that juvenile bigeye tuna do occur, at least on occasion, off the southeast Australian coast where they may be caught by recreational anglers.

Yellowfin tuna

There were 17 yellowfin tuna recaptured in 2008/2009, and while the database on recaptured yellowfin is quite large (680 recaptures recorded to date), new information continues to be accumulated each year. The longer distance recaptures are shown in Figure 7, below.

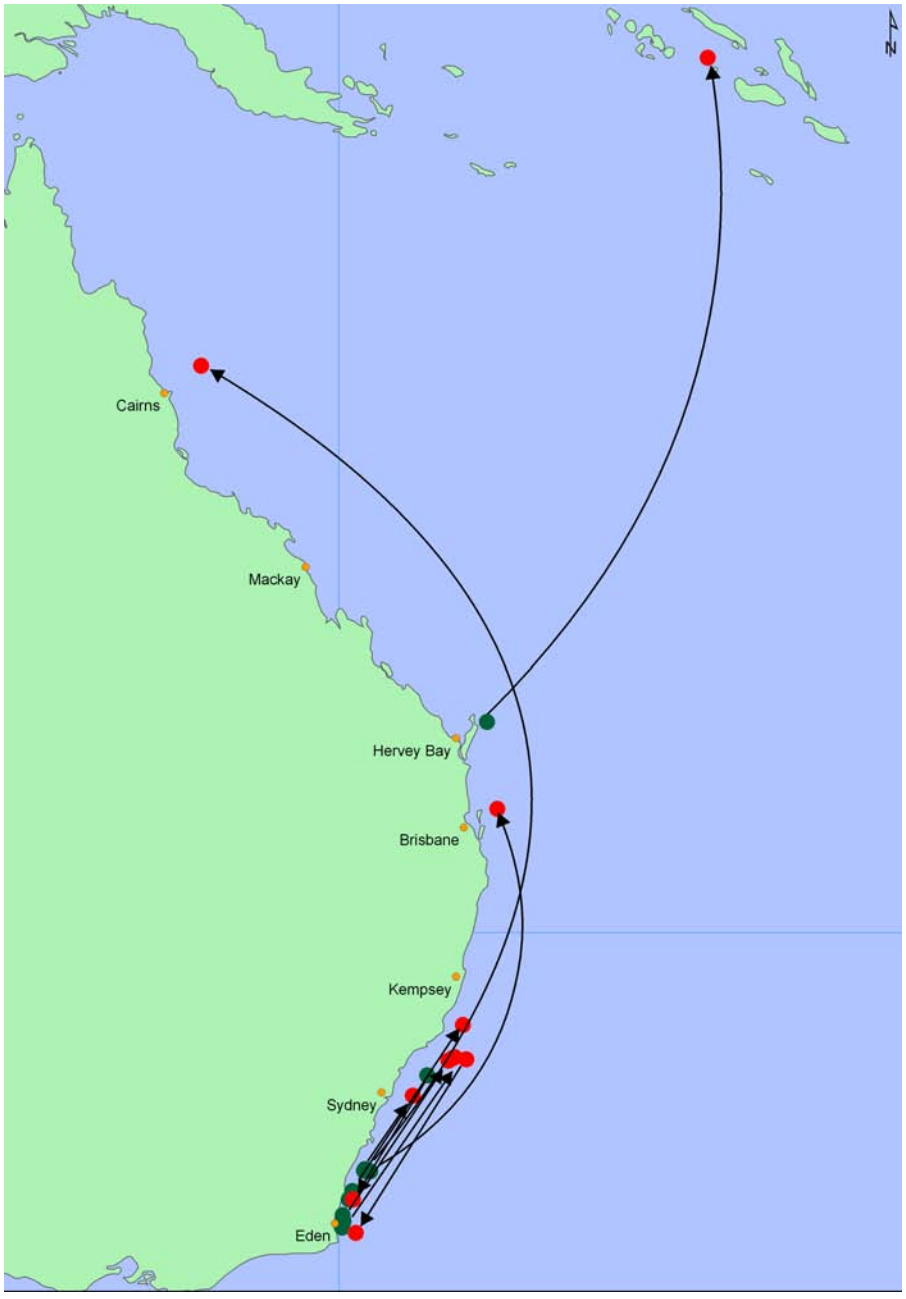


Figure 7. Long distance movements of yellowfin tuna – 2008/2009

Twelve of the recaptured yellowfin were tagged on the south coast of NSW, between Batemans Bay and Eden. All of these fish were relatively small at tagging (3-18 kg) and all were recaptured to the north, either on the continental shelf, or close to it, right along the east coast. Recapture locations included Sydney, Newcastle, Port Stephens, Moreton Island and one particularly long movement, from Bermagui to Port Douglas.

Times-at-liberty for these fish ranged from two months to, in the case of the Port Douglas recapture, 19 months. These data again demonstrate the strong tendency for juvenile yellowfin tuna, once recruited to the southeast coast, to stay near the continental shelf during their first few years.

On the other hand, there is always some 'leakage' of yellowfin tuna away from the coast, as shown by one fish that was tagged off Fraser Island and subsequently recaptured in the Solomon Islands, a distance of 1,014 nmi. When tagged, this fish was only estimated at 6 kg, but when it was recaptured 270 days later, its length was measured at 103 cm, which would convert to a weight of about 20 kg. It is therefore possible that this was an early maturing fish that was heading to its tropical spawning grounds.

Southern bluefin tuna

As has happened quite often in the past, a southern bluefin tuna (SBT) tagged off Port Macdonnell SA was recaptured well to the west in the Indian Ocean. This particular fish was tagged in April 2007 and recaptured 458 days later about 2,790 nmi to the west, about half way between Australia and Madagascar. Interestingly, five other recaptured SBT, two tagged off South Australia and three off southern Tasmania, were also tagged at the same time (April/May 2007) and were also at liberty for about the same time periods (453 to 480 days). However, in these cases, all were recaptured by Australian fishermen in the Great Australian Bight, where they were caught for grow-out in the tuna farms at Port Lincoln.

One other SBT swam against the flow, however. This fish was also tagged at Port Macdonnell in April 2007, but was recaptured a little over two years later some 688 nmi southeast of Cape Howe, in the Tasman Sea.

Southern bluefin tuna caught in the wild and penned near Port Lincoln, South Australia. Note the tag in the fish nearest the camera – quite possibly placed some time previously by a recreational angler. Photo: Dr Kerstin Fritsches

Shortbill spearfish

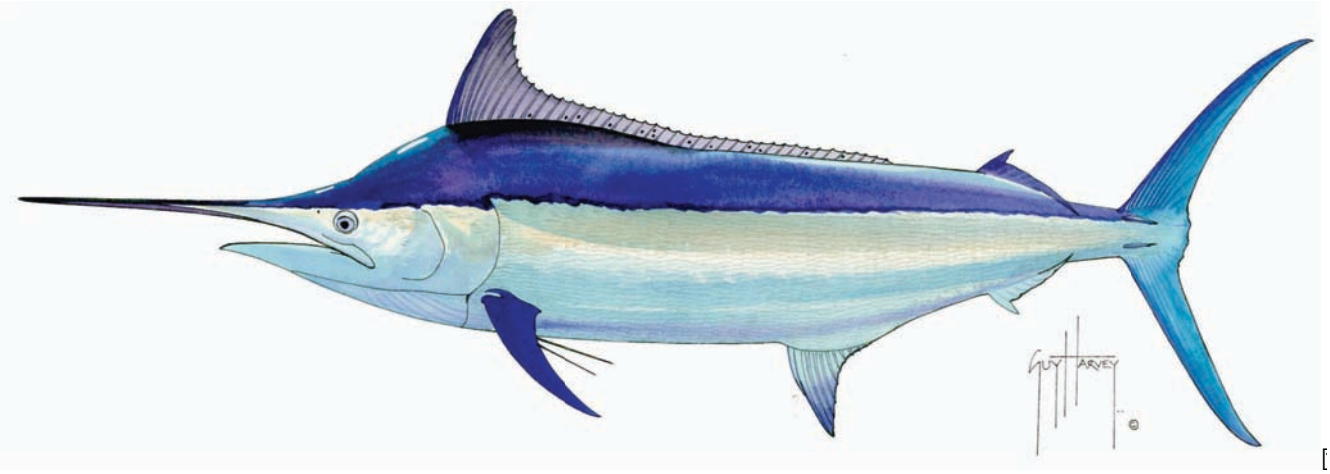
This year saw the first ever recapture of a shortbill spearfish for the program (341 have been tagged to date). It was tagged off Port Stephens NSW in February 2009 and recaptured 45 days later about 45 nmi east of Fraser Island Qld. At release, this fish was estimated at 40 kg, a particularly large size for this species. However, at recapture, its short length was measured at 168cm, which would equate to a weight of 18 to 20 kg. The releasing angler can be forgiven for such an error, however, since spearfish, like sailfish, look deceptively robust in the water. In fact, its length at release was estimated at 170 cm, which the measurement at recapture proved to be very accurate (for comparison, a black marlin measuring 170 cm would indeed weigh about 40 kg).

A tagged shortbill spearfish showing the characteristic long body and high dorsal fin. Only 341 spearfish have been tagged, and the first recapture was recorded in 2008/09. Photo: Phil Bolton

Blue shark

Once again, a blue shark recapture has shown just how mobile these true ocean wanderers can be. This particular shark was tagged off Port Hacking in January 2009 at an estimated weight of 60 kg. It was only at liberty for 81 days, but in that time, had travelled to Papua New Guinea waters where it was caught by a local longliner and the tag subsequently found at the processing plant. During its time at liberty, the shark covered a minimum of 18 nmi per day, which is a fairly common average rate of travel for other blue sharks recaptured at distant points from their release sites.

Focus on: Black marlin (*Istiompax indica*)



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

The black marlin is the least common of the world's four species of marlin and as such, is one of the least understood of the billfishes. This is one of the largest of the teleost (bony) fishes in the world, growing to over 4 metres in length and up to 700kg in weight.

Identification

The main feature which sets the black marlin apart from all other billfishes is its rigid pectoral fins. In adults, these fins cannot be folded against the body, even with reasonable force. It should be noted, however, that very small fish have flexible pectoral fins, the calcification of the pectoral joint which causes this rigidity not occurring until a size of about 10 to 15 kg. Another diagnostic feature is the position of the second dorsal and anal fins. The black marlin is the only istiophorid in which the second dorsal fin is anterior to the second anal fin – a feature which holds for all sizes. Lastly, the dorsal fin of the black marlin is the lowest of all of the istiophorids, measuring no more than half the maximum body depth in adults.

Geographic range

Although black marlin are distributed throughout the Indo-Pacific between about latitudes 40°N and 40°S, closer examination of historic Japanese catch rates clearly shows that the density of the species is very sparse in open ocean areas, but much more 'clumped' near large land masses and continents. In fact the black marlin is the most land-associated of the billfishes, preferring waters on or near continental shelves during most stages of its life cycle.

Areas where black marlin aggregate include the northern part of the Great Barrier Reef, the east coast and the northwest shelf of Australia, extending to the southern islands of Indonesia, the South China Sea off Vietnam, Malaysia and Thailand, in the eastern Pacific off Peru and central America (Panama and Ecuador) and off Kenya and Mauritius in the Indian ocean.

Black marlin do not occur in the Atlantic ocean, however, Japanese research longliners historically recorded stray black marlin from time to time in the Atlantic as far north as the coast of Brazil and even in the Caribbean. The likely route for these infrequent 'invasions' would be around the Cape of Good Hope, and most world distribution maps of black marlin show dotted arrows following this route. Even so, such occurrences are considered very rare.

Movements

The first black marlin was tagged off Cairns, Australia in 1968 and since then, more over 48,000 have been tagged off eastern Australia.

The long distance movements of tagged fish give the impression of mass long distance dispersal of black marlin. However, this picture does not necessarily mean that many or most fish take these routes in all or most years. It does, however, clearly indicate that the species is capable of very extensive movements and that exchange of individuals throughout the species' Pacific-wide range can and does occur. A study of the genetics of black marlin in the Indo-Pacific confirmed this picture in that no differences could be found between DNA 'fingerprints' from fish taken from throughout the black marlin's range. This finding of apparent widespread mixing indicates that there is almost certainly only one stock of black marlin in the Pacific (quite possibly extending to the Indian ocean as well). The important implication of this finding is that international cooperation in managing the species needs to be on an ocean-wide scale.

Another question raised by the tagging results is whether the movements of black marlin are random, or part of some purpose-driven migratory cycle. Tagging results have clearly shown that, after a period of several months, the average distance moved by tagged fish increases rapidly with time at liberty, at least for the first nine months or so after release. This rapid dispersal takes fish away from the tagging grounds off eastern Australia throughout the western Pacific and beyond at an average rate of about 20 km per day. However, recapture data also show that there is a very marked 'cluster' of recaptures near the point(s) of release after about one year (330 to 400 days) followed by another period of apparent rapid dispersal in the ensuing months. Clustering of recaptures near release points is also apparent after two years, and also after three, four and five years (with decreasing numbers of recaptures as time increases). This fascinating finding suggests either that some fish never leave the areas in which they were tagged, or that annual homing occurs, at least for a proportion of the population. Careful examination of Japanese catch data for the Great Barrier Reef over long periods clearly showed that, by early summer each year, catch rates of black marlin suddenly declined dramatically, indicating a sudden *en masse* departure of fish from that area over a very short time. Long term charter boat captains in the area also attest to the fact that black marlin virtually disappear completely at this time, leading to the conclusion from tag returns that at least some fish must be returning to the reef on an annual basis.

Growth and size

By carefully analyzing the size 'pulses' of small black marlin which appear every so often along the east coast of Australia, it is estimated that they reach a size of about 25kg at one year of age, and that a 100kg fish would be 3 to 4 years old. Several very small black marlin have been aged by counting presumed daily rings on their otoliths. Previous work on tuna indicates that these rings are laid down every day during the early life of fish, and assuming that this is also the case for marlin, two black marlin weighing just under 4 kg were estimated to have been only about 130 days (4 months) old. A rare, even smaller specimen of a black marlin, only 45cm in length, was also aged in this way and estimated to be about 80 days old.

After several years of age, the growth rates of black marlin become more difficult to assess, but all evidence so far points to continued rapid growth. It is very likely (but as yet, unproven) that male black marlin grow more slowly than females and die at an earlier age, explaining why all fish over about 170kg are females.

The maximum size to which black marlin grow is of the order of 700 kg, the all tackle world record for the species being 709 kg for a fish caught off Peru in 1953 while another weighing 691kg was caught in the same area in 1954. Nearly 600 fish weighing more than 450 kg have been captured since then, nearly all off Cairns, but none has exceeded these two long-standing records. There are persistent anecdotes of much larger black marlin being caught by longline vessels, but none of these has ever been substantiated.

Reproduction

Examining the gonads of black marlin caught by both recreational anglers and Japanese longliners, together with some records of occurrence of black marlin larvae, has revealed that spawning takes place in the Coral Sea in late spring/early summer each year. Egg counts from ovaries taken from adult females weighing between 400kg and 600 kg ranged from 65 million to 250 million eggs.

The fully ripe eggs of the black marlin, about 1.3mm in diameter, are fertilized externally, after which they float at the surface for several days before hatching into tiny larvae. The larvae are themselves miniature predators of the planktonic world — all eyes and mouth, with one purpose — to eat and therefore, to grow. The mortality rate during these critical early stages must be enormous, as a whole suite of slightly larger predators take their relentless toll. Although mortality rates are obviously extremely high, it is still difficult to understand why very small black marlin, less than about 10kg, are extremely rare in recreational and commercial catches. It is possible that, during this phase of their life cycle, very small fish remain offshore in the mid water zone, and are therefore not available to most fishing gears, although this explanation obviously needs to be tested.

Behaviour

The diving behaviour of black marlin has been revealed by tracking using electronic tags, both ultrasonic and data-storing satellite tags. In most cases, tagged black marlin tend to swim closer to the surface during the night compared with the day. There is also a tendency for fish to dive to deeper depths after dawn, and to make more ascents to the surface after about noon. Tracked fish have rarely penetrated the thermocline, and then only briefly, remaining at temperatures no more than 8°C below that of the surface waters. The deepest dives so far recorded have only been to about 180 metres. During tracking, fish tended to initially move offshore from the edge of reefs before heading parallel to the shore. The average mean swimming speeds over the ground for tracks lasting up to 28 hours ranged from about 1.5 to 4 knots.

Fisheries

Although black marlin are not now targeted by most commercial fisheries in the Pacific, the numbers taken each year as bycatch are probably quite large. It has been estimated that in the western and central Pacific, at least 30,000 black marlin are taken annually. Beginning in the early 1950s, Japanese longliners consistently fished off northern Queensland Australia and during the peak years of the 1960s, up to 14,000 fish were taken annually by that fishery. A long-standing charter fishery for black marlin off the Great Barrier Reef, Australia has operated successfully for more than 40 years. During that time, strike rates have fluctuated considerably, but the fishery has proven itself to be sustainable over this entire period.

Not a sailfish, but a tiny black marlin from eastern Malaysia. A fish of this size would be about 80 days old. Photo: Mike Tan

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 to hold the fish by the bill. 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

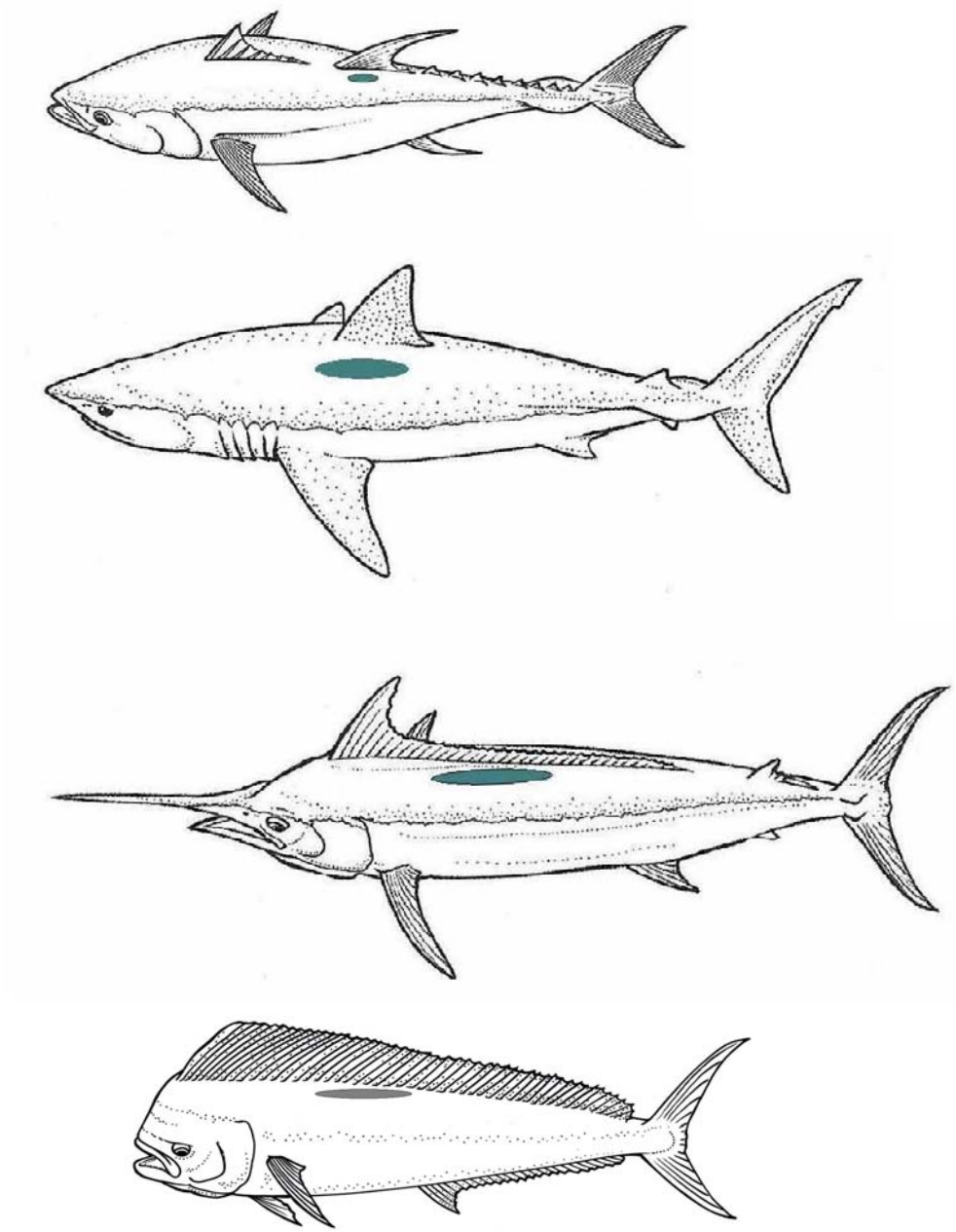
Smaller pelagic species may be removed from the water before tagging. This enables improved accuracy of tagging and may simplify hook removal. Often holding the fish on its back will lessen its 'flapping'. Try to prevent the fish damaging itself on hard, hot, or dry surfaces. A wet foam mat or similar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

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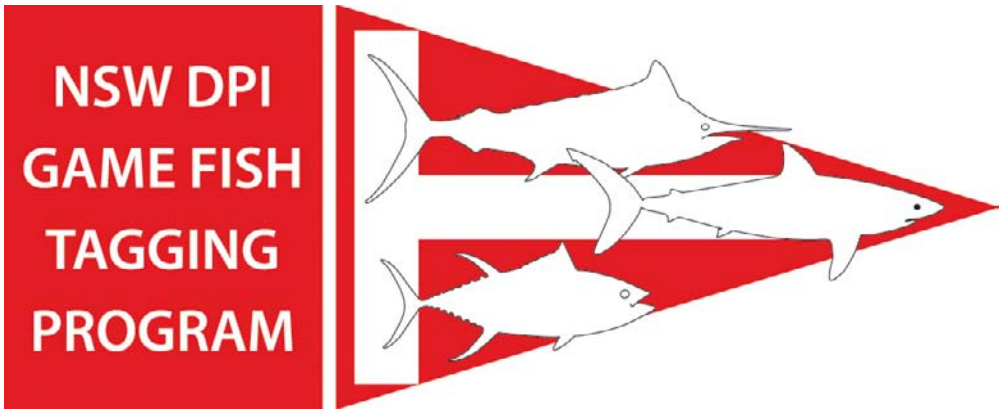

Appendix I: All Recaptures of Tagged Fish Reported in 2008/2009 (note: blanks indicate incomplete data)

Species	Release Date	Release Locality	Days at Liberty	Distance Moved NM	Direction
Albacore	8/11/08	Jervis Bay Canyons NSW	222	17	SW
Albacore	24/06/09	Bermagui NSW	3	5	NNE
Amberjack	6/06/09	Gold Coast QLD	7	1	SE
Australian Salmon	8/06/08	Yorke Peninsula SA	33	3	S
Australian Salmon	8/06/08	Yorke Peninsula SA	116	79	NNE
Australian Salmon	8/06/08	Yorke Peninsula SA	54	137	NE
Australian Salmon	31/12/08	Yorke Peninsula SA	25	0	–
Australian Salmon	17/03/09	Vivonne Bay SA	12	1	E
Bigeye Tuna	9/03/05	Eden NSW	1268	1593	ENE
Black Marlin	23/02/05	Barwon Banks QLD	1371	2124	NW
Black Marlin	20/02/08	Norah Canyons NSW	368	37	NNE
Black Marlin	12/03/08	Exmouth WA	149	2720	NW
Black Marlin	3/08/08	Cairns QLD	47	117	SSE
Black Marlin	17/08/08	Cape Bowling Green QLD	114	616	SSE
Black Marlin	7/09/08	Cape Bowling Green QLD	3	270	NNW
Black Marlin	7/09/08	Cape Bowling Green QLD	113	388	SE
Black Marlin	7/09/08	Cape Bowling Green QLD	117	547	SSE
Black Marlin	11/09/08	Cape Bowling Green QLD	116	606	SSE
Black Marlin	4/10/08	Otter Reef QLD	90	0	–
Black Marlin	2/12/08	Mooloolaba QLD	29	9	WSW
Black Marlin	10/12/08	Mooloolaba QLD	37	87	S
Black Marlin	29/12/08	Gold Coast QLD	0	0	–
Black Marlin	12/01/09	Mooloolaba QLD	95	1082	NW
Black Marlin	10/02/09	Caloundra QLD	25	17	N
Black Marlin	26/02/09	Port Stephens NSW	19	166	SSW
Blue Marlin	28/10/01	Madang PNG	2765	805	NW
Blue Marlin	20/01/02	Lae PNG	2628	1076	WNW
Blue Marlin	6/01/09	Lae PNG	102	15	E
Blue Shark	24/01/09	Port Hacking NSW	81	1498	NW
Bronze Whaler	17/11/06	St Kilda SA	715	0	–
Bronze Whaler	19/11/07	St Kilda SA	351	0	–
Dogtooth Tuna	1/12/08	Coral Sea QLD	6	0	–
Dogtooth Tuna	1/12/08	Coral Sea QLD	6	0	–
Dolphinfish	21/02/09	Port Stephens NSW	3	0	–
Dolphinfish	15/03/09	Sydney NSW	31	0	–
Eagle Ray	4/09/04	Port River SA	1748	2	NNW
Giant Trevally	29/05/08	Airlie Beach QLD	38	0	–
Giant Trevally	26/10/08	Whitsundays QLD	9	21	SW
Mako Shark	11/10/08	Shellharbour NSW	8	43	N
Mako Shark	8/04/09	Tuross Canyons NSW	2	88	NNE
Miscellaneous	4/10/07	Hayman Island QLD	353	31	SSW
Rainbow Runner	13/04/08	Benalla Banks PNG	172	6	SSE
Rainbow Runner	15/06/08	Lae PNG	23	13	NW
Sailfish	2/10/05	Groote Eylandt NT	1100	22	NW
Sailfish	8/10/08	Mooloolaba QLD	82	3	SSW
Sailfish	31/03/09	Dampier WA	62	3	ESE
Sailfish	30/05/09	Dampier WA	1	0	–
Shortbill Spearfish	24/02/09	Port Stephens NSW	45	492	NE
Snapper	20/01/08	Port River SA	351	0	–
Snapper	20/01/08	Port River SA	351	0	–
Snapper	17/10/08	Ardrossan SA	7	72	S

Species	Release Date	Release Locality	Days at Liberty	Distance Moved NM	Direction
Snapper	25/01/09	Cape Jervis SA	81	21	SE
Snapper	26/04/09	Abrolhos Islands WA	35	27	SSE
Southern Bluefin Tuna	7/12/06	Cannon Reefs SA	627	182	SE
Southern Bluefin Tuna	15/04/07	Port Macdonnell SA	458	2787	SW
Southern Bluefin Tuna	15/04/07	Port Macdonnell SA	762	688	SE
Southern Bluefin Tuna	20/04/07	Neptune Islands SA	481		
Southern Bluefin Tuna	24/04/07	Tasman Island TAS	453		
Southern Bluefin Tuna	27/04/07	Tasman Island TAS	461		
Southern Bluefin Tuna	28/04/07	Tasman Island TAS	472	7685	SW
Southern Bluefin Tuna	11/05/07	Port Macdonnell SA	460		
Spanish Mackerel	16/10/06	Vanderlin Island NT	698	22	ENE
Spanish Mackerel	29/07/07	Whitsundays QLD	356	0	–
Spanish Mackerel	10/12/07	Otter Reef QLD	231	4	WSW
Spanish Mackerel	10/08/08	Whitsundays QLD	175	494	SSE
Spanish Mackerel	13/09/08	Cape Bowling Green QLD	88	532	SSE
Striped Marlin	5/06/08	Gold Coast QLD	104	138	NNE
Striped Marlin	7/12/08	Port Stephens NSW	55	163	SSW
Striped Marlin	20/02/09	Port Stephens NSW	2	19	N
Striped Marlin	22/02/09	Port Stephens NSW	34	5	SSW
Striped Marlin	28/02/09	Port Stephens NSW	23	364	ESE
Striped Tuna	27/01/07	Cape Moreton QLD	613		
Striped Tuna	26/08/07	Lae PNG	383	0	–
Striped Tuna	4/05/08	Lae PNG	114	1196	WNW
Threadfin Salmon	8/10/07	George River WA	383	0	–
Whaler Shark	3/08/08	Dampier WA	98	6	NNE
Yellowfin Tuna	13/04/06	Lae PNG	1168	351	NNW
Yellowfin Tuna	9/04/07	Bermagui NSW	638	1218	NW
Yellowfin Tuna	21/04/07	Bermagui NSW	493	234	NNE
Yellowfin Tuna	26/05/07	Batemans Bay NSW	477	552	NNE
Yellowfin Tuna	17/11/07	Waddy Point QLD	270	1014	NNE
Yellowfin Tuna	24/11/07	Lae PNG	358	622	SE
Yellowfin Tuna	2/12/07	Sydney NSW	413	245	SSW
Yellowfin Tuna	13/04/08	Eden NSW	151	279	NNE
Yellowfin Tuna	13/04/08	Eden NSW	151	271	NNE
Yellowfin Tuna	14/04/08	Eden NSW	150	282	NNE
Yellowfin Tuna	14/04/08	Mowarry Point NSW	426	208	NNE
Yellowfin Tuna	25/04/08	Merimbula NSW	418	26	NNE
Yellowfin Tuna	17/05/08	Bermagui NSW	85	289	NNE
Yellowfin Tuna	19/05/08	Bermagui NSW	115	240	NNE
Yellowfin Tuna	7/06/08	Batemans Bay NSW	80	187	NNE
Yellowfin Tuna	8/06/08	Batemans Bay NSW	70	200	NNE
Yellowfin Tuna	2/08/08	Coffs Harbour NSW	28	193	S
Yellowtail Kingfish	4/12/05	Mowarry Point NSW	965	198	NE
Yellowtail Kingfish	5/08/06	Port Augusta SA	741	0	–
Yellowtail Kingfish	12/08/06	Eden NSW	873	1167	E
Yellowtail Kingfish	29/10/06	Eden NSW	828	14	SW
Yellowtail Kingfish	1/12/06	Swansea NSW	802	105	NE
Yellowtail Kingfish	11/02/07	Batemans Bay NSW	579	156	NNE
Yellowtail Kingfish	19/12/07	Toothbrush Island NSW	305	238	NNE
Yellowtail Kingfish	29/12/07	Rottnest Island WA	227	7	NE
Yellowtail Kingfish	26/01/08	Bass Point NSW	192	49	ESE
Yellowtail Kingfish	10/02/08	Mowarry Point NSW	282	140	NNE
Yellowtail Kingfish	4/05/08	Port Augusta SA	370	0	–
Yellowtail Kingfish	21/06/08	Macmasters Beach NSW	202	1	W
Yellowtail Kingfish	22/09/08	Mooloolaba QLD	10	0	–

Species	Release Date	Release Locality	Days at Liberty	Distance Moved NM	Direction
Yellowtail Kingfish	27/09/08	Southport QLD	31	16	SW
Yellowtail Kingfish	14/10/08	Swansea NSW	98	0	–
Yellowtail Kingfish	26/10/08	Brisbane QLD	20	5	S
Yellowtail Kingfish	25/12/08	Long Reef NSW	76	0	–
Yellowtail Kingfish	25/01/09	Botany Bay NSW	149	58	SW
Yellowtail Kingfish	25/01/09	The Banks NSW	41	0	–
Yellowtail Kingfish	7/02/09	The Banks NSW	136	0	–
Yellowtail Kingfish	12/04/09	Montague Island NSW	38	2	WNW