4.9. Comparison of Fishery Sectors for Striped Marlin

Commercial longline catch and effort data for striped marlin were provided by calendar year hence the aggregates of charter and tournament striped marlin CPUE were compiled by calendar year here rather than fishing season (Figure 41). Commercial longline data were also only available to 2004. This prevented comparison of longline trends with the declines of tournament and charter CPUEs evident in 2005. The mean values for tournament data in Figure 41 differ somewhat from that of Figure 17A, due to being aggregated to calendar years and values expressed mean of ratios rather than ratio of means (Pollock et al. 1994).

Longline CPUE was the most consistent of the fishery sectors, with the least fluctuations between years. Charter data were available for 2001 to 2005, with incomplete coverage, but showed an initial increase in CPUE then a sharp decline from 2002 to 2005. Commercial longline CPUE increased from 1994 to 1999 then declined steadily from 0.11 striped marlin/hundred hooks in 1999 to 0.49/hundred hooks in 2004.

The tournament CPUE fluctuates and lacks a clear trend. There is an increase in CPUE from 2002 to 2004 in contrast to the declines in the other two fishery sectors, with a subsequent decline in 2005. The difference in the tournament trend in contrast to the other two sectors suggests an increased catchability of striped marlin for anglers from 2001 to 2004, possibly due to a change in technique, such as the shift to live baiting discussed in Section 7.

Figure 41. Mean CPUE trends of striped marlin by calendar year for: Recreational-tournament; Charter; and, Longline fleets for NSW. Longline data courtesy of BRS.
Spatio-temporal overlap occurs between recreational game fishers and the domestic commercial longliners along the coast of NSW (Figure 42). The overlap is most pronounced during the summer gamefish season near Port Stephens and some south-coast ports. In particular, the overlap as numbers of fish caught by each sector in the same 3×3 degree cell was greatest in February off the far NSW south coast east of Bermagui. It should be noted that in this area the continental shelf and slope are very narrow and hence the normal spatial separation (by depth) of the two sectors is compressed (Knight. et al. 2006).

The issue of interaction and conflict between the recreational and longline sectors fishing for striped marlin are detailed in Bromhead et al. (2006) and Knight et al. (2006). They summarise the demonstrated interactions, for example, the size range of marlin is similar in both sectors and the distribution of longline catches and tag-releases overlap – particularly on the NSW south coast in late summer (Figure 42).

**Figure 42.** Overlap between commercial and recreational fishers for gamefish off NSW. Mean monthly catch (Australian longline) and tag-releases for 3 × 3 degree by 3-year blocks. Commercial and Charter areas with less than five vessels data were excluded. From Bromhead et al. (2006). Courtesy of R. Summerson, Australian Department of Agriculture Forestry and Fisheries, Bureau of Rural Sciences.
4.10. **Fate of captured fish**

The catch-data set incorporates the results of the tournaments as well as fish reported captured in scheds. Of the 21,987 fish with a reported fate at monitored tournaments, 84.8% of fish were tagged and released. There was a trend through the monitoring period of an increasing proportion of fish tagged and released compared to those retained and weighed. The proportion tagged increased from 75.7% in 1993/94 to 88.6% in 2004/05. There was also a small proportion of landed fish that were reported but scored no points (‘not weighed’). The average of not-weighed fish over the period from tournament results was 2% though this had declined from 9% in 1993/94 to 0.7% in 2004/05 (Figure 43).

A principal purpose of post-fishing interviews is to capture the unreported catch data. The 4,312 interviews done over the five years to the end of the 2004/05 revealed a greater proportion of not-weighed fish than the tournament records. The average proportion of not-weighed fish of the 5,015 fish reported during interviews was 12% compared to 1.5% for the same years of the tournament records (Figure 44).

The interviews further revealed an increasing proportion of tagged fish throughout the time series. This appears to be mostly related to a decreasing proportion of not-weighed fish. The proportion of not-weighed fish decreased from 45% in 1998/99 to 12% in the last two seasons. Mahi mahi were the main species in the not-weighed category in 1998/99 though the NSW Gamefishing Association (NSWGFA) tournament rules limit the number of tagged mahi mahi per day was not instigated until July 2001. The value for them as a table fish perhaps outweighed their 25-point tagging value.

![Figure 43. Fate of captured fish reported from tournament and sched data by year. N=21,987.](image-url)
Figure 44. Fate of all species from interviews by year. Proportions of tagged, weighed, not-weighed and caught and free-released fish. Numbers of fish represented are shown on the figure. N=5,015.

4.10.1. Billfish

Among marlin species there was a difference in their fate at capture. Of the three species of marlin targeted, blue marlin had the highest proportion retained and weighed versus tagged and released. Over the monitoring period, 26% of blue marlin recorded were retained and weighed and 73% tagged (Figure 47). The annual proportions of tagged blue marlin were between 62% and 86%. There appeared to be an increase in the proportion of tagged fish in recent years, though the numbers of blue marlin reported captured have been low in recent seasons.

In comparison, the overall proportions of tagged striped and black marlin were 89.5% and 94.2% respectively (Figure 45 and Figure 46). For these species the proportion of fish tagged increased through the monitoring period. The ratio of tagged to retained black marlin varied, with seasons of high ratios of tagged fish coinciding with large numbers caught and mean weights less than 80 kg (see Figure 60). Thus years where large numbers of small black marlin were caught had a high proportion of tagged fish. The mean tagging rate in 2004/05 was 97.8% (Figure 46).

Striped marlin captures had a high proportion of tagged fish and an even more pronounced increase in the rate of tagging through the monitoring period (Figure 45). Striped marlin tagging rate went from 80.6% in 1993/94 to 94.5% in 2004/05. The development of targeting techniques for striped marlin was coincident with and perhaps influential in the advance of a pro-tagging attitude for marlin fishers.
Figure 45. The fate of striped marlin as proportions of tagged, weighed and not-weighed (retained). Numbers tagged are shown. N=3,640.

Figure 46. The fate of black marlin as proportions of tagged, weighed and not-weighed (but retained) from catch data. Numbers tagged are shown. N=3,251.

Figure 47. The fate of blue marlin as proportions of tagged, weighed and not-weighed (but retained) from catch data. Numbers tagged are shown. N=884.
4.10.2. Sharks

The nature of the point system means that the larger sharks (>85 kg on 37 kg line-class) score more points when weighed rather than tagged (Figure 2). Also, the technique used in shark fishing is generally offering a dead bait to be ingested for hook-up, which means it is more likely that sharks are deep hooked and less likely to be in a condition to be tagged. Hence sharks are generally more likely to be weighed.

Tiger sharks are the largest fish caught in the gamefish fishery off NSW and hence have the lowest tagging rate of all target species (Figure 48). Only 29% of tiger sharks were tagged during the monitoring period. The ratio of tiger sharks tagged increased until the 2002/03 season when 72% were tagged. However the proportion decreased in the following two seasons to less than 20% tagged. This coincides with an increase in the relative number of larger tiger sharks and an increase in the average size (Figure 64).

![Figure 48. The fate of tiger sharks as proportions of tagged, weighed and not-weighed (but retained) from catch data. Numbers tagged are shown. N=585.](image)

Makos had a higher proportion tagged: overall 72% of mako sharks captured were tagged (Figure 49). Tagging rates increased from 1993/94 to 1998/99 when the proportion of tagged mako sharks reached 86% and subsequently declined. While no overall trend was apparent, this correlated with the season of highest catch rates of mako sharks (see Figure 20A) and of low average size of mako sharks (see Figure 66).

Seventy percent of blue sharks in the monitoring period were tagged (Figure 50). There was an increase in tagging rates for blue shark in the first five seasons of monitoring and a subsequent decline. In 1993/94 the tagging rate was 42%, which increased to 95% in 1997/98, then declined subsequently. The numbers of blue sharks represented were low in the last three seasons.

The point system only offers half as many points to a blue shark weighed for the same size and line class as for other sharks and yet their tagging points are the same as for other sharks (see Figure 3). Hence the incentive would be expected to be for a higher tag and release for blue sharks than other species.

Hammerhead sharks had the highest tagging rate of the sharks with almost 88% of hammerhead sharks tagged over the monitoring period. The annual range of the proportion tagged was 78 – 95% (Figure 51). This was probably influenced by the small average size of hammerheads caught at tournaments (Figure 70).
Figure 49. The fate of mako sharks as proportions of tagged, weighed and not-weighed (but retained) from catch data. Numbers tagged are shown. N=1,145.

Figure 50. Fate of blue sharks as proportions of tagged, weighed and not-weighed (but retained) from catch data. Numbers tagged are shown. N=451.

Figure 51. The fate of hammerhead sharks as proportions of tagged, weighed and not weighed (but retained) from catch data. Numbers tagged are shown. N=451.
4.10.3. **Sportfish**

Yellowfin tuna is the primary target species for some tournaments and on average 85% of yellowfin tuna were tagged (Figure 52). The annual range was between 69% and 93% tagged. There appears to be some cyclic nature of the ratio of tagged to weighed yellowfin tuna. This has some inverse relation to the average size of yellowfin (Figure 74) and may reflect that fate is related to size of yellowfin. This is anecdotally supported. The points system is trebled for yellowfin tuna, which would encourage weighing of larger yellowfin. The relatively high proportion of yellowfin tuna not-weighed (2.8% average) is most likely a reflection of their eating qualities.

![Figure 52](image_url)

**Figure 52.** The fate of yellowfin tuna as proportions of tagged, weighed and not-weighed (but retained) from catch data. Numbers tagged are shown. N=4,822.

There is a very high proportion of mahi mahi tagged, owing to their commonly small size in NSW (Figure 76). Overall, 92% of mahi mahi were tagged and up to 100% per annum (Figure 53). The season 1993/94 had the lowest tagging rate, though the total number of mahi mahi caught was relatively low. On average 1.7% or a maximum of 4% of mahi mahi were retained unweighed, again probably destined to be eaten.

![Figure 53](image_url)

**Figure 53.** The fate of mahi mahi from catch data as proportions of tagged, weighed and not-weighed (but retained) from catch data. Numbers tagged are shown. N=2,915.
4.11. Changes in bait-type

The bait type used for captured fish was recorded in interviews. This is an incomplete estimate of CPUE as it does not include zero captures per bait-type. But this analysis can show shifts in method used by anglers through time, which may in turn influence shifts in CPUE.

4.11.1. Blue Marlin

Blue marlin captures were predominantly caught on lures (80% over the period). While the proportion on lures did fluctuate among seasons, with an apparent increase in the proportion caught on lures (64% in 2001/02 to 93% in 2004/05) the ‘unspecified’ proportion declined. A small number were also caught on live bait, up to 21% (in the 2003/04 season).

![Blue Marlin Graph]

Figure 54. Percentages of the number of blue marlin reported caught in tournament interviews by bait-type.

4.11.2. Striped Marlin

While striped marlin were frequently caught on lures, increasing numbers were caught on live bait. In 2004/05 over 51% were caught on live bait, while 42% were caught on lure. This was an increase from 25% declared caught on bait in 2002/03 and a corresponding decrease from 63% caught on lures in the same season. In the first season of interviews, despite 62% of interviews not specifying bait type, less than 4% of striped marlin captured were caught on bait but 34% were caught on lures, a lure-to-bait ratio of 9:1. There is a clear shift in techniques used to catch this species. The increased use of live bait has implications for CPUE interpretation over this period. Striped marlin also had the highest proportion caught on dead baits, 5% on average though this declined from 8.3% to 2.4% from 2002/03 to 2004/05.
4.11.3. **Black Marlin**

The shift in bait type catching black marlin was the most pronounced of the marlins and was consistent with the trend of striped marlin. Of black marlin caught in 2001/02, 73% were by caught on lure compared to 9% on live bait. This had changed by 2004/05 to over 62% of black marlin caught by live bait compared to 32% by lure.

Anglers adopt a change in techniques to targeting a species if the technique is perceived to improve their success. The increasing use of live-bait to target striped and black marlin is anecdotally supported as being a more successful method than lures. This then suggests that there is a positive bias in the CPUE trends in the most recent seasons for striped and black marlin.
4.12. Marlin mortality estimates from number tagged

The tournaments monitored are a subset of competitive gamefishing activity in NSW, and represent an unknown proportion of recreational gamefishing activity. Harvest estimates are important in stock assessment and management, though notoriously difficult to estimate in recreational fisheries. For some esteemed target species such as the marlins, a proxy for the total number of fish captured is the number of fish tagged. This is approximate and assumes that the tagging rate is consistent for non-tournament captures but does offer an estimate of total catch by gamefishers. Mortality estimates may then be made if mortality rates of tagged fish are known.

Tag numbers were from the Gamefish Tagging Program as presented in Part 4.16 of this document. Owing to the assumption that the number tagged represents a close approximation of the number of fish caught, estimates were only made for the three marlin species (as these have particularly high tagging rates). Tagging rates were derived from tournament fate of fish caught as in Part 4.10 of this report. Recent studies of mortality rates of tagged marlin were used to calculate potential hooking mortality rates and the mortality attributed to bait type was derived from this study (Part 4.12).

4.12.1. Marlin

4.12.1.1. Striped Marlin

In 2003/04 there were 1,100 striped marlin tagged on the east coast of Australia (1,049 from NSW) and in 2004/05 there were 759 striped marlin tagged on the east coast (748 from NSW).

Making the assumption that the tagging versus landing rates reflected in tournament post-fishing interviews represent the whole recreational fishery, then the estimates of retained (‘weighed’ and ‘not-weighed’) striped marlin were 14% for 2003/04 and 8.3% for 2004/05. Extrapolating from the numbers tagged for these seasons gave estimates of 171 (2003/04) and 68 (2004/05) retained striped marlin for the NSW gamefish fishery. Although the assumption has been made that tagging versus landing rates in tournament fishing represent the whole fishery, anecdotal evidence suggests that tagging rates for the whole recreational fishery are lower than in tournaments and hence the retained estimates provides here are most likely under-estimated.

Hooking mortality has been related to depth of hooking in the fish and so has been related to bait-type used. Estimation of hooking mortality of tagged and released striped marlin was based on the proportion of striped marlin caught on live bait as this has been linked to significantly higher hooking mortality than lures. If the numbers caught by bait type were consistent from interviews then 38.4% and 52.7% were caught on live bait for the two seasons respectively, i.e., 403 (2003/04) and 394 (2004/05) striped marlin. Domier et al. (2003) found that mortality from live-bait use with ‘J’ hooks was 26% for tagged striped marlin. Extrapolating from the above estimates this equates to 105 (2003/04) and 102 (2004/05) striped marlin mortalities from hooking mortality. If these mortalities are added to the known number of striped marlin retained (‘weighed’ and ‘not-weighed’) then the estimated number of mortalities in NSW would be 276 (2003/04) and 170 (2004/05) striped marlin mortalities due to recreational gamefish fishing in NSW. This compares with commercial longline reported landings for NSW of 2,853 and 1,941 for the calendar years 2004 and 2005, which does not include those that are lost due to predation or post-escape mortalities (Table 5). Thus the proportion of the recreational mortality in the combined estimated mortality of both sectors for NSW was 8.8% and 8.1% for 2004 and 2005.
Making the same assumptions for the whole Australian east coast fishery and assuming that tagging rates were the same in Queensland as for NSW, an estimate of striped marlin mortality for recreational gamefishing for the Australian east coast was 289 (2003/04) and 173 (2004/05). The catch from the Australian ETBF for 2004 and 2005 was 5,180 and 3,994 striped marlin landed (Table 5). Therefore the recreational gamefish mortality of striped marlin for the Australian east coast as a proportion of the combined mortality from both sectors was 5.3% and 4.2% for 2004 and 2005 respectively. The lower proportions of striped marlin mortality for the whole Australian east coast compared to just NSW reflects the higher commercial catches in southern Queensland.

The actual number retained at monitored tournaments was 35 in 2003/04 and 19 in 2004/05. If the estimated number of retained fish from extrapolations is added to the tagged number then the total estimated number of striped marlin caught (including retained and tag and released) for these two seasons would be 1,279 (1,220 for NSW) in 2003/04 and 828 (816 in NSW) for 2004/05. These figures are not considered to be representative of the whole recreational fishery for striped marlin.

4.12.1.2. Black Marlin

Black marlin are more widely targeted and caught by recreational anglers along the Australian east coast than striped marlin. In 2003/04 and 2004/05, 377 and 874 were tagged in NSW (representing 46% and 56% of the east coast total). Mortalities estimated from retained and not-weighed black marlin from interview data (21.4% and 1.1% each year respectively) would be 103 and 10 for the same seasons respectively. Of the tagged black marlin for these seasons 45.5% and 62.6% were caught on live bait. A pop-up archiving tag (PAT) study of small black marlin currently underway suggests that, depending on whether non-reporting tags are a result of tag failure or mortality, then there is a median best/worst case estimated mortality rate of around 21% of live bait caught tagged black marlin (J. Pepperell pers. comm.). This can be extrapolated as 36 and 115 fish respectively for the same seasons. Thus an approximation of recreational mortality of black marlin in NSW equates to 139 and 125 black marlin in the 2003/04 and 2004/05 seasons respectively. The actual numbers reported landed for monitored tournaments was 15 and 10 respectively. These particularly low numbers are due to the small size and hence very high proportion of tagged black marlin at NSW tournaments. This does not account for the incidental catch and retention by anglers for which a capture of a small black marlin is a remarkable event.

Commercial longliners cannot retain black marlin, however the numbers reported to have been caught and released in waters off NSW were 104 and 183 in 2004 and 2005 respectively.

4.12.1.3. Blue Marlin

Blue marlin differs from the other two marlin species in that they are predominantly caught on lures and a higher proportion are weighed rather than tagged in tournaments due to their size. Actual mortalities at monitored tournament for the 2003/04 and 2004/05 the seasons were 6 and 8 blue marlin respectively.

In the eleven seasons to 2004/05 there were 1,967 blue marlin tagged of which 1,223 (62%) were tagged in NSW. Tournament interviews indicated in the 2003/04 and 2004/05 seasons 61% and 69% of fish caught were tagged. Based on the number of blue marlin tagged, the numbers extrapolated to have been retained for the same seasons were 78 and 18 blue marlin for NSW. Graves et al. (2002) found that 8 of 9 blue marlin caught on lures and tagged survived at least five days, the other one marlin could not be ascribed to having died or tag failure. Presuming that the fish died the mortality rate would be 11%. For the same past two seasons 86 and 32 of tagged fish in NSW were estimated to have been caught on lures, with an 11% mortality rate this would equate to 9 and 4 deaths respectively. For the same seasons 26 and 3 blue marlin were estimated to have been caught on bait. No figures are available for the mortality associated with blue marlin caught.
on live bait, though if the same rate is assumed as that for striped marlin (26%) then this would equate to 7 and 1 blue marlin mortalities for the respective seasons. Therefore extrapolated total mortality estimates of blue marlin for the 2003/04 and the 2004/05 seasons would be 94 and 23 blue marlin respectively.

Blue marlin cannot be retained by commercial longliners, but the numbers caught and released (condition unknown) were 262 and 233 for 2004 and 2005 respectively.

### Table 5.  
Australian Eastern Tuna and Billfish Fishery (ETBF) longline catch total by calendar year. Source: AFMA AL05 daily longline fishing logbooks as of 28 March 2006. NSW fishery defined as latitude 28.18°S to 37.5°S.

<table>
<thead>
<tr>
<th>Year</th>
<th>Species</th>
<th>2004 No. retained</th>
<th>2005 No. retained</th>
<th>2004 No. released</th>
<th>2005 No. released</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>2004</td>
<td>Black marlin</td>
<td>0</td>
<td>0</td>
<td>487</td>
<td>785</td>
<td>785</td>
</tr>
<tr>
<td>2004</td>
<td>Blue marlin</td>
<td>0</td>
<td>0</td>
<td>798</td>
<td>915</td>
<td>915</td>
</tr>
<tr>
<td>2004</td>
<td>Striped marlin</td>
<td>5,180</td>
<td>0</td>
<td>307</td>
<td>167</td>
<td>4,161</td>
</tr>
<tr>
<td>2004</td>
<td>Yellowfin tuna</td>
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<td>3,313</td>
<td>45,166</td>
</tr>
<tr>
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<td>Albacore</td>
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<td>1,378</td>
<td>1,104</td>
<td>70,707</td>
</tr>
<tr>
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<td>380</td>
<td>305</td>
<td>536</td>
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<td>0</td>
<td>496</td>
<td>308</td>
<td>466</td>
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<td>4,093</td>
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<td>527</td>
<td>501</td>
<td>2,344</td>
</tr>
</tbody>
</table>

4.13. Size frequencies and trends

Sizes of fish by species were derived from three sources: The first (and majority) source was the estimated weights from the Gamefish Tagging Program database – these were all derived from the recreational fishery (though not all from within tournaments); the second source was the weights reported via scheds and in tournament results provided by clubs officials for both tagged and weighed fish (though not all fish captured and tagged at tournaments had a recorded weight); and, the third source was from post-fishing interviews (this included estimated weights for tagged fish and a combination of estimated and actual weights for retained fish).

Histograms were created for size frequencies of all sources combined. Mean weights per annum and by zone were calculated for tag, tournament and interview data though the latter had a reduced time series. Furthermore, data were sparse for some species.
4.13.1. **Billfish**

4.13.1.1. **Striped Marlin**

The NSW GFA record for a striped marlin caught is 191.5 kg caught in 1992 off Tathra on the NSW south coast (Gamefish Association of Australia 2005).

There were 879 striped marlin with recorded weights at tournaments (Figure 57). The mean weight was 84.3 kg, while both median and modal weights were 80 kg. The weight frequency was normally distributed with low skewness and kurtosis. Ninety percent of the range was 50 kg to 130 kg while fifty percent of the striped marlin were between 70 and 94 kg.

The mean size of tagged fish was 79 kg and modal size was 80 kg suggesting a symmetrical distribution around the modal size (Figure 58). Ninety percent of tagged striped marlin were between 40 – 115 kg and 50% were from 70 – 90 kg (Figure 79). The structure of the tag data is uni-modal, leptokurtotic and reasonably stable throughout the time series. The stability may be due to the large numbers of fish tagged. There were 11,601 estimated weights for tagged striped marlin (Figure 79).

Interviews provided weight data for 480 striped marlin. The mean was 75.7 but median and modal weights were also 80 kg. Ninety percent of the weights were between 35 kg and 110 kg, while 50% were between 60 kg and 90 kg.

The tag, tournament and interview weights appear to be similar in structure. Tagged striped marlin were smaller than those recorded in tournaments (74.9 kg compared to 84.3 kg) while those reported at interview were the smallest at 74 kg. Mean weight trends for tagged and tournament striped marlin were very similar for most seasons though the tournament mean weight was higher in the first and very last season of monitoring (Figure 58).

There was an influx of smaller marlin in some seasons in size categories between 20 – 60 kg (Figure 79). This also produced a pronounced decrease in the mean size in 1996/97 though was also evident in 2002/03 and 2004/05 (Figure 58).

![Figure 57. Distribution of size data for striped marlin from the three sources: Tags, tournaments and interviews, on logarithmic scale.](image)
Tagged striped marlin were largest in the Southern Zone with an 89.1 kg average compared to 81.4 kg in the Central Zone and 74.8 kg in the Northern Zone (Figure 90). Inter-annual mean size trends for tagged striped marlin were more stable than the tournament reported fish in all zones though in particular in the southern zone.

Figure 58. Striped marlin mean estimated weight (kg) for tournament records and tag records by fishing season with standard errors.

4.13.1.2. Black Marlin

While the Australian record for black marlin is 654 kg, the largest caught off NSW is a relatively modest 324 kg caught in 1991 off Coffs Harbour (Gamefish Association of Australia 2005).

There were only 361 black marlin for which a weight was recorded at tournaments. The mean weight was 71.2 kg while the modal weight was 50 kg. Ninety percent of the weights were between 30 kg and 143 kg, while 50% were between 50 kg and 85 kg. The maximum weight reported was 235 kg.

Interviews recorded weights of 46 black marlin. The mean weight from interviews was 87.3 kg while the modal weight was 80 kg. Ninety percent were in the size range 33 kg to 143 kg and 50% were from 70 kg to 102 kg.

The tag data comprised 6,975 fish with a broad range in sizes to 351 kg. Ninety percent of the tagged black marlin were between 20 kg and 109 kg and 50% were between 30 kg and 70 kg. While the overall mean size of tagged black marlin was 52.9 kg, the modal size was only 30 kg. Thus while the distribution of tagged black marlin was uni-modal, it was skewed to smaller fish in all data sources (Figure 59 and Figure 80). The size structure was variable with the seasons of largest numbers of black marlin tagged being the most skewed to small marlin (Figure 80). The resultant mean size of marlin declined in these years (Figure 60). These years, 1996/97, 1998/99 and 2004/05 were when there were ‘runs of small blacks’ in inshore waters (potentially pulses of recruitment). The number of tagged black marlin was much greater than represented in the tournament data, though where numbers were sufficient (1999/00) the distributions appeared similar. Tournament reported black marlin were largest on average. The overall mean sizes for the tag, tournament and interview data are 52.9 kg, 71.2 kg and 59.8 kg respectively. Though there were fewer years with interview size data.
The distributions suggest episodic pulses of juvenile black marlin being caught in some years, in particular the 1996/97, 1998/99 and 2004/05 seasons. There appears to be a sequence of recruitment pulses being represented as a dominant cohort growing through the size ranges from juveniles in the 1998/99 season through to the 2000/01 season (Figure 80).

Black marlin increased in average size with latitude (Figure 91). The Southern Zone tagged fish were on average 95.2 kg compared to 68.7 kg for the Central Zone and 66.9 kg for the Northern Zone. Inter-annular trends in the tournament data are less clear than tagging data as only the Central Zone has a consistent time series in the tournament data, though there may be some decline in average sizes of black marlin overall in both data sets.

Figure 59. Distribution of size data of black marlin from the three sources: Tags, tournaments and interviews, on logarithmic scale.

Figure 60. Black marlin mean estimated weight (kg) for tournament records versus tag records by fishing season with standard errors.
4.13.1.3.  Blue Marlin

Pacific blue marlin is the largest of the istiophorids caught by anglers off NSW. The Australian record of 452 kg was caught in 1999 off Batemans Bay, NSW (Gamefish Association of Australia 2005).

Tournament monitoring recorded the weights of 220 blue marlin with the maximum weight being 306 kg. The mean weight was 137.5 kg while the modal weight was 120 kg. Ninety percent were between 71 kg and 210 kg, while 50% were from 110 to 160 kg.

Weights of black marlin in the monitoring period were up to a reported 400 kg (which was tagged) (Figure 81). Ninety percent of tagged blue marlin were between 60 kg and 190 kg while 50% were between 90 kg and 145 kg. In tournaments, 90% of the catch was between 70 kg and 210 kg, while 50% were between 107 kg and 160 kg. The overall mean size of tagged fish was 119.8 kg and the modal size was 120 kg, the data were symmetrical and normally distributed (0.88, 3.5) (Figure 62). The mean size of the tournament data was 136.8 kg and the modal size was 120 kg (Figure 62).

Interviews provided data on 71 blue marlin. The mean weight from interviews was 137.4 kg while the modal weight was 150 kg. The range was similar with 90% between 68 kg and 216 kg and 50% between 100 kg and 160 kg.

Tagged fish were smaller than tournament reported and interview reported blue marlin though the latter two were similar (Figure 61). The overall mean sizes for the tag, tournament and interview data were 119.8 kg, 136.8 kg and 137.3 kg.

Blue marlin differs from the other marlins in that there is little difference in sizes with latitude (Figure 92).

Figure 61. Distribution of size data of blue marlin from the three sources: Tags, tournaments and interviews, on logarithmic scale.
4.13.2. **Sharks**

4.13.2.1. **Tiger Shark**

Tiger sharks are the largest fish targeted by gamefish anglers in NSW. The largest recorded was 626 kg, caught in 1939 off Sydney (Gamefish Association of Australia 2005).

Though the overall numbers with sizes recorded were low, the tournament and interview data cover much of the size range to 528 kg (Figure 63). Of target species, tiger sharks had the greatest disparity between sizes of tagged versus tournament reported fish (Figure 64). Only small tiger sharks (<100 kg) were tagged and these were not well represented in tournament records though they were represented in the interview data (Figure 82). While tournament and interview data represented a broad size range, tagging data appeared biased to smaller size categories. The overall average sizes for tag, tournament and interview data were 60.9 kg, 207.0 and 214.1 kg respectively. Ninety percent of the 306 tournament reported tiger sharks were between 60 kg and 389 kg, while 50% were from 110 to 294 kg. The modal length from tournament data was 250 kg, which is larger than the mean of 207 kg. There were no clear modes apart from juveniles in the tagged data. There were few juveniles represented in 2004/05 though the number of tiger shark reported sizes was very low (Figure 82). There appears to be little difference in the average size of the tournament reported sharks among the three zones (Figure 93). The average over the monitoring period for the Northern, Central and Southern Zones was 190.7 kg, 208.3 kg and 194.4 kg respectively. There were no consistent patterns among zones as the Northern and Southern Zones do not have size data for all years. The Southern Zone had the greatest inter-annular fluctuation in average size due to low numbers of tiger shark sizes represented. There was a decline in mean size of tiger sharks in the Central Zone from 240.2 to 210.7 kg over the monitoring period, though this was within the standard errors.
Figure 63. Distribution of size data of tiger sharks from the three sources: Tags, tournaments and interviews, on logarithmic scale.

Figure 64. Tiger shark mean estimated weight (kg) for tournament records and tag records by fishing season with standard errors.
4.13.2.2. **Mako Shark**

Mako sharks grow to a large size, the NSW record being 467 kg. Tournament data recorded sizes to 380 kg. Tagged mako sharks were skewed towards smaller sizes whereas tournament recorded mako sharks had two modes (Figure 65). There was some indication of a modal progression in the tagging data, which suggested recruitment in the sequence of 1995/96 to 1999/00. Over these seasons a mode progressed from the smallest size group through to 40 kg to the 60 kg category over the four seasons (Figure 83).

There was a significant difference in the average size of tournament versus tagged mako sharks (Figure 66). The mean weight of tagged mako sharks was 49.3 kg compared to 95.5 kg for the tournament caught fish. Both data had a modal size of 40 kg. The 61 mako sharks recorded in interviews had a mean of 90 kg with a mode of 50 kg. The distributions tended to be leptokurtotic and skewed toward smaller fish, this was particularly the case of those tagged (Figure 83). Ninety percent of the tournament reported mako sharks were between 20 and 236.2 kg and 50% between 50 and 120 kg. In comparison, 50% of the tagged makos were between 25 and 65 kg.

Tournament reported mako sharks were, on average, largest in the Central Zone and tagged mako sharks were similar in size in the Central and Southern Zones. Mako sharks were smallest in the Northern Zone in both tournament and tagging data. (Figure 94).

![Figure 65](https://example.com/image65.png)

**Figure 65.** Distribution of size data of mako sharks from the three sources: Tags, tournaments and interviews, on logarithmic scale.

![Figure 66](https://example.com/image66.png)

**Figure 66.** Mako shark mean estimated weight (kg) for tournament records and tag records by fishing season with standard errors.
4.13.2.3. Blue Sharks

The Australian record blue shark weighed 198.2 kg and was caught off Catherine Hill Bay, NSW in 1976 (Gamefish Association of Australia 2005).

The blue shark size distributions of tournaments and tags were similar (Figure 67). The average size of tagged blue sharks tended to be larger than most other shark species, the mean was 62.8 kg. The mean of the tournament reported sharks was 86.0 kg (Figure 68). Ninety percent of the 95 tournament reported blue sharks were between 30 kg and 147 kg while 50% were between 50 kg and 105 kg. Half the 1,379 tagged blue sharks were between 45 kg and 80 kg. There were no clear size trends though the mean size of tagged blue sharks was more stable through time than the tournament data. There were relatively few juveniles; weight frequencies showed that unlike other sharks the smallest sizes (<50 kg) comprised a small proportion of those tagged (Figure 83).

There was no difference in the mean sizes of blue sharks between Southern and Central Zones (Figure 95).

![Figure 67. Distribution of size data of blue sharks from the three sources: Tags, tournaments and interviews, on logarithmic scale.](image)

![Figure 68. Blue shark mean estimated weight (kg) for tournament records versus tag records by fishing season with standard errors.](image)
4.13.2.4.  Hammerhead Sharks

The three species of oceanic hammerheads caught off NSW of differing potential sizes were recorded as one species in tournaments and tagging data, which complicates interpreting the size data. The NSW record is 358 kg caught in 1999 off Port Stephens (Gamefish Association of Australia 2005). Tournament data report hammerhead sharks to 300 kg. The distribution of tagged hammerhead sharks was skewed to smaller sharks than those from tournaments (Figure 69).

There were few tournament reported hammerhead sharks except for the 1999/00 and 2000/01 seasons (Figure 72). The mean of the 122 tournament recorded hammerhead sharks was 64.1 kg, while the mode was lower, 40 kg, compared to 35.7 kg of those tagged (Figure 70) indicating a skewed distribution to the smaller sized hammerhead sharks. Ninety percent of the size distribution was between 20 kg and 135 kg while 50% was between 30 kg and 88 kg. The tagged hammerheads had a mean of 35.7 kg and 50% were between 12 kg and 50 kg. There were only 18 reported hammerhead sharks in interviews.

The sizes of hammerhead sharks were skewed to the smaller sizes in most years (Figure 85). There were no clear patterns of sizes of tournament or tagged hammerhead sharks among zones (Figure 83).

![Figure 69](image1.png)  
Figure 69. Distribution of size data of hammerhead sharks from the three sources: Tags, tournaments and interviews, on logarithmic scale.

![Figure 70](image2.png)  
Figure 70. Hammerhead shark mean estimated weight (kg) for tournament records and tag records by fishing season with standard errors.
4.13.2.5. Whaler Sharks

Whaler sharks refer to a broad species complex that gamefishers aggregate into one category. The NSW record is 378 kg caught in 1986 off Port Stephens (Gamefish Association of Australia 2005). Tournament reported sizes ranged from 5 to 319 kg and tagged whaler sharks were up to an estimated 300 kg (Figure 86). Tournament reported whaler sharks were consistently larger than those tagged (Figure 72). The mean size of whalers reported in tournaments was 98 kg, while tagged whalers averaged 39.6 kg. Ninety percent of the tournament reported whalers were between 18.5 kg and 252 kg and 50% were between 60 kg and 120 kg. There was little structure to the size distribution though those tagged were skewed to the smaller size classes; in many years the modal tagged size was the smallest size category illustrated (<25 kg).

The number of whaler sharks with size measurements recorded has declined in recent years. Tagged whaler sharks were on average largest in the Southern Zone for most seasons (Figure 97).

Figure 71. Distribution of size data of whaler sharks from the three sources: Tags, tournaments and interviews, on logarithmic scale.

Figure 72. Whaler shark mean estimated weight (kg) for tournament records versus tag records by fishing season with standard errors.
4.13.3. **Sportsfish**

4.13.3.1. **Yellowfin Tuna**

The NSWGFA record for yellowfin tuna was 124 kg, caught in 1993 at Montague Island (Gamefish Association of Australia 2005). The size range of tournament yellowfin tuna was up to 110 kg, though most were less than 50 kg.

Juveniles generally dominated the size range. Distributions were skewed to the smaller sizes with a periodic pulse of numerous juveniles in the smallest size category (<10 kg) (Figure 87). This was particularly apparent in 1993/94, 1998/99 and 2004/05, there was a progression of the dominant age class through subsequent years. The smallest age category appeared in most other years also.

The mean size of tournament reported yellowfin tuna was 23.0 kg with a mode of 10 kg, for tagged yellowfin the mean was 13.0 kg (Figure 74). Ninety percent of tournament caught yellowfin tuna were between 5 kg and 59 kg and 50% were between 10 kg and 30 kg, 50% of tagged fish were between 5 and 20 kg.

The tag, catch and interview structure were similar in recent years. There were no apparent size trends among zones (Figure 98).

**Figure 73.** Distribution of size data of yellowfin tuna from the three sources: Tags, tournaments and interviews, on logarithmic scale.

**Figure 74.** Yellowfin tuna mean estimated weight (kg) for tournament records versus tag records by fishing season with standard errors.
4.13.3.2. **Mahi Mahi**

The NSWGFA record for mahi mahi is 38 kg caught in 1989 off Botany Bay (Gamefish Association of Australia 2005).

The size range of the mahi mahi represented in the tagging and tournament catch data range from 1 kg to 28 kg. The size structure was uni-modal; the mean sizes of mahi mahi were 4.5 kg for the tournaments and 2.2 kg for tagged fish (Figure 76). Ninety percent of tournament mahi mahi were from 1 kg to 16.5 kg and 50% were from 2.5 kg to 12 kg. In comparison, 50% of tagged mahi mahi were reported as from 1 kg to 2 kg (Figure 88). While the mean size of tagged mahi mahi was consistent, that of tournament recorded mahi mahi appeared cyclic with high mean sizes in 1995/96 and 2003/04, whereas in 1999/00 and 2000/01 seasons mean tournament sizes were lower and similar to those tagged (Figure 76). This appeared to be due to more juveniles in tournaments for those seasons (Figure 88).

The mean sizes of mahi mahi were larger in the Northern Zone in some seasons, though overall there was no perceptible difference among zones (Figure 87).

![Figure 75. Distribution of size data of mahi mahi from the three sources: Tags, tournaments and interviews, on logarithmic scale.](image)

![Figure 76. Mahi mahi mean estimated weight (kg) for tournament records versus tag records by fishing season with standard errors.](image)
4.13.3.3. **Albacore**

The NSWGFA record for albacore tuna is 23.2 kg caught in 1985 off Bermagui (Gamefish Association of Australia 2005). The size range of tournament data approached this size, though most albacore were below 16 kg. The size frequency was mostly uni-modal and mostly skewed to juveniles (Figure 76). However in 1993/94 the data were bimodal at 4 – 6 kg and 10 – 12 kg. There appeared to be a progression of the smaller mode through the seasons to 2000/01. The numbers of fish with size estimations reported was low in recent years and has no clear structure. The 2002/03 season appeared to have consisted of some recruits with an absence of large fish (Figure 89 and Figure 99).

There was little difference between the mean size of albacore tournament reported and tagged; the mean size of the former was 8.4 kg and the latter 8.0 kg. The size range was fairly narrow, 90% of albacore were between 5 kg and 12 kg and 50% were from 8 kg to 10 kg. Fifty percent of tagged albacore were 5 kg to 9 kg. There were no clear differences in size of albacore between zones (Figure 100).

![Figure 77](image-url)  
Figure 77. Distribution of size data of albacore tuna from the three sources: Tags, tournaments and interviews, on logarithmic scale.

![Figure 78](image-url)  
Figure 78. Albacore tuna mean estimated weight (kg) for tournament records versus tag records by fishing season with standard errors.
Figure 79. Size frequency of striped marlin: number of tagged, tournament-recorded and interview-reported striped marlin per 10 kg category for 12 seasons of monitoring.
Figure 80. Size frequency of black marlin: number of tagged, tournament-recorded and interview-reported black marlin per 10 kg category for 12 seasons of monitoring.
Figure 81. Size frequency of blue marlin: number of tagged, tournament-recorded and interview-reported blue marlin per 10 kg category for 12 seasons of monitoring.
Figure 82. Size frequency of tiger sharks: number of tagged, tournament-recorded and interview-reported tiger sharks per 10 kg category for 12 seasons of monitoring.
Figure 83. Size frequency of mako sharks: number of tagged, tournament-recorded and interview-reported mako sharks per 10 kg category for 12 seasons of monitoring.
Figure 84. Size frequency of blue sharks: number of tagged, tournament-recorded and interview-reported blue sharks per 10 kg category for 12 seasons of monitoring.
Figure 85. Size frequency of hammerhead sharks: number of tagged, tournament-recorded and interview-reported hammerhead sharks per 10 kg category for 12 seasons of monitoring.
Figure 86. Size frequency of whaler sharks: number of tagged, tournament-recorded and interview-reported whaler sharks per 10 kg category for 12 seasons of monitoring.
Figure 87. Size frequency of yellowfin tuna: number of tagged, tournament-recorded and interview-reported yellowfin tuna per 10 kg category for 12 seasons of monitoring.
Figure 88. Size frequency of mahi mahi: number of tagged, tournament-recorded and interview-reported mahi mahi per 10 kg category for 12 seasons of monitoring.
Figure 89. Size frequency of albacore: number of tagged, tournament-recorded and interview-reported albacore per 10 kg category for 12 seasons of monitoring.
4.13.4. **Average Weights by zone**

4.13.4.1. **Billfish**

![Graph showing average weights by zone for striped marlin](image)

**Figure 90.** Striped marlin mean estimated weight by Zone by fishing season with standard errors: A) tournament result; and, B) tagging data.

![Graph showing average weights by zone for black marlin](image)

**Figure 91.** Black marlin mean weight by Zone by fishing season with standard errors: A) tournament results; and, B) tagging data.

![Graph showing average weights by zone for blue marlin](image)

**Figure 92.** Blue marlin mean estimated weight by Zone by fishing season with standard errors: A) tournament result; and, B) tagging data.
4.13.4.2. **Sharks**

Figure 93. Tiger shark mean estimated weight by Zone by fishing season with standard errors: A) tournament result; and, B) tagging data.

Figure 94. Mako shark mean estimated weight by Zone by fishing season with standard errors: A) tournament result; and, B) tagging data.

Figure 95. Blue shark mean estimated weight by Zone by fishing season with standard errors: A) tournament result; and, B) tagging data.
**Figure 96.** Hammerhead shark mean estimated weight by Zone by fishing season with standard errors: A) tournament result; and, B) tagging data.

**Figure 97.** Whaler shark mean estimated weight by Zone by fishing season with standard errors: A) tournament result; and, B) tagging data.
4.13.4.3. Sportfish

Figure 98. Yellowfin tuna mean estimated weight by Zone by fishing season with standard errors: A) tournament result; and, B) tagging data.

Figure 99. Mahi mahi mean estimated weight by Zone by fishing season with standard errors: A) tournament result; and, B) tagging data.

Figure 100. Albacore mean estimated weight by Zone by fishing season with standard errors: A) tournament result; and, B) tagging data.
4.13.5. Seasonality of CPUE and size trends

4.13.5.1. Marlin

The catch rates of all three marlin species were highest at tournaments occurring during late summer through to early autumn. Black marlin and blue marlin CPUE peaked in March toward the end of the season in the Central and the Southern Zones (Figure 102A and Figure 103A), whereas striped marlin catch rates peaked in January in the Central Zone, but later in March in the Southern Zone (Figure 101A). Size trends of marlin are less clear, though there appears to have been an increase in mean size toward the end of the season. Striped marlin from tournaments in the Southern Zone had the largest increase of mean size over the season: from an average of 86 kg in mid season (January to March) to a mean of 104 kg in the late season (April and May) (Figure 101B).

4.13.5.2. Sharks

Catch rates of tiger sharks and hammerhead sharks were highest in tournaments in the second half of the season (Figure 104A and Figure 107A), whereas those of mako sharks and blue sharks were highest in the spring tournaments (Figure 105A and Figure 106A). Tournament-caught makos were largest during the late season though this was not as defined in tagged mako sharks (Figure 105A and B). Tagged hammerhead sharks were largest in the austral summer (Figure 107B), whereas tagged blue sharks were larger during winter (Figure 106C).

4.13.5.3. Sportfish

Catch rates of yellowfin tuna fluctuated, did not appear particularly seasonal, rather CPUE appeared to be dominated by particular tournaments where they were targeted (Figure 108A). Catch rates were highest (1.3 fish per vessel-day) at the White Sands Tournament held out of Jervis Bay. Mahi mahi were particularly seasonal with highest catch rates during mid season (Figure 109A). Albacore CPUE was highest in the Southern Zone in May and June (Figure 110A). Yellowfin caught in tournaments and tagged were largest in the winter months (Figure 108B and C), the largest mahi mahi were caught in tournaments at the very end of the season in April (Figure 109B and C). Tagged albacore appear to have been largest in summer (Figure 110C).
Figure 101. Striped marlin monthly mean: (A) tournament CPUE; (B) tournament weight (kg); and, (C) tagged weight (kg) for the monitoring period, by Zone with standard errors.

Figure 102. Black marlin monthly mean: (A) tournament CPUE; (B) tournament weight (kg); and, (C) tagged weight (kg) for the monitoring period, by Zone with standard errors.

Figure 103. Blue marlin monthly mean: (A) tournament CPUE; (B) tournament weight (kg); and, (C) tagged weight (kg) for the monitoring period, by Zone with standard errors.
Figure 104. Tiger shark monthly mean: (A) tournament CPUE; (B) tournament weight (kg); and, (C) tagged weight (kg) for the monitoring period, by Zone with standard errors.

Figure 105. Mako shark monthly mean: (A) tournament CPUE; (B) tournament weight (kg); and, (C) tagged weight (kg) for the monitoring period, by Zone with standard errors.

Figure 106. Blue shark monthly mean: (A) tournament CPUE; (B) tournament weight (kg); and, (C) tagged weight (kg) for the monitoring period, by Zone with standard errors.

Figure 107. Hammerhead shark monthly mean: (A) tournament CPUE; (B) tournament weight (kg); and, (C) tagged weight (kg) for the monitoring period, by Zone with standard errors.
Figure 108. Yellowfin tuna monthly mean: (A) tournament CPUE; (B) tournament weight (kg); and, (C) tagged weight (kg) for the monitoring period, by Zone with standard errors.

Figure 109. Mahi mahi monthly mean: (A) tournament CPUE; (B) tournament weight (kg); and, (C) tagged weight (kg) for the monitoring period, by Zone with standard errors.

Figure 110. Albacore monthly mean: (A) tournament CPUE; (B) tournament weight (kg); and, (C) tagged weight (kg) for the monitoring period, by Zone with standard errors.
4.13.6.  Number of fish tagged by zone

The GTMP does not provide information on total catch by the recreational gamefish sector as it is a subset of recreational gamefishing activity. The Gamefish Tagging Program (GTP) data does provide an estimate of numbers of each species tagged and hence an indication of the scale of the fishery. However this does not provide an estimate of fish captured and retained or released without being tagged. The numbers of fish reported from the GTP are here provided and are compared with the catch figures of the GTMP.

4.13.6.1.  Marlin

Amongst the marlins, striped marlin had the highest number reported captured in monitored tournaments. There were 3,668 reported caught at monitored tournaments in the study, the most reported for a season was 609 in 1999/00. In the same twelve-year monitoring period the GTP recorded 12,385 tagged striped marlin in NSW (12,732 for the Australian east coast) (Figure 111B). The 1999/00 season also had the highest number tagged by recreational fishers with 1,968 striped marlin tagged in NSW. Ninety seven percent of tagged striped marlin were tagged off NSW, of these 48.6% were tagged in the Central Zone.

There were 3,265 black marlin reported caught in monitored tournaments over the period, the maximum was 890 in 1996/97, the season of the fewest tournaments monitored. Over the same period there were 8,443 black marlin tagged off NSW (13,890 for the Australian east coast) (Figure 111A). The maximum number tagged in NSW was 2,521 in 1996/97 (3,240 for the Australian east coast). Overall, 60.8% of the black marlin tagged were from waters off NSW, of these 71.7% were from the Central Zone.

Blue marlin were the least common of the marlins reported at tournaments, 888 were captured at monitored tournaments. Over the monitoring period there were 1,326 tagged blue marlin off NSW (2,163 for the Australian east coast) (Figure 88C). The maximum tagged in a season was 241 for NSW waters in 1998/99 (the maximum for the Australian east coast was 341 in 2003/04). Over the monitoring period 61.3% of blue marlin tagged were tagged off NSW, of these 74.2% were tagged in the Central Zone.
Figure 11. Number of fish tagged and released in NSW by Zone and Queensland for three species of marlin by fishing season.
4.13.6.2. **Other Billfish**

Other billfish are rarely reported caught in NSW tournaments. There were 24 sailfish reported caught at tournaments in the study period. Over this time, the GTP recorded 135 tagged off NSW compared to the total east coast number of 4,655 tagged (NSW=3.0%). The maximum number tagged off NSW for a season was 29 in 2004/05. Of those tagged off NSW, 65.9% were tagged in the Northern Zone.

There were 118 shortbill spearfish reported captured at monitored tournaments, 32 in 2001/02. In the same period there were 179 tagged off NSW, a maximum of 44 in 2001/02. Of the 201 tagged off the Australian east coast 80.1% were off NSW, of these 68.7% were tagged in the Central Zone.

There were no swordfish captured at monitored tournaments. There were 41 reported tagged, 37 off NSW (90.2%), of these 37.8% from the Central Zone.

![Graphs](A) Sailfish, (B) Shortbill Spearfish, (C) Swordfish)

Figure 112. Number of fish tagged and released in NSW by Zone and Queensland for three species of ‘other billfish’ by fishing season.
4.13.6.3. Sharks

There were 591 tiger sharks reported captured in monitored tournaments over the period. The most in a season was 77 in 1998/99. There were 452 tagged off the Australian east coast of which 437 were reported tagged off NSW. The majority of the 437 tagged off NSW were tagged in the Central Zone. The most in a season was 55 in 1997/98.

Mako sharks were the most numerous of the sharks caught at tournaments and the sixth-most commonly reported species of fish caught. This study recorded 1,158 mako sharks in monitored tournaments, with 302 the highest for a season, reported in 1998/99. The GTP reports 3,197 mako sharks tagged off NSW, 99.8% of the Australian east coast total of 3,202 tagged mako sharks. Of those tagged in NSW, 57.3% were tagged in the Central Zone while 40.2% were tagged in the Southern Zone.

There were 453 blue sharks reported captured in monitored tournaments with 153 the maximum for a season in 1995/96. All the 859 blue sharks reported tagged were off NSW, 75.6% of these were tagged in the Central Zone. The maximum number tagged in a season was 419 in 1996/97, which has steadily declined to 19 in 2004/05.

The study recorded 443 hammerhead sharks at monitored tournaments with 64 the maximum number in 1999/000. There were 1,797 tagged in NSW of the 1,857 total tagged in this period (96.8%). The maximum number tagged was 290 in 1993/94; there has been a consistent decline in the number tagged since.

There were 422 whaler sharks reported captured at monitored tournaments, 75 in 1997/98. Of the 2,418 tagged off the east coast 1,854 (76.7%) were tagged off NSW, 61.4% were tagged in the Central Zone. The maximum was 241 in 1999/00.

**Figure 113.** Number of sharks tagged and released in NSW by Zone and Queensland for five species of shark by fishing season.
4.13.6.4. Tunas

Yellowfin tuna were the most numerous of the species reported at monitored tournaments, 4,862 were reported caught in the period, 1,186 in 1995/96. The GTP records 15,110 tagged off the Australian east coast, with 11,394 (75.4%) having been tagged off NSW. Of those tagged in NSW, 64.8% were tagged in the Southern Zone. The maximum number tagged off NSW was 2,358 in 1995/96.

Albacore were the fifth-most commonly reported captured species at monitored tournaments, 1,874 were captured, with the maximum number 785 occurring in the first year of monitoring, 1993/94. There were 7,670 reported tagged off the Australian east coast by recreational fishers with 7,663 (99.9%) reported tagged off NSW, of these 89.3% were tagged in the Southern Zone. The maximum for a season was 2,662 tagged in 1995/96.

There were only 6 southern bluefin tuna reported at tournaments, 5 of which were reported in 1997/98. There were 83 southern bluefin tuna tagged over the monitoring period, with half (42) tagged in 1996/97, 40 of which were in the Central Zone.

Figure 114. Number of fish tagged in NSW waters by Zone and Queensland for three species of tunas by fishing season.
4.13.6.5. *Other Sportfish*

Mahi mahi were the fourth-most common species reported in monitored tournaments. There were 2,952 reported of which 1,151 were captured in 2000/01. Tagging records show 7,219 tagged for the Australian east coast, with 6,621 tagged off NSW (91.7%). One was reported tagged off Victoria. For NSW, 72.4% were tagged in the Central Zone. The maximum number tagged in NSW was 1,462 in 2000/01.

There were 107 wahoo reported caught at monitored tournaments, 42 of which were in 1998/99. There were 316 reported tagged of which 148 (46.8%) were off NSW. For NSW waters, 62.8% were tagged in the Central Zone. The maximum number tagged in a season was 55 in 1998/99.

![Graph](image)

**Figure 115.** Number of fish tagged in NSW waters by Zone and Queensland for two species of other sportfish by fishing season.