

New Zealand Fisheries
Assessment Report
2008/28
May 2008
ISSN 1175-1584

New Zealand billfish and gamefish tagging, 2006–07

J. Holdsworth
P. Saul

New Zealand billfish and gamefish tagging, 2006–07

J. Holdsworth
P. Saul

Blue Water Marine Research Ltd
P O Box 402081
Tutukaka
Northland

**Published by Ministry of Fisheries
Wellington
2008**

ISSN 1175-1584

©
**Ministry of Fisheries
2008**

Holdsworth, J.; Saul, P. (2008).
New Zealand billfish and gamefish tagging, 2006–07.
New Zealand Fisheries Assessment Report 2008/28. 27 p.

This series continues the informal
New Zealand Fisheries Assessment Research Document series
which ceased at the end of 1999.

EXECUTIVE SUMMARY

Holdsworth, J.; Saul, P. (2008). New Zealand billfish and gamefish tagging, 2006–07.

New Zealand Fisheries Assessment Report 2008/28. 27 p.

The gamefish tagging programme has been an integral part of the New Zealand marine sports fishery since the mid 1970s. The species that form the focus of the programme are striped marlin (*Tetrapturus audax*), mako shark (*Isurus oxyrinchus*), blue shark (*Prionace glauca*), yellowfin tuna (*Thunnus albacares*), and yellowtail kingfish (*Seriola lalandi*). Worldwide there has been a growing trend toward the catch and release of large pelagic species hooked by recreational fishers. The collection of movement and, on occasion, growth information through cooperative tagging programmes with recreational fishers is a cost-effective way of collecting information on large pelagic species that are difficult to study by other means. However, in cooperative programmes, tagging may be spread over a long period and it is difficult to control the tagging event and quality of reporting.

Release and recapture data for the 2006–07 season (July to June fishing year) are summarised in this report and compared with those from previous seasons. Particular recaptures that provide growth or movement information of significance or interest are described.

This season 2490 fish were reported tagged and released. The number of striped marlin tagged (1024) is a slight increase on the 2005–06 season, and the size distribution of tagged fish also was similar to the previous season. Fishing for striped marlin was significantly less successful on the upper west coast of the North Island than in 2004–05, but better off east Northland than in the previous year. The number of mako and blue sharks tagged has been significantly lower than the long-term average for the last four years. The lowest number of mako sharks since 1984–85 was tagged. The average estimated size of tagged blue sharks was the lowest recorded in this programme to date. The number of kingfish tagged (961) in 2006–07 was down slightly from 2005–06. The percentage of kingfish accurately measured on release was 72%, predominantly from a few dedicated anglers and skippers. A number of long-term recaptures of kingfish were made, but, as usual, few of these were far from the tagging location.

A total of 61 recaptures were reported in the 2006–07 fishing season, including 38 yellowtail kingfish, 1 blue marlin, 2 blue sharks, and 1 yellowfin tuna. No tagged striped marlin or mako sharks were reported.

Four of the 38 kingfish recaptures showed movement of 20 nautical miles or more in 2006–07, and all these fish were smaller than 100 cm. Eighteen tagged kingfish recaptures were reported from the White Island area, including one fish that was tagged then recaptured four times in 32 days. One kingfish was recaptured in the same location almost 7 years after being tagged and grew from 70 cm to 110 cm (estimated 19 kg). This fish was released again with the tag intact.

Two blue sharks were recaptured on the west coast of the North Island within a few weeks and 40 nautical miles of release. A 40 kg yellowfin tuna tagged at North Cape in February 2006 was recaptured by a tuna longliner near the Barrier Bank (30 nautical miles north-east of Great Barrier Island) in April 2007. It was 155 nautical miles southeast of the release location and had been at liberty for 424 days.

1. INTRODUCTION

1.1 Overview

The New Zealand Cooperative Gamefish Tagging Programme was initiated by the Ministry of Agriculture and Fisheries in 1975 following requests from gamefish clubs. Similar programmes had been established by New South Wales Fisheries in 1973 and by Woods Hole Oceanographic Institute, USA, in 1954. Although the tags supplied in New Zealand were initially intended for billfish, it was accepted that a variety of gamefish species would be tagged (Saul & Holdsworth 1992).

Generally, the aims of cooperative tagging programmes are to provide basic information on movement and migration patterns; age, growth, and longevity; and stock structure for defining management units (Ortiz et al. 2003). These programmes have gained widespread support from recreational anglers and provide the only logistically and economically feasible way to tag large numbers of billfish (Pepperell 1990).

The New Zealand Big Game Fishing Council (NZBGFC) has supported the programme since its inception and has purchased and distributed all tags through gamefish clubs since 1992. Administration of the data remained with the Ministry of Agriculture and Fisheries until 1996, when the Ministry of Fisheries was formed. The administration for the gamefish tagging programme was initially contracted out to the National Institute of Water and Atmospheric Research (NIWA) and in 2000 was put out to competitive tender by the Ministry of Fisheries.

This report is the annual gamefish tagging report for the 2006–07 season prepared by Blue Water Marine Research as part of the reporting requirements for the Ministry of Fisheries, project TAG2006/01. The overall objective of the project is to manage and report the data obtained from the co-operative tag recapture program for gamefish.

1.2 Description of the fishery

The recreational fishery for large pelagic species is very important for many New Zealanders and contributes to tourism in New Zealand. The fishery operates mainly over the warm summer and autumn months. Striped marlin (*Tetrapturus audax*) is the mainstay of the gamefishery on the Northland east coast (Figure 1), with blue marlin (*Makaira nigricans*), small numbers of black marlin (*Makaira indica*), shortbill spearfish (*Tetrapturus angustirostris*), and swordfish (*Xiphias gladius*) also caught. Yellowfin tuna (*Thunnus albacares*) and mako sharks (*Isurus oxyrinchus*) are largely an incidental bycatch of the billfish fishery in Northland, and there is a year-round fishery for kingfish (*Seriola lalandi*). In the Bay of Plenty (Figure 1), yellowfin tuna and large yellowtail kingfish are the main pelagic gamefish sought, though at times striped marlin and blue marlin are targeted. On the North Island east coast, fishing clubs are established from Gisborne to Wairarapa (Figure 1). Shark species become increasingly important with distance south. Gamefishing has developed on the west coast of the North Island over the last 14 years with, at times, a very productive marlin and tuna fishery accessed from the west coast harbours and beaches, as far south as Taranaki. In the South Island, the gamefishery is centred off Canterbury, Otago, and Fiordland (Figure 1), with blue shark (*Prionace glauca*) abundant and therefore the primary target species, along with porbeagle shark (*Lamna nasus*) and occasionally southern bluefin tuna (*Thunnus maccoyii*). There is a developing seasonal (winter) fishery for Pacific bluefin tuna (*Thunnus orientalis*) off the central west coast of the South Island, accessed from the ports of Greymouth and Westport. This fishery is associated with the spawning aggregations of hoki (*Macruronus novaezealandiae*) that are targeted by commercial vessels offshore between July and September.

Where billfish and tuna are targeted by recreational anglers, surface trolling with artificial lures or baits is the predominant method of fishing, with most gamefish being caught on artificial lures trolled at speeds ranging from 4 to 10 knots. Since 1997 there has been a slight trend back towards the use of live baits for billfish, but most marlin are still caught on lures, as are many mako sharks. Some mako sharks and most other shark species are caught on drifted baits, either targeted or as an incidental catch during broadbill swordfish fishing.

Marlin species are also a bycatch of the commercial surface longline fishery that targets bigeye and southern bluefin tuna (*Thunnus obesus* and *T. maccoyii*). Within the New Zealand Exclusive Economic Zone (EEZ), commercial fishers are obliged by regulation to release all billfish, except swordfish, alive or dead. This regulation includes a provision that live billfish should be tagged if possible, and previously tagged marlin recaptured by commercial fishers are permitted to be boated and brought to port for scientific study.

1.3 Background

Data management and reporting for the Gamefish Tagging Programme is funded by the New Zealand Ministry of Fisheries, and the New Zealand Big Game Fishing Council purchases and distributes tags to fishing clubs and anglers at cost. Tags are supplied free of charge to commercial fishers who express an interest in tagging the species of interest. Collection of tag report cards has been greatly assisted by the fishing clubs, most of which keep accurate records of captures and require that tag report cards are handed in at the completion of successful trips.

For the last 12 years striped marlin, mako shark, blue shark, and yellowtail kingfish have been the focus of the programme. These species were selected during a review of the programme in 1992 on the basis that either there was potential to tag substantial numbers of fish and make sufficient recaptures to provide useful data, and/or they were species of national or international significance or concern. These criteria are still valid.

In October 2000, fishers and stakeholder groups were consulted on the scope and objectives of the programme and the resulting Gamefish Tagging Policy (Holdsworth & Saul 2003) was circulated to clubs and organisations. It was recommended that tagging of striped marlin, mako shark, blue shark, and kingfish continue, and that in future yellowfin tuna be included. Objectives included increasing knowledge of the nature and range of migration of striped marlin, yellowfin tuna, and mako and blue sharks tagged in the southwest Pacific, and improving knowledge of kingfish growth and movement.

2. METHODS

The tags used in this programme up to 2005 all used printed yellow streamers with a stainless steel dart anchor. Between 1975 and 1984, Floy FH-69 billfish tags supplied by the US National Marine Fisheries Service (NMFS) were issued with the prefix H before the tag number. During 1985, 1000 modified Floy tags were issued (model FH-69A, prefix G). Since 1986, the Hallprint billfish tags have been used (G series continued). All three tag types have stainless steel tag heads capable of being implanted with the same slotted stainless steel applicator. During 1995 and 1996 a number of striped marlin were recaptured with the tag head and a short section of the Hallprint plastic streamer, but no readable information. These tags could be identified as G series but had broken below the tag number. A modified Hallprint tag with stainless wire extending the full length of the tag was issued from December 1996 (G 53501) until March 2004 (G 92500). Tag supply had run low in 2004 and the manufacturer had a limited supply of stainless wire: 4000 tags were supplied with wire extending 35 mm up the tag. The tag number was printed lower on the tag and was over the area with wire. If the tag broke above the wire, as before, the tag number would remain. In 2005, 1000 tags with the nylon double-barbed anchors were purchased for billfish. This type of tag head was developed by The Billfish Foundation (US) and the NMFS and has been widely used

on billfish in the USA and more recently in Australia. These large plastic head intra-muscular tags – type PIMA – were purchased from Hallprint with the new prefix N and carried on the tag numbering sequence from the G series tags (N 102501 to N 103500). Both tag types are currently in use.

The process of tagging gamefish has been described by Saul & Holdsworth (1992). Numbered tag report cards are issued with each tag. They collect information on the species, date, location, size and weight of the fish tagged. More recent tag cards have included a space for latitude and longitude of release, the skipper's phone number, and tick boxes for capture method and whether the hook was removed before release.

The individually numbered tags are printed with the address of the Ministry of Fisheries' Auckland office and the words "Please measure and sex – Reward". Tag cards and recapture reports are passed on to the contractor for entry into the database. The fisher reporting a recaptured fish is sent a printed polo shirt as a reward along with a letter describing the release date and location, growth, movement, and time at liberty of the fish. A copy of the recapture letter is also sent to the skipper and angler who tagged the fish.

Data presented in this report are variously summarised by species and season, month, and area. This year the fish tagged by season and species have been summarised separately for fish tagged inside New Zealand fisheries waters (Table 1) and fish tagged outside New Zealand fisheries waters (Table 2). New Zealand gamefish clubs have always used an austral fishing season from 1 July to 30 June the following year. The tagging database and this report also use this definition of fishing season.

Large, lively fish are not easy to weigh and many are not removed from the water during tag and release. Therefore, weights are estimated by skipper or crew in most cases. Estimated weights have been summarised by 10 kg weight class rounded down as in previous NIWA gamefish tagging reports (Hartill & Davies 1999, 2000, 2001). For example, the 10 kg weight class includes fish from 10 to 19 kg.

More than half of the kingfish tagged are measured (fork length) by anglers before release. These data give a more accurate record of the size of fish than estimated weights. The size distribution of tagged kingfish has been summarised by 5 cm length classes; lengths are rounded down. For kingfish records where the length was not measured, the estimated weight was converted to length using the following formula derived from the length weight relationship of Walsh et al. (2003), where length is in centimetres and weight is in grams:

$$\text{Length} = 3.3154 \text{Weight}^{0.3621}$$

Distances moved are expressed as minimum possible travel distances in nautical miles as this remains the standard measure in marine navigation. Where straight lines between release and recapture positions cross landmasses, the shortest distance by sea was calculated.

3. RESULTS

3.1 Striped marlin

The number of striped marlin reported as tagged and released inside New Zealand fisheries waters in the 2006–07 season was 963, an increase on the 2005–06 season (922) and about the average of the previous 10 years (980) (see Table 1). A further 675 striped marlin were reported as landed in gamefish club records (Roz Nelson, N.Z. Big Game Fishing Council, pers. comm.). It is estimated that 59% of recreationally caught striped marlin were tagged and released in 2006–07. The number of striped marlin landed by fishers and not recorded in 2006–07 is not known.

The monthly totals of striped marlin tagged over the last six seasons are shown in Figure 2a. February was again the peak month for striped marlin releases, followed by March. The number of striped marlin tagged was lower in January than in the previous three years, due to lower catches overall during the early part of the season.

A summary of striped marlin tagged within Ministry of Fisheries statistical areas (Figure 2b) reveals few fish were tagged on the west coast of the North Island, especially from Cape Reinga down to Taranaki. The fishery around the King Bank and Middlesex Bank (Area 048) accounted for 33% of the striped marlin tagged in New Zealand in 2005–06, but the proportion decreased to 19% in 2006–07. These changes probably reflect a change in availability of striped marlin in these areas, rather than changes in fisher behaviour. Fishing was productive off east Northland, particularly between Whangaroa and Cape Rodney, where Area 003 provided 39% of the total (Figure 2b). The Bay of Plenty, which experienced a bumper year for marlin in 2004–05 (15% of the total), accounted for 10% of tagged striped marlin in 2006–07. Sixty-one striped marlin were tagged outside New Zealand fisheries waters, all of these at the Wanganella Banks, in the Tasman Sea.

Striped marlin estimated release weights for the last four seasons are plotted in Figure 3 and show a mode at 80 kg in 2006–07. The distribution of estimated weights is similar to that in 2005–06, except that a greater proportion of the fish were in the 90kg bin.

Long-distance recaptures for striped marlin show a wide spread of locations across the southwest Pacific Ocean and Tasman Sea (see Figure 2c). Fish tagged in the same season, even in the same month and area, have been observed to travel to completely different regions of the southwest Pacific after leaving New Zealand.

No striped marlin were recaptured during 2006–07. This is the first season since 1992 that no recaptures were made, although only one striped marlin was recaptured in 2005–06. The recapture rate of striped marlin by release year since 1993–94 is plotted in Figure 2d. The recapture rate was about 0.5% in the mid 1990s, increased in the late 1990s, and has declined since then.

3.2 Mako shark

The number of mako sharks tagged in New Zealand fisheries waters during the 2006–07 season was 150, which is 53% lower than the average number of makos tagged for the 10 previous seasons (see Table 1). According to NZBGFC records, 85% of all mako sharks caught by gamefish club members in 2006–07 were tagged and released. The number of makos released without being tagged is unknown.

Mako sharks are not generally a target species in northern New Zealand but are caught as a bycatch from vessels targeting billfish or tuna. In 2006–07 makos were tagged in the northern half of the North Island (Figure 4). The catch was distributed fairly evenly between the west coast of the North Island, east Northland, and the Bay of Plenty.

Most makos were tagged between January and June 2007 with a strong mode in February, when twice as many makos were tagged as in any other month (Figure 5a). The size distribution of makos tagged in 2006–07 shows that most were estimated to be 90 kg or less, with a mode at 10 kg (Figure 5b). A higher proportion of small mako sharks was tagged in 2006–07 than in recent seasons. A few large makos between 200 and 320 kg were also tagged.

Gamefish tags last quite well in mako sharks. There have been numerous long distance and long duration recapture reports from the southwest Pacific. The longest distance recorded was about 3000 nautical miles from New Zealand to the Marquesas Islands and the longest confirmed duration for a mako has been 2384

days (6 years 6 months). Recaptures of makos outside New Zealand fisheries waters show clusters of recaptures around Fiji, New Caledonia, Queensland, and New South Wales (Figure 5c). To a large extent this may reflect the distribution of fishing effort and the likelihood of reporting.

There were no tagged mako recaptures reported in 2006–07, the first time since the first recapture in this programme in 1976–77. This is another species with a recapture rate that appears to be declining. Over all seasons, the recapture rate for mako sharks in this programme is 2.8%.

3.3 Blue shark

There were 156 blue sharks tagged in New Zealand fisheries waters during the 2006–07 season. This is the most tagged in the last 5 years (see Table 1). The average for the previous 10 years for this species is 222 per season. Seventy-five blue sharks were tagged off Otago Heads, predominantly in February (Figures 6 and 7a). There were two other notable areas, Kaikoura (32) and Castle Point (17) where blue sharks were tagged in February. The estimated weight of tagged blue sharks in the 2006–07 had a mode at 30 kg and there were some larger sharks also tagged, unlike the previous season (Figure 7b).

One-third of blue shark recaptures have been recorded from outside New Zealand waters. In some respects, the recapture locations are similar to those reported for striped marlin and mako sharks – Australia, New Caledonia, Fiji, Tonga, French Polynesia (Figure 7c). This may reflect fishing effort in the southwest Pacific, and/or variable tag reporting, rather than distribution of the species. However, there have also been two other more extensive movements. One shark travelled to the Indian Ocean (40° 21' S, 109° 20' E), a minimum travel distance of 3100 nautical miles from Tutukaka, east Northland, in 206 days and the other travelled 4630 nautical miles east, almost to Chile (31°16' S 85°10' W) in 624 days.

The distribution of tagged blue shark recaptures plotted as distance travelled against days at liberty shows a group of 12 recaptures close to their release points in the first month after release, then another group of 5 recaptures close to the release points after one year (Figure 7d). As with mako sharks, there is also a band of recaptures between 1200 and 1800 nautical miles for fish at liberty from 3 months to 3 years.

In the 2006–07 fishing season two blue sharks were recaptured close to their release locations. The first was tagged at Tangimoana in late January 2007 and recaptured in the same area in mid February 2007 on an amateur fisher's longline. The second recapture was also on the west coast of the North Island. A blue shark tagged off Raglan in early January 2007 was recaptured in mid February 2007. This fish had been at liberty for 40 days and was recaptured by an amateur fisher 40 nautical miles to the south. Overall, the recapture rate for blue sharks on the programme is 1.4% (Table 3).

3.4 Kingfish

The number of kingfish tagged and released in New Zealand fisheries waters during 2006–07 was 961, slightly less than the number tagged in 2005–06 (see Table 1). As in previous years large numbers of kingfish were tagged during January and February, but in 2006–07 tagging effort was steady at more than 60 per month from November until June (Figure 8a). The distribution of tagging effort (see Figure 8b) in 2006–07 was similar to last season with 180 kingfish tagged on the west coast of the North Island in the fisheries Statistical Area 042 and about 200 fish tagged in the far north (Statistical Areas 047 and 048). There were about 100 fewer kingfish tagged at White Island and the rest of Statistical Area 010, while there were 107 more kingfish tagged in Statistical Area 011, mainly on the Ranfurly Banks.

Seventy-two percent of tagged kingfish were measured on release in 2006–07, up from 65% in the previous season. Kingfish size distribution is presented as length frequency. Where length at release was not supplied by anglers, it was calculated from the estimated weight, as described in the methods section.

The size of kingfish tagged ranged from 40 to 150 cm with a mode of fish between 100 and 110 cm (Figure 8c). In 2005–06, most kingfish tagged were between 65 and 115 cm. Most of the larger fish in 2006–07 were tagged at White Island, Ranfurly Banks or in the Three Kings area.

Thirty-eight kingfish recaptures were reported in 2006–07 (Table 3). These fish ranged from 69 to 130 cm in length. Time at liberty ranged from 2 to 2540 days (nearly 7 years) and displacement ranged from 0 to 90 nautical miles.

Eighteen recaptures were reported from Statistical Area 010, all of them at White Island or the adjacent reefs. Four of these recaptures were of the same 117 cm kingfish over a period of 32 days. This fish was tagged near the Volker Rocks on 14 November 2006 and was described as very lean. Ten days later it was caught and released with the tag intact at Laisons Reef, about 2 miles south of the Volkners. It was recaptured and released on 3 December and again on 6 December at the same location. On 16 December its luck ran out and it was kept by an angler fishing at White Island. All of the other recaptures made near White Island were from fish that had moved 4 nautical miles or less, and were caught after periods at liberty from 7 to 1113 days.

A few recaptured kingfish were caught some distance from where they were released. Most of these were relatively small. A 91 cm fish tagged in February 2006 off Tokomaru Bay was recaptured by a commercial fisher a year later at East Cape, a distance of 20 nautical miles. A 74 cm kingfish tagged in February 2006 in Hawke Bay was recaptured in a commercial trawl net near Cape Turnagain, Wairarapa in October 2006. It had travelled a minimum distance of 40 nautical miles south. A third fish tagged in February 2006 off Sumner, Canterbury, was recaptured 12 miles south of Kaikoura, a displacement of 56 nautical miles north 447 days later. This was a 69 cm fish on release and was estimated to be 85 cm on recapture in May 2007. This is the most southern kingfish recapture in the programme to date. The longest distance movement reported for a kingfish in 2006–07 was 90 nautical miles for a 73.5 cm fish tagged at Gannet Island, on the west coast off Waikato, in January 2004. It measured 96 cm on recapture in December 2006 when taken by a trawler off the Kaipara Harbour and had been at liberty for 1060 days (2 years 11 months). It grew 22.5 cm and about 4 kg during this time.

Good information on kingfish growth has come from a long-term recapture of a kingfish from the Rangatira Knoll, Bay of Plenty. A measuring board was used to measure this fish on release and recapture on Rick Pollock's charter boat *Pursuit*. The fish was tagged in mid February 2000 and measured 70 cm, with an estimated weight of 5 kg. It was recaptured in the same area on 28 January 2007 and measured 110 cm in length and was estimated to weigh 19 kg. The fish was described as fat and it was released again with the tag intact. Therefore it was at liberty for 2540 days (nearly 7 years) and grew 40 cm in length and an estimated 14 kg in weight during this time. Overall, the recapture rate for kingfish is 7.7% for this programme.

3.5 Yellowfin tuna

Only eight yellowfin tuna were reported as tagged in the 2006–07 season, mostly off east Northland. Yellowfin were scarce throughout the fishery during 2006–07, and only 282 were landed in total by NZBGFC-affiliated clubs. In past seasons, significant numbers of yellowfin have been tagged only when the fish were abundant.

There was one recapture of a yellowfin tuna in 2006–07. This 40 kg fish was tagged at North Cape in February 2006. It was recaptured by a tuna longliner near the Barrier Bank (30 nautical miles north-east of

Great Barrier Island) 155 nautical miles from the release location on 18 April 2007. It weighed 48 kg gilled and gutted (about 55kg green weight) and had been at liberty for 424 days. Long distance recaptures of yellowfin tuna are shown in Figure 9. Overall, the recapture rate for yellowfin tuna is 1.1% for this programme.

3.6 Other billfish

More blue marlin have been tagged in New Zealand waters in 2006–07 than in the previous season. Twenty-six were tagged, mostly in the Three Kings area and east Northland. There were also 36 tagged in the Kingdom of Tonga (see Tables 1 and 2). Most blue marlin were tagged between August and October in the Pacific Islands while in New Zealand they were tagged between February and April (Figure 10a). The fish tagged in Tonga were generally estimated at 150 kg or less. Many of the fish were much smaller, between 60 kg and 110 kg. In New Zealand waters, blue marlin were mainly estimated at 140 kg or more in 2006–07 (Figure 10b).

One blue marlin recapture was reported this season. This was an estimated 160 kg fish tagged off Vava'u in March 2006. It was recaptured by a commercial tuna longliner on 21 December 2006 about 100 nautical miles southwest from where it was released. This was at liberty for 265 days and measured 251 cm, equivalent to 160 kg.

The overall recapture rate of blue marlin is now 0.9% for this programme (Table 3). There were 16 swordfish, 2 black marlin and 14 shortbill spearfish tagged in New Zealand fisheries waters in 2006–07, but no recaptures of these species.

3.7 Other species

Each year, anglers tag and release a small variety of species that are not considered to be mainstream parts of the programme. Most of these are sharks, including school shark, hammerhead shark, thresher shark, and bronze whaler. The number of “other sharks” tagged in 2006–07 was 61, comparable to the previous five years. One bronze whaler (*Carcharinus brachyurus*) was recaptured in the 2006–07 season. Unfortunately, there was no matching release information handed in for this tagged fish which was caught at Rangiputa, Northland, on 12 May 2007 and weighed 160 kg.

Just 14 tag cards for Pacific bluefin tuna have been handed in for the 2006–07 season from the west coast. Anecdotal information suggests that more were tagged and released but the cards have not been handed in. Eight Pacific bluefin were tagged with pop-up satellite archival tags in August 2006. Only four of these reported, two in the Tasman Sea west of the North Island and two in the Pacific Ocean east of the South Island.

3.8 General

Overall, 4978 gamefish dart tags with stainless steel anchors were issued to clubs and individuals by the NZBGFC in the 2006–07 season. Also issued to skippers participating in the billfish logbook programme were 285 of the Hallprint PIMA tags with the nylon anchors. In 2006–07, 184 of these new tags were used, a similar number to the previous season. As yet, no recaptures have been reported for this tag type. The overall number of tags issued and number used in each region in 2006–07 is given in Figure 11. The selection of regions is based on the commonly fished gamefish areas. For all species, 2377 tag report cards had been handed in for fish tagged in 2006–07.

4. DISCUSSION

The striped marlin fishery in northern New Zealand started slowly in 2006–07. Fishers did not start catching fish until late January, but February and March were good months, especially in East Northland and Bay of Plenty. The striped marlin catch on the North Island west coast was well down on previous seasons. The fishing on the banks north of the Three Kings Islands for striped marlin was average in February and March, but did not pick up late in the season as it often does. Instead there were reasonable numbers of marlin caught and tagged off East Northland through to the end of May. The tagging percentage of 59% in New Zealand fisheries waters was at the lower end of the range from recent years. However, this is highly influenced by the charter and private vessels that fish the Three Kings, where almost all of the striped marlin are tagged because of the distance from the nearest port. A new vessel fished the Wanganella Banks and tagged 61 striped marlin over four days in mid-April 2007. These fish were caught in international waters and are not included in the tallies above for New Zealand. Overall, the number of striped marlin tagged in 2006–07 was slightly up on the previous year, and just under the ten year mean.

The number of tags returned from striped marlin has varied between one and five per year over the last ten years, with the notable exception of 1997–98 and 1998–99, in which twelve and fourteen returns were made, respectively. No other years have approached these totals. No tagged striped marlin were recaptured, or at least reported, in 2006–07. The reasons for the low recapture rate are unclear. Tag shedding has been proposed as one reason, and the trial of nylon-headed tags is a response to this. This type of tag head has been shown to improve tag return rates in recreational fisheries for blue marlin and sailfish (Ortiz et al. 2003). The return of recovered tags may not be a high priority for some commercial fishers, although New Zealand vessels have a good record of returning tags from various species. Variations in commercial fishing effort outside the New Zealand EEZ may also result in more or fewer tagged fish from New Zealand being recaptured and reported in different years.

The weight distribution of striped marlin in 2006–07 was similar to that of 2005–06, with a mode at 80 kg, and a relatively long tail of frequencies up to 150 kg. Ageing studies are currently underway. Spines from the dorsal and anal fin and otoliths have been collected from fish in New Zealand which weighed between 48 and 152 kg. These fish ranged from 206 cm to 256 cm in length measured from the tip of the lower jaw to the fork in the centre of the tail. The large average size of New Zealand fish may assist in describing the upper range of age and the growth curve. Usually, only sexually mature fish are encountered in the New Zealand catch.

A striped marlin stock assessment has been undertaken and presented to the WCPFC for the southwest Pacific. The results are still preliminary but the Scientific Committee is recommending that there should be no increase in fishing mortality (i.e., fishing effort) on striped marlin in the southwestern Pacific as a precautionary measure. This recommendation applies particularly to the Coral Sea and Tasman Sea as these areas account for most of the striped marlin catch in the region.

The number of mako sharks tagged and released in 2006–07 was the lowest since 1985–86, and remained well below the 10 year average. Anglers again reported very few sightings of mako sharks, particularly in the areas off the northeast of the North Island, where they were formerly common. There is very little target fishing for sharks by Northland and Bay of Plenty anglers, but the majority of recreationally-caught mako sharks have historically been taken in these regions. Almost all mako sharks are taken accidentally on lures being trolled for tuna or billfish. Since catch levels have been far higher in previous years and have consistently dropped in recent years, it is reasonable to assume that there is a decrease in the number of mako sharks being encountered by recreational fishers. The reason for this is open to speculation, although many recreational fishers believe catch in the domestic tuna longline fishery has caused the decline. The number of recaptures is also low, probably as a result of fewer fish being tagged and released.

Mako recaptures peaked in 1995–96 and 1996–97, coinciding with seasons in which record numbers of mako sharks were tagged.

The number of blue sharks tagged increased for the first time in four years. The mode of estimated weight of tagged blue sharks is just 30 kg, the lowest yet recorded in this programme. The number tagged is dominated by the fishery off Otago Heads during February, when blue sharks are targeted during a national game fishing contest, although this year fishers have also targeted them off Kaikoura.

The Scientific Committee of the WCPFC supported dedicated shark research programmes, especially for species that rank highly in the Ecological Risk Assessment. New Zealand is developing its own National Plan of Action for sharks that will help identify species at risk in New Zealand waters. A large proportion of the recreational shark catch is now tagged and released, which should assist in the research and conservation of these species.

Good numbers of kingfish continue to be tagged off Raglan, on the North Island west coast, but only one recapture was reported in 2006–07. In the 2005–06 season, six fish were recaptured. It was interesting to see a return from the sixteen kingfish tagged off Canterbury in February 2006. Recreational anglers report small numbers of kingfish off the South Island east coast in summer, but it is likely that these are seasonal visitors in warm years. The fish was recaptured off the Kaikoura coast 56 nautical miles north in May the following year, the southernmost tag return for a new Zealand kingfish.

There have been sufficient data collected from long-distance recaptures to discuss the dispersion of four fish species from New Zealand, and with which countries we share these highly migratory species. In the southwestern Pacific Ocean, mako, blue shark, and striped marlin are mostly taken as a bycatch on surface longline vessels targeting bigeye, yellowfin, and albacore tuna. These vessels are the main source of tag returns from outside the New Zealand fisheries waters (200 nautical mile EEZ). Ninety-six mako sharks have been recaptured outside New Zealand waters and 50 of these have been reported from Fiji. Most of the rest of the reported mako recaptures come from New Caledonia, Australia, and the Tasman Sea, west of New Zealand. Blue shark recaptures come from similar areas to the north and northwest of New Zealand, but of 22 offshore recaptures 4 have travelled northeast or east. One blue shark was captured close to South America, and one was recaptured southwest of Perth, West Australia, indicating a broader distribution than shown by New Zealand tagged makos. Striped marlin also seem to fan out into the subtropical southwest Pacific in what appear to be three main directions: northwest to the north Tasman Sea; north to Fiji, Tonga, and Samoa; and northeast to French Polynesia. Although there have been only eight long distance yellowfin tuna recaptures, four of these have come from international waters in the mid Tasman Sea northwest of New Zealand, an area fished by vessels from Australia, Japan, and Chinese Taipei in recent years (Western and Central Pacific Fisheries Commission 2005). Also fishing in the waters of the island nations in the southwest Pacific are vessels from China, Korea, the Philippines, and Spain, as well as domestic fleets mainly out of New Caledonia, Vanuatu, Fiji, Tonga, Cook Islands, Samoa, American Samoa, and French Polynesia.

5. ACKNOWLEDGMENTS

Thanks to all those who participated in this programme by releasing or reporting tagged fish. The New Zealand Big Game Fishing Council and all affiliated clubs are thanked for their cooperation and the purchase and distribution of tags. The Ministry of Fisheries provided funding for this project, “Management of data from the gamefish tag recapture programme” TAG2006/01.

6. REFERENCES

- Hartill, B.; Davies, N.M. (1999). New Zealand billfish and gamefish tagging, 1997–98. *NIWA Technical Report 57*. 39 p.
- Hartill, B.; Davies, N.M. (2000). New Zealand billfish and gamefish tagging, 1998–99. *NIWA Technical Report 79*. 30 p.
- Hartill, B.; Davies, N.M. (2001). New Zealand billfish and gamefish tagging, 1999–2000. *NIWA Technical Report 106*. 29 p.
- Holdsworth, J.; Saul, P. (2003). New Zealand billfish and gamefish tagging, 2001–02. *New Zealand Fisheries Assessment Report 2003/15*. 39 p.
- Ortiz, M.; Prince, E.; Serafy, J.; Holts, D.; Davy, K.; Pepperell, J.; Lowery, M.; Holdsworth, J. (2003). A global overview of the major constituent-based billfish tagging programs and their results since 1954. *Marine and Freshwater Research* 54: 489–508.
- Pepperell, J. G. (1990). Australian cooperative gamefish tagging programme, 1971–1986. In: Parker et al. (eds), Fish-marking techniques. *American Fisheries Society Symposium* 7: 765–774.
- Saul, P.; Holdsworth, J. (1992). Cooperative gamefish tagging in New Zealand waters, 1975–90. *New Zealand Fisheries Technical Report No. 33*. 24 p.
- Walsh, C.; McKenzie, J.; McGregor G.; Poortenaar, C.; Hartill, B.; Smith, M. (2003). Information available for the management of New Zealand kingfish (*Seriola lalandi lalandi*) stocks. *New Zealand Fisheries Assessment Report 2003/25*. 57 p.
- Western and Central Pacific Fisheries Commission (2005). Tuna Fishery Yearbook 2004. Lawson, T.A. (ed). Secretariat of the Pacific Community, Noumea.

Table 1: Number of fish tagged and released by species and season, and the mean number of releases for the 10 seasons previous to 2006–07, for fish tagged inside the New Zealand EEZ only.

Season	BEM	BKM	BWS	KIN	MAK	SHA	SSF	STM	SWO	TOR	YFN	OSP	Total
1974–75			1		9								10
1975–76				1	17	2		3			1		24
1976–77			1	1	34			2					38
1977–78				15	58			7					80
1978–79			1	107	152	1		18				5	284
1979–80			26	22	129	3		17					197
1980–81		1	7	7	116	2		2				7	142
1981–82			99	30	185	3		11				17	345
1982–83			18	55	151	4		6			2	11	247
1983–84			15	54	220	7		9			6	9	320
1984–85			10	143	98	4					25	2	282
1985–86			23	318	211	1		2			6	4	565
1986–87			12	365	177	31		2			5	18	610
1987–88	1	1	91	689	505	47		97	6		13	82	1 532
1988–89	1		122	371	370	32		371	4		63	116	1 450
1989–90	1	2	87	427	424	26	2	365	4		139	100	1 577
1990–91			90	528	417	32	7	229	5		24	51	1 383
1991–92	1	1	128	389	353	40	1	239	20		39	38	1 249
1992–93	1		64	692	352	24	8	383	36		10	75	1 645
1993–94	10		162	1 100	666	19	17	928	3		92	38	3 035
1994–95	4		175	1 443	1 529	23	29	1 202	10		200	24	4 639
1995–96	7	3	163	643	1 158	30	13	1 102	3		110	5	3 237
1996–97	6	5	343	416	920	36	5	1 301	4		33	9	3 078
1997–98	8	1	724	364	518	54	1	895			3	4	2 572
1998–99	36	1	276	311	754	40	6	1 541	2		17	8	2 992
1999–00	51	2	314	818	398	56	2	787	2		27	40	2 497
2000–01	34		203	606	277	72	1	851	6		17	4	2 071
2001–02	21	2	163	778	346	69	13	771	3		7	3	2 176
2002–03	6	1	78	646	155	54	14	671	3		76	2	1 706
2003–04	8		106	771	188	64	8	1 051	2		184	6	2 388
2004–05	29	5	101	806	241	61	7	1 345	6		81		2 682
2005–06	17	2	95	1 016	193	76	11	922	5	7	5	4	2 353
2006–07	26	2	156	961	150	61	14	963	16	14	8	6	2 377
Total	268	29	3 854	14 893	11 471	974	159	16 093	140	21	1 193	688	49 783
Previous 10 year mean	24	2	222	708	322	61	8	980	5		43	8	2 381

BEM	blue marlin	SSF	shortbill spearfish
BKM	black marlin	STM	striped marlin
BWS	blue shark	SWO	broadbill swordfish
KIN	kingfish	TOR	Pacific bluefin
MAK	mako shark	YFN	yellowfin tuna
SHA	other shark species	OSP	all other species

Table 2: Number of fish tagged and released by species and season, in the New Zealand gamefish tagging database, for fish caught outside the New Zealand EEZ.

Season	BEM	BKM	BWS	KIN	MAK	SHA	SAI	SSF	STM	SWO	YFN	OSP	Total
1974-75													
1975-76													
1976-77													
1977-78													
1978-79													
1979-80													
1980-81													
1981-82													
1982-83													
1983-84													
1984-85													
1985-86											2	2	4
1986-87											2	4	6
1987-88													
1988-89													
1989-90	6	2						1			1		10
1990-91		2					4						6
1991-92	4	1							2				7
1992-93	10	1		1			5	1	3		3	5	29
1993-94	10	2			1		5		1		12	3	34
1994-95	25	4		1	2		9		4		15	4	64
1995-96	39	3					4	2	2			7	57
1996-97	20						4		1				25
1997-98	16	4					6		3				29
1998-99	7	1					2				2		12
1999-00	13	1					11	1	4				30
2000-01	37	1					8						46
2001-02	48	1					11		1				61
2002-03	53						15	2	6				76
2003-04	78	18		1	1		15	4	308		12	1	438
2004-05	69	3			1		6	3	9		4		95
2005-06	43						7	1	68			6	125
2006-07	36						10	3	61	1		2	113
Total	514	44		3	5		122	18	473	1	53	34	1 267

BEM blue marlin
 BKM black marlin
 BWS blue shark
 KIN kingfish
 MAK mako shark
 SHA other shark species

SAI sailfish
 SSF shortbill spearfish
 STM striped marlin
 SWO broadbill swordfish
 YFN yellowfin tuna
 OSP all other species

Table 3: Number of fish recaptured by species and season. Total and recapture rate by species.

Season	BEM	BKM	BWS	KIN	MAK	SHA	SAI	SSF	STM	SWO	YFN	OSP	Total
1976-77				1	2								3
1977-78					3								3
1978-79				7	6								13
1979-80				3	3							1	7
1980-81				2	3								5
1981-82				2	8								10
1982-83			1	11	5								17
1983-84				9	1								10
1984-85				10	7								17
1985-86				56	10								66
1986-87				92	9	4							105
1987-88				77	8	1						3	89
1988-89			2	91	13	1			1			3	111
1989-90			-	45	10	6			2			-	63
1990-91			3	37	7	3			1		1	1	53
1991-92			3	31	12	1			-		-	3	50
1992-93			2	43	3	2			3		-	-	53
1993-94			1	54	10	5			4		1	-	75
1994-95			2	86	16				6		-	1	111
1995-96		1	1	71	32	1			6		3	1	116
1996-97		-	4	52	35	2			5		1	1	100
1997-98	1	-	9	26	17	2			12		1	1	69
1998-99	-	-	10	20	15	4			14		-	-	63
1999-00	1	-	11	57	23	5			5		-	2	104
2000-01	1	-	4	29	15	3			2		1	1	56
2001-02	-	-	3	48	16	1			2	1	-	-	71
2002-03	2	-	-	27	9	2			2	-	-	1	43
2003-04	-	-	2	32	9	2			5	1	2	-	53
2004-05	-	-	2	38	6	1			4	-	2	-	53
2005-06	1	-	1	53	3	3			1	-	1	1	64
2006-07	1	-	2	38	-	1			-	-	1	-	43
Total	7	1	63	1 148	316	46	0	0	75	2	14	20	1 696
Releases	782	73	3 854	14 896	11 476	974		177	16 566	141	1 246	722	
Recapture rate (%)	0.9	1.4	1.6	7.7	2.8	4.7			0.5	1.4	1.1	2.8	

BEM blue marlin
 BKM black marlin
 BWS blue shark
 KIN kingfish
 MAK mako shark

SHA other shark species
 STM striped marlin
 SWO broadbill swordfish
 YFN yellowfin tuna
 OSP all other species

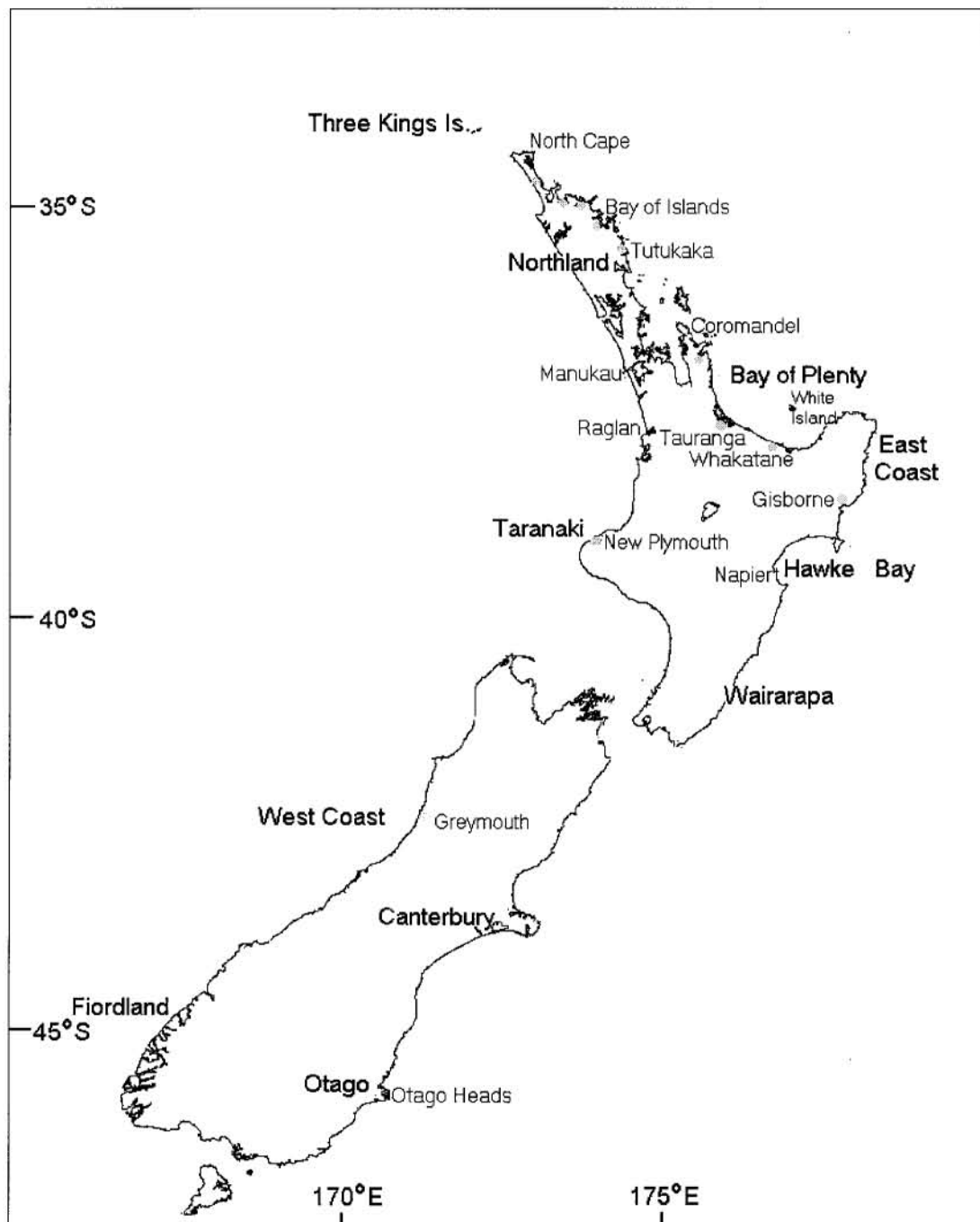


Figure 1: Location of the main areas of gamefish tagging in New Zealand.

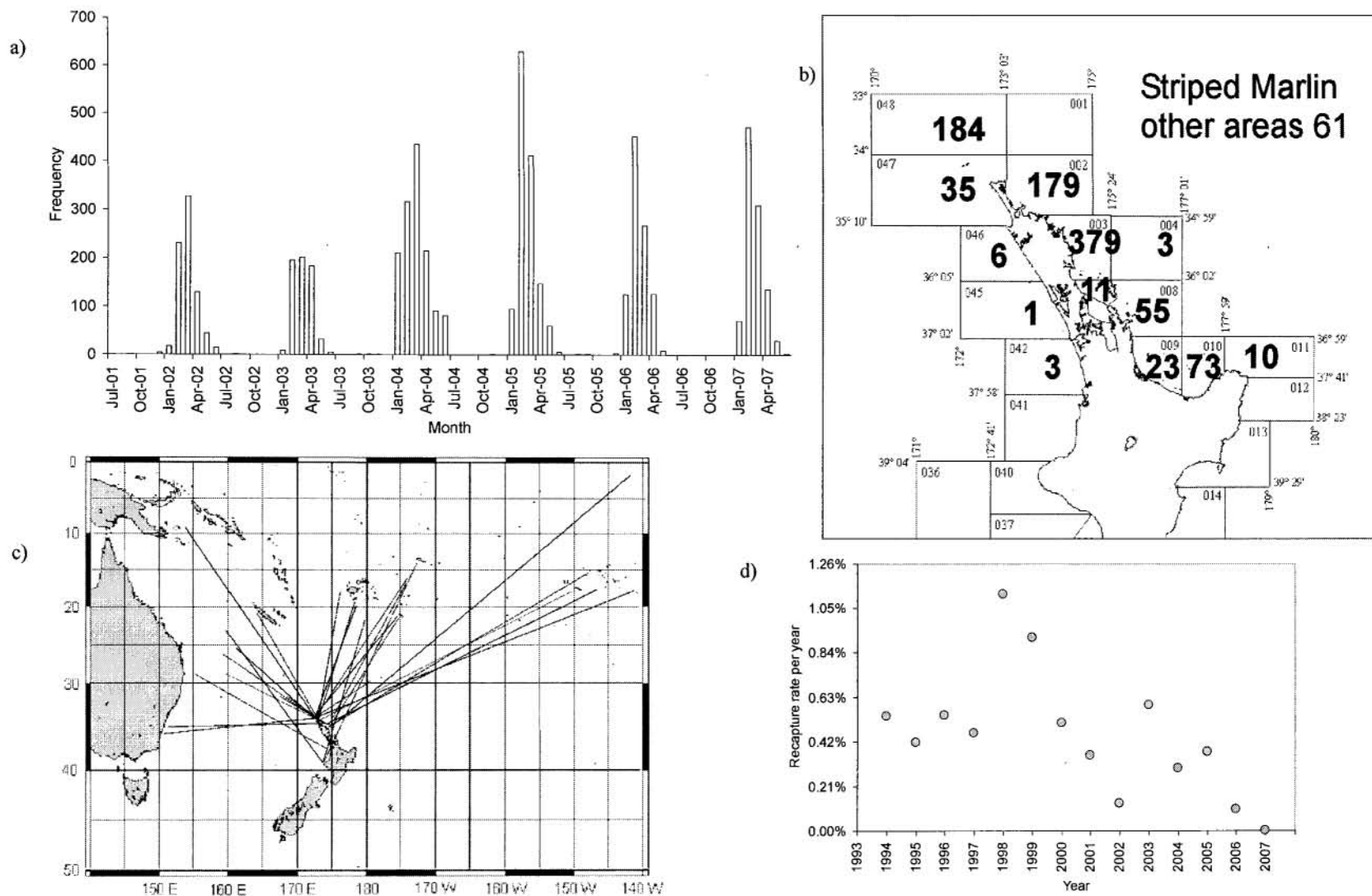


Figure 2: (a) Number of striped marlin released by month, 2002–07; (b) Numbers of striped marlin released by statistical reporting area in 2006–07; (c) Long distance movements of tagged striped marlin; (d) Striped marlin recapture rate by fishing year.

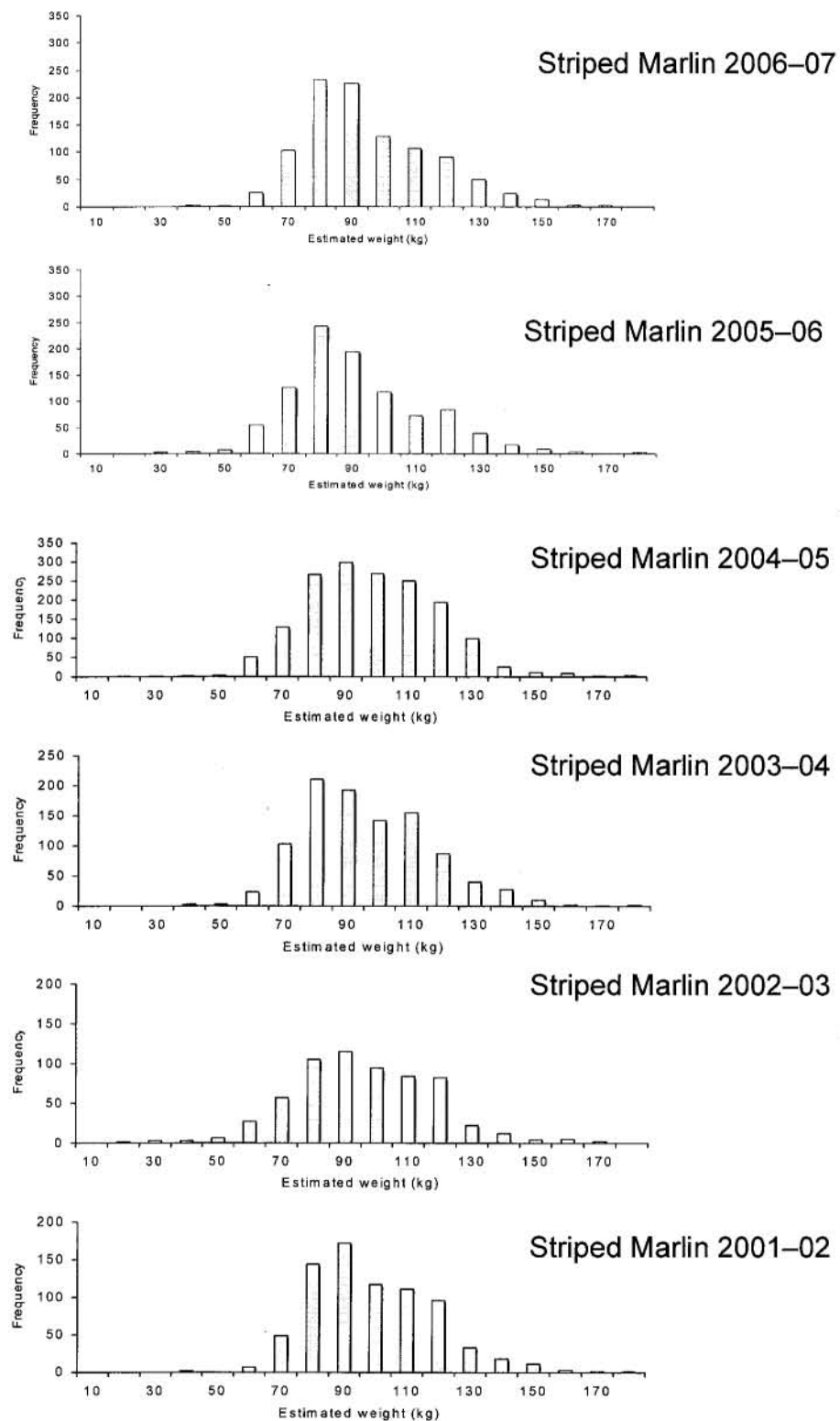


Figure 3: Striped marlin estimated release weights by season, 2001-02 to 2006-07. Note that y axis scales vary between years. See Table 1 for number of striped marlin tagged each year.

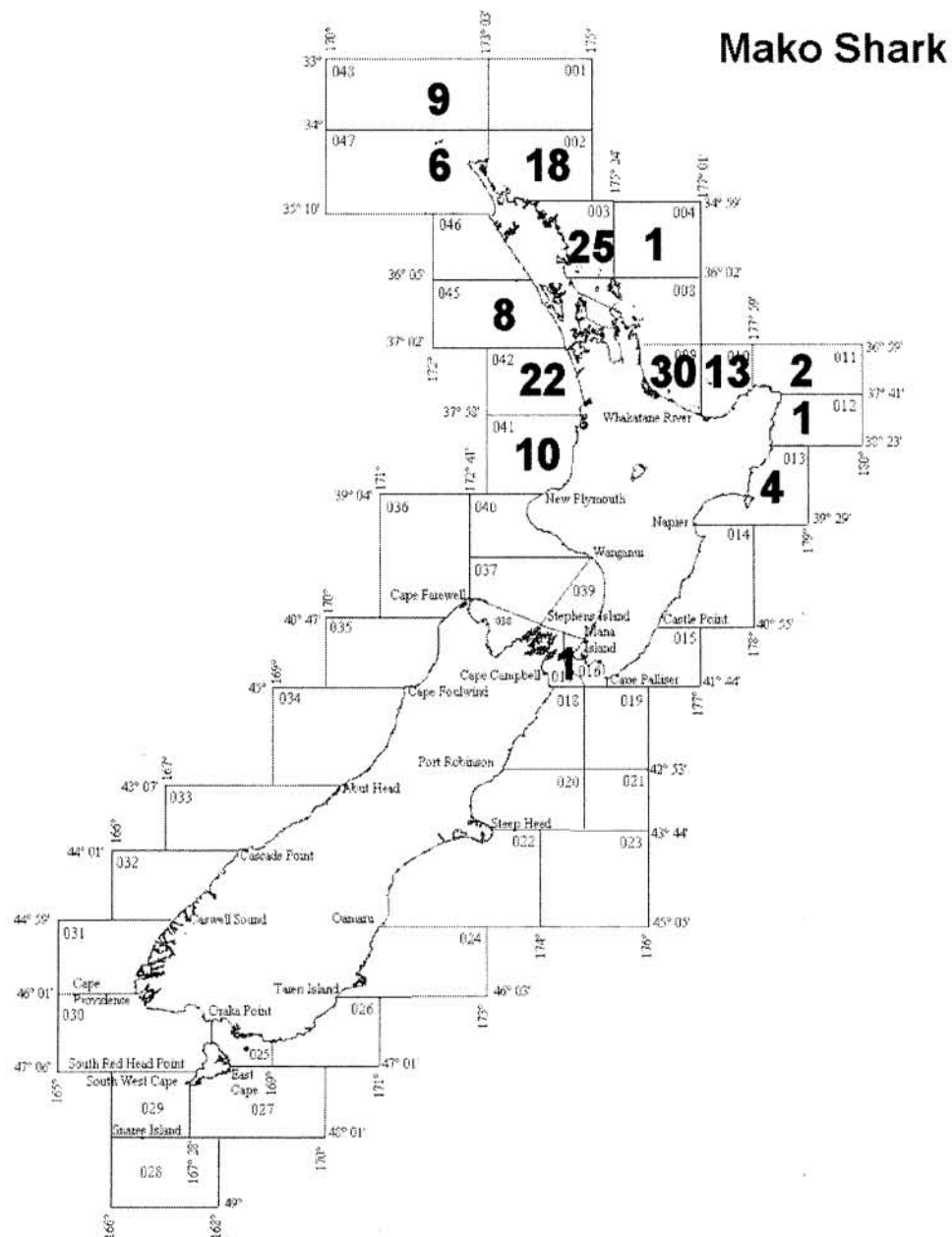


Figure 4: Mako sharks tagged and released by statistical reporting area in 2006–07.

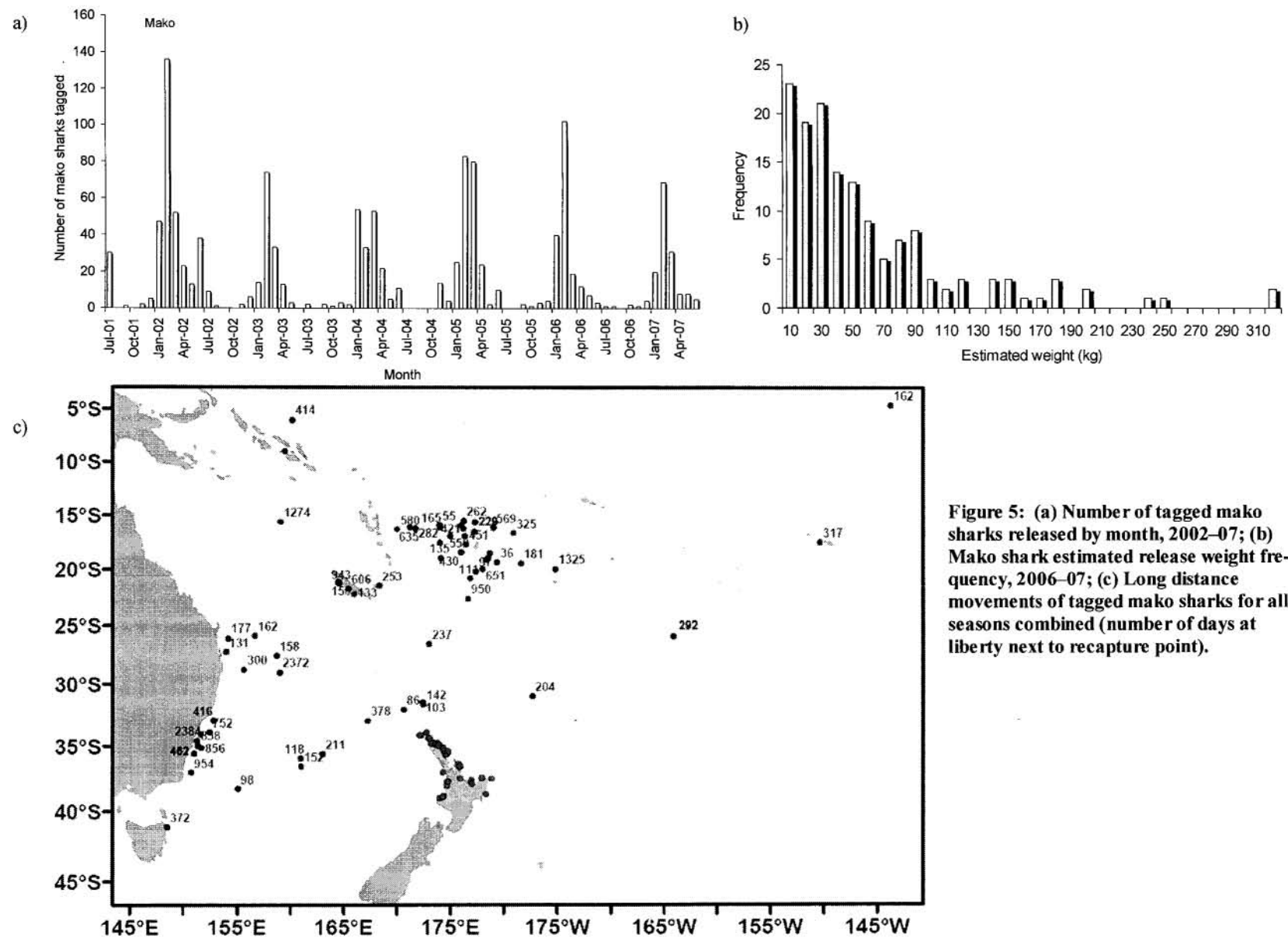


Figure 5: (a) Number of tagged mako sharks released by month, 2002–07; (b) Mako shark estimated release weight frequency, 2006–07; (c) Long distance movements of tagged mako sharks for all seasons combined (number of days at liberty next to recapture point).

Blue shark

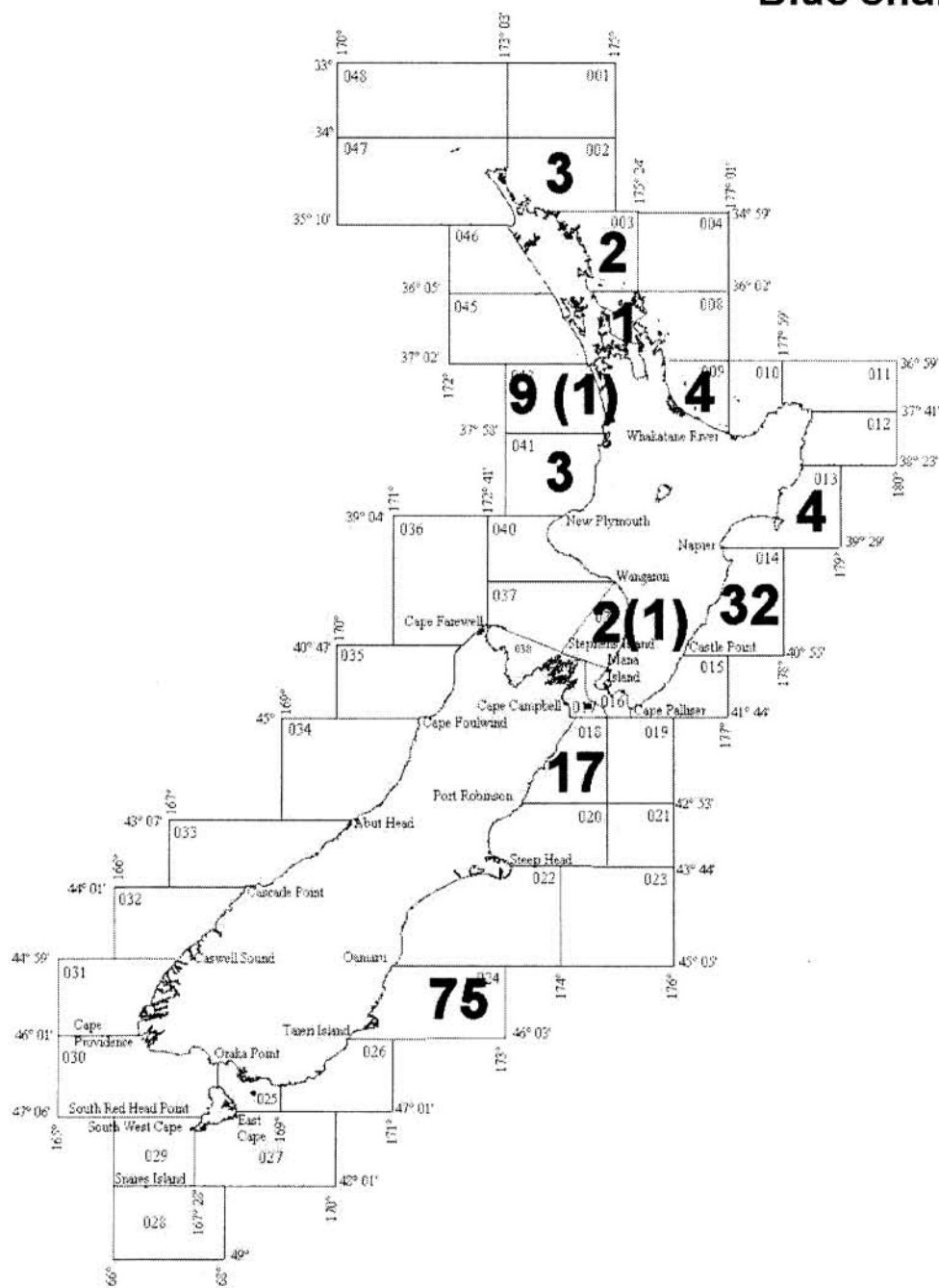


Figure 6: Blue sharks tagged and released by statistical reporting area in 2006–07. Numbers in parentheses are recaptured tags.

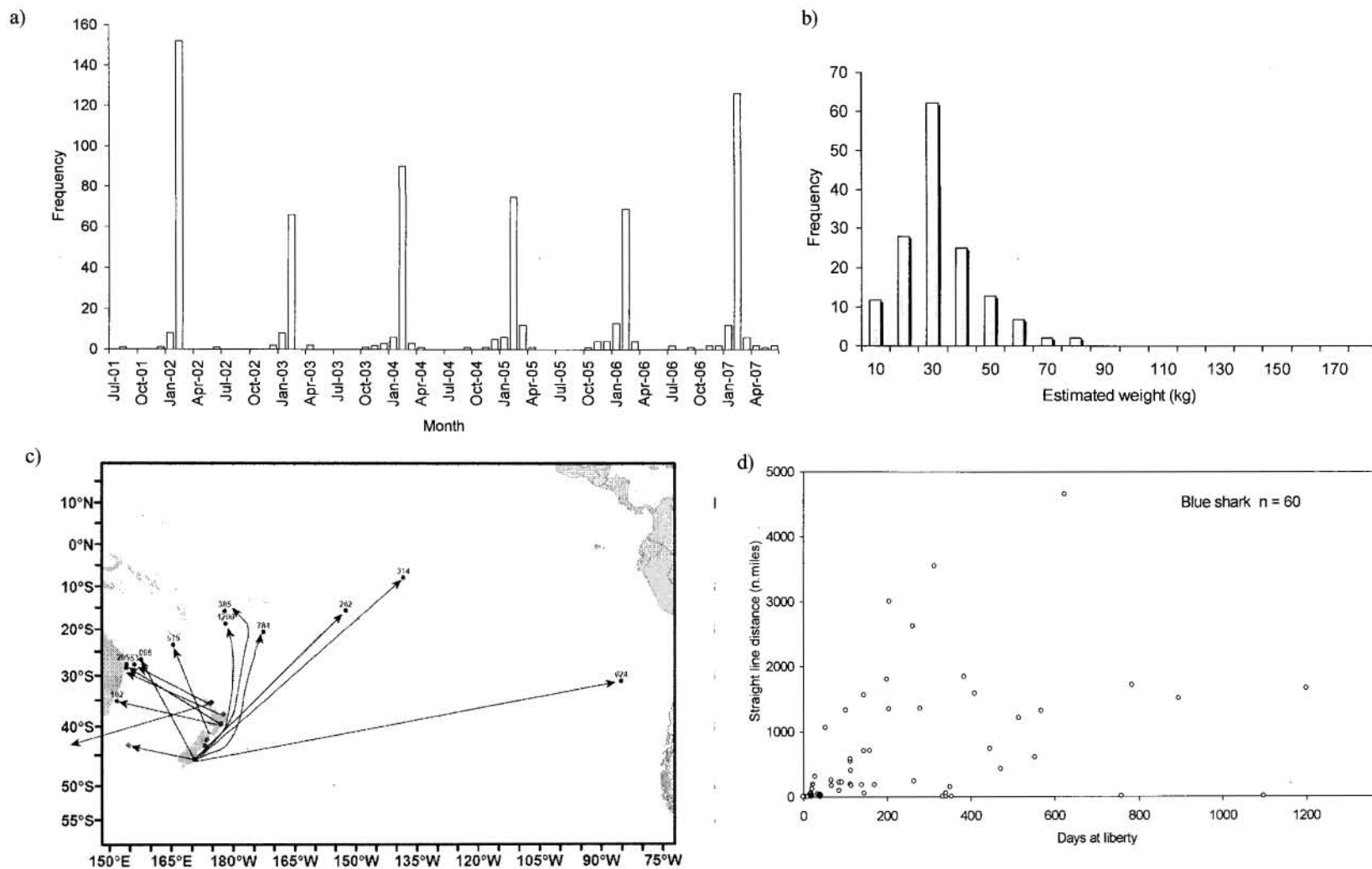


Figure 7: (a) Number of tagged blue sharks released by month, 2002–07; (b) Blue shark estimated release weight frequency 2006–07; (c) Long distance movements of tagged blue sharks all seasons (days at liberty at recapture point); (d) Blue shark days at liberty and straight line distance travelled, solid markers for 2006–07.

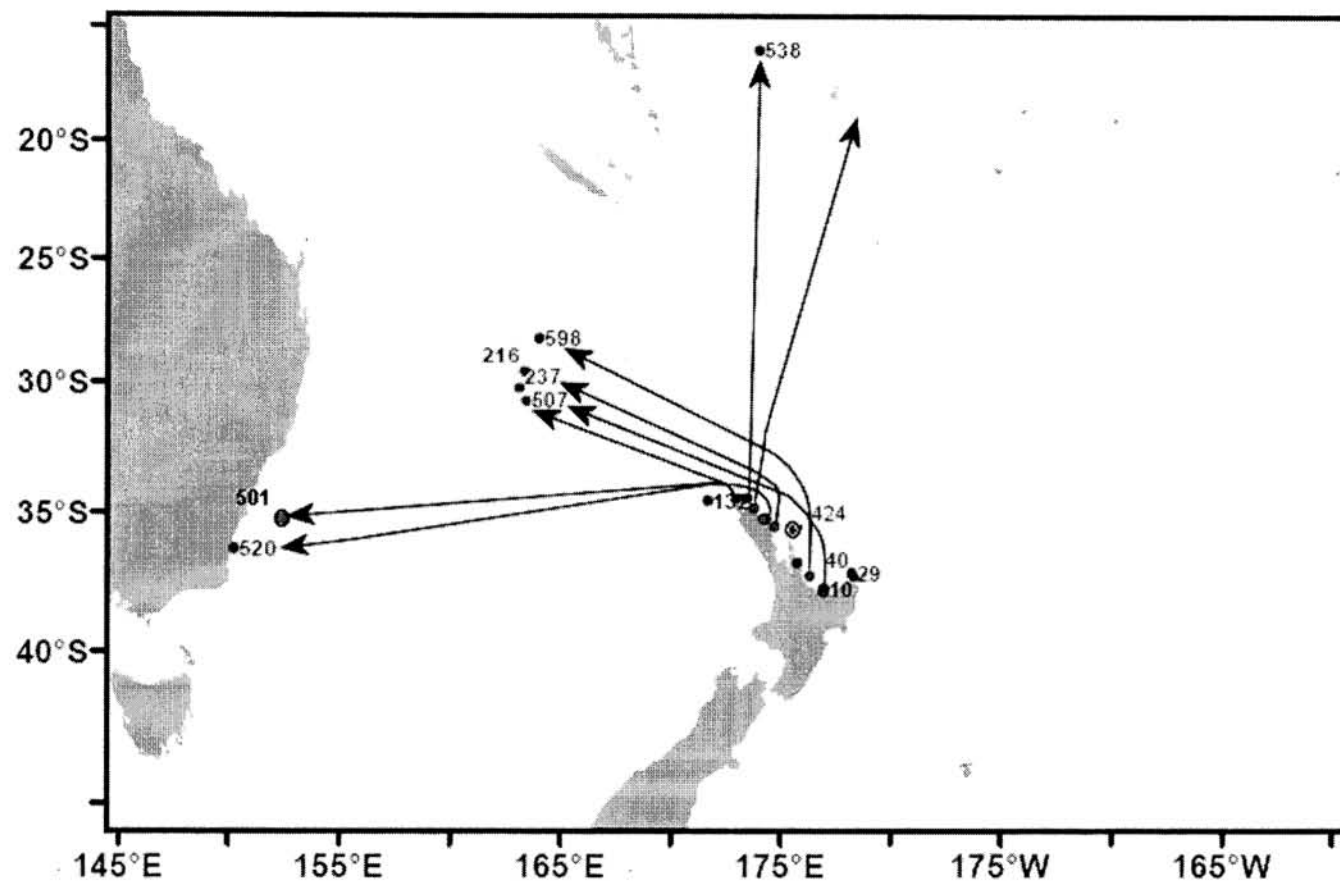


Figure 9: Yellowfin tuna recaptures with days at liberty near recapture point, all years combined.

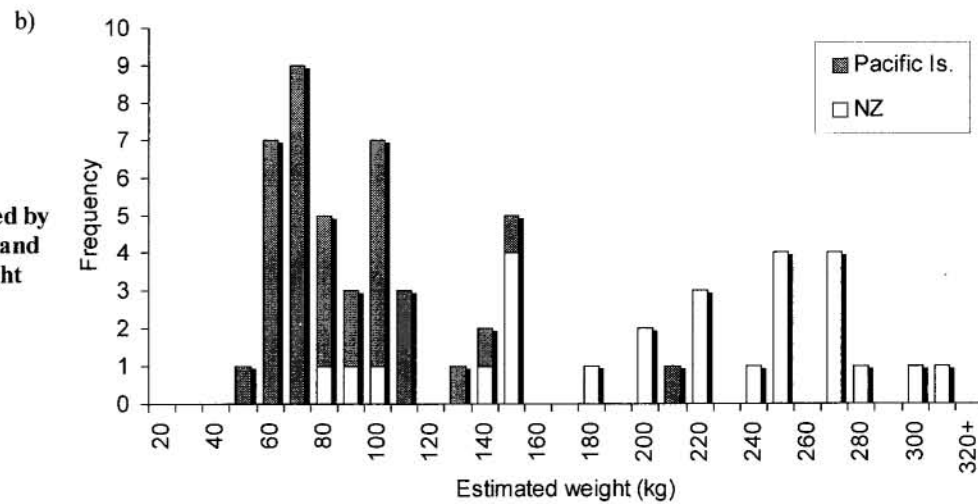
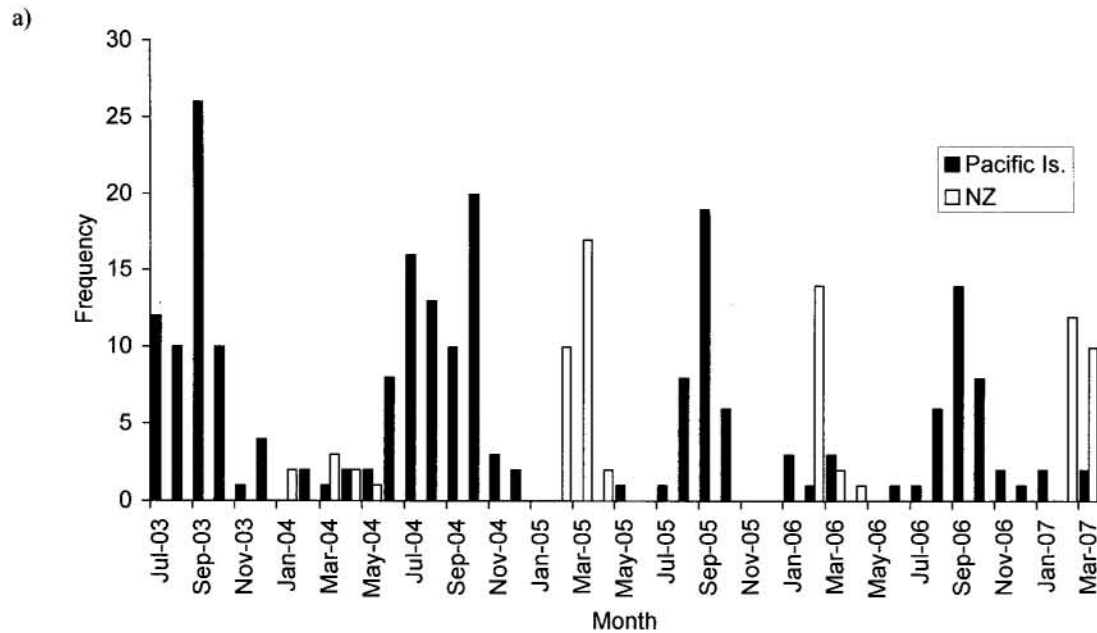


Figure 10: (a) Number of blue marlin tagged and released by month in Pacific Island waters (solid bars) and New Zealand waters (open bars) 2003–07; (b) Blue marlin release weight frequency in the 2006–07 season.

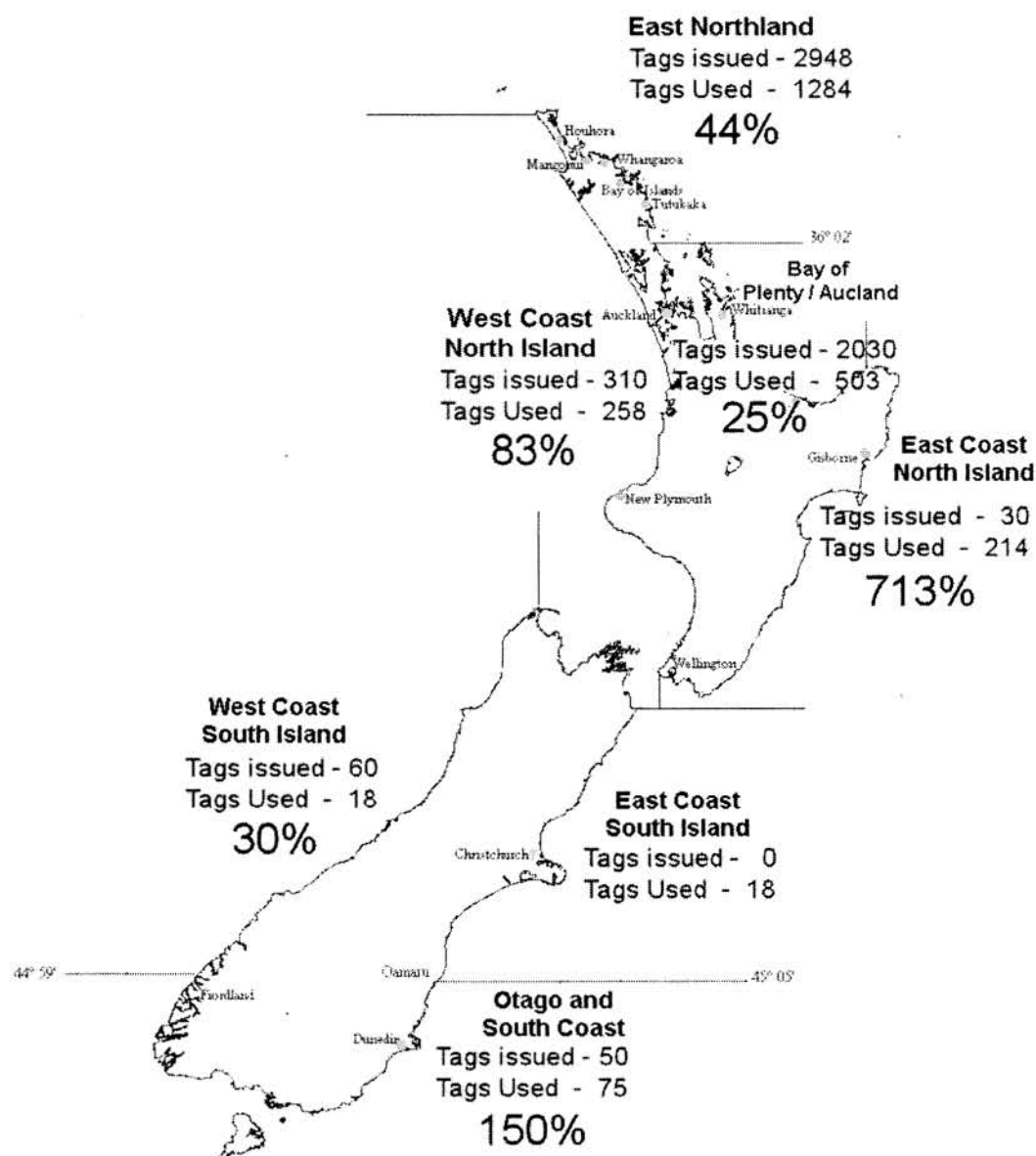


Figure 11: The number of tags issued to clubs and individuals and the number reported used by region for the 2006–07 season. The percentage of tags used can be influenced by the number of tags issued in previous seasons.