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PART 1: INFORMATION ON FISHERIES, RESEARCH, AND STATISTICS

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NEW ZEALAND

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Annual report
Part 1
Information on fisheries, statistics and research

Ministry of Fisheries
Po Box 101-103, Wellington, New Zealand

Scientific data was provided to the Commission in accordance with the decision relating to the provision of scientific data to the Commission by 30 April 2009	**YES**
If no, please indicate the reason(s) and intended actions:	

Abstract

Since 2002, skipjack (25244t in 2008), which is nearly all taken by purse seine, has comprised the greatest part of the New Zealand catch of all tuna species, both within and beyond New Zealand fisheries waters. Outside New Zealand fisheries waters, yellowfin (2897t) makes up most of the balance. Yellowfin are rarely part of the purse seine catch within New Zealand fisheries waters due to the domestic purse-seine fishery focussing on free schools of skipjack. The second most important component of New Zealand's domestic fisheries is albacore (3739t) which are taken mostly by troll gear, but are also landed as target and bycatch in the longline fishery. Despite the fact that the domestic longline fleet targets both bigeye and southern bluefin tuna and more recently swordfish, the greatest part of the catch consists of albacore. Over 150t of striped marlin are caught annually by the recreational fleet, with well over half the fish tagged and released. Most highly migratory species caught in New Zealand waters are exported and the destination of exports varies depending on the species.

New Zealand has four Class-6 purse seiners and a number of smaller vessels fishing offshore in the EEZs of Pacific Island States and in high seas areas of the equatorial western and central Pacific Ocean (WCPO). These vessels have also fished domestically along with six smaller capacity domestic-based purse seiners. The number of purse-seiners has declined from 11 vessels in 2005 to 10 vessels in 2008. The New Zealand longline tuna fleet consists of domestically owned and operated vessels (mostly between 15 to 25 m in length). The number of longline vessels operating in New Zealand has declined from 151 vessels in 2002 to 35 in 2008.

Blue shark is the most common non-tuna bycatch species in the longline fishery followed by Ray's Bream. Recent reductions in longline effort have resulted in reductions in catches of the major bycatch species.

New Zealand longline vessels fishing south of 30^{o}S are required to use tori lines to reduce catches of seabirds during the setting process. In addition, longline vessels fishing for tuna or swordfish in New Zealand fishery waters may only set their lines at night unless using line weighting. New Zealand longline vessels have been provided with turtle dehooking and mitigation equipment. As the purse seine fishery in New Zealand fishery waters is based on free schools of skipjack, bycatch is minimal (e.g. 1% by mass). No interactions with non-fish bycatch (e.g. seabirds, turtles, and marine mammals) were observed in the purse seine fishery.

New Zealand has an Observer Programme and two active domestic port sampling programmes. In 2008 18.2% of the longline effort (hooks) was observed, and almost 28% of the New Zealand purse seine sets were observed. A considerable amount of research is directed at tunas, tuna-like and bycatch species in New Zealand. Fishers and fish receivers are required to furnish returns (monthly reports) to the Ministry of Fisheries. New Zealand has four data collection systems in place to collect catch and effort data. New Zealand also has a system for collecting information on non-fish bycatch from fishers.

1.1 Annual Fisheries Information

1.1.1 Annual catch by species, gear in the WCPFC Convention Area

The catch by species taken within and beyond New Zealand fisheries waters is summarized in Table 1 and catch by gear type for 2007 and 2008 is provided in Table 2 and Figure 1. Since 2002, skipjack catches taken by purse seine has comprised the greatest part of the catch of all tuna species, both inside and outside New Zealand fisheries waters. Outside New Zealand fisheries waters, yellowfin makes up most of the balance, but are rarely part of the purse seine catch inside New Zealand fisheries waters. The purse-seine fishery inside New Zealand fisheries waters is exclusively targeted on free schools of skipjack.

Albacore are the second largest component of the tuna catch, and are taken mostly by troll gear, but also by longline. Troll gear also takes a small amount of skipjack with occasional catches of other tuna species. Although longlining has mostly targeted bigeye, southern bluefin and more recently swordfish, the greatest part of the catch consists of albacore. Pacific bluefin and yellowfin tunas are also taken in small numbers in longline sets, with skipjack only rarely taken. Blue, black, and striped marlin are caught in small numbers in the domestic longline fishery, but to protect New Zealand's sport fishery, marlins may not be landed for sale when taken within New Zealand fisheries waters.

Over 150t of striped marlin were caught in 2007 in the recreational fishery, with well over half the fish tagged and released. Most world records for striped marlin are for fish caught in New Zealand. A recreational fishery for Pacific bluefin tuna has also recently developed, and preliminary estimates of catches are in excess of 10t per year. Several world records have been claimed.

Overall commercial landings of the longline and troll caught species have declined in each year since 2002 consistent with the decline in number of vessels operating in these fisheries.

1.1.2 Number of vessels by gear type, size

Approximately 170 domestically owned and operated vessels (mostly 15 to 25 m) make up the main part of the domestic commercial New Zealand tuna fishing fleet. These vessels fish using troll or longline gear, with some switching between gear types seasonally or operating for part of the year in non-tuna fisheries (Table 3). Some of these vessels do a limited amount of pole and line and handline fishing, but there is no dedicated pole and line or handline fishery. All surface longline vessels reported in Table 3 targeted a species complex including tuna and swordfish.

There has been a significant reduction in the New Zealand tuna fleet since 2001 and most of the reduction has occurred in vessels smaller than 50 GRT, although some reduction is also seen in larger vessels (Figure 2).

Four New Zealand flagged Class-6 purse seiners (vessels with over 4256t hold capacity) have fished in the EEZs of Pacific Island States and on the high seas of the equatorial western and central Pacific Ocean (WCPO) since 2000. These vessels have traditionally also fished part of the year within New Zealand fisheries waters targeting free swimming (unassociated) schools of skipjack. Together with six smaller capacity domestic-based purse seiners, the total number of purse-seiners has declined over the reporting period from 11 vessels to 10.

There has been no foreign licensed access for tuna longline fishing in New Zealand fisheries waters since 1995 and only vessels operated by New Zealand companies can fish in New Zealand fisheries waters. The only foreign licences issued since 1995 for fishing in New Zealand fisheries waters have been to US purse vessel operating under the Multilateral Treaty between the

Government of the United States of America and the Governments of certain Pacific Island Countries (commonly referred to as the US Tuna Treaty).

A small fleet of foreign owned longline vessels on charter to New Zealand fishing companies have operated in New Zealand fisheries waters since the late 1980s. These longliners have almost exclusively targeted southern bluefin tuna although on one occasion two were chartered to target albacore tuna. In 2006, three Australian flagged vessels entered the longline fishery under charter arrangements, targeting bigeye tuna and swordfish. These vessels had all left New Zealand by August 2007.

Table 1: Estimated whole weight (t) of tuna and swordfish landed by New Zealand flagged vessels active in the WCPFC Convention Area, for years 2004 to 2008 (0 refers to catches < 500 kg). NZFW refers to catches within New Zealand fishery waters (200nm of the coastline), and ET refers to catches outside this area. The 2008 figures are preliminary. Note: the estimates presented in this Table may differ from those estimated by the SPC (WCPFC-2008-IP-11 rev2) due to differences in the estimation procedures used for the purse seine catch.

		Calendar year				
		2004	**2005**	**2006**	**2007**	**2008**
Albacore	NZFW	4 459	3459	2541	2092	3739
Thunnus alalunga	ET	2	1	1	0	0
	Total	4 461	3460	2542	2092	3739
Bigeye	NZFW	185	176	178	213	133
Thunnus obesus	ET*	0	353	997	651	585
	Total	185	529	1175	864	718
Pacific bluefin[&]	NZFW	67	21	21	14	14
Thunnus orientalis	ET	0	0	0	0	0
	Total	67	21	21	14	14
Skipjack	NZFW	9 383	10656	7247	11392	10034
Katsuwonus pelamis	ET	10 003	10746	19588	22266	15211
	Total	19 386	21402	26835	33659	25244
Swordfish	NZFW	532	329	571	392	347
Xiphias gladius	ET	6	18	10	0	0
	Total	538	348	581	392	347
Yellowfin	NZFW	20	36	14	25	12
Thunnus albacares	ET*	2 658	2486	2679	2329	2897
	Total	2 678	2522	2693	2355	2910

* The ET estimates for yellowfin tuna also include some bigeye tuna as these are not always separated on purse seine logbooks completed by fishers.

Table 2: Percentage catch by gear type for 2007 and 2008 for major species taken in New Zealand tuna fisheries in the western and central Pacific Ocean convention area. Note: due to rounding some of these figures may add up to >100%.

2007	Longline	Troll	Handline	Pole & Line	Purse seine
Albacore	17	83	0	<1	0
Bigeye tuna	25	<1	0	0	75
Skipjack tuna	<1	<1	0	<1	100
Swordfish	100	0	0	0	0
Yellowfin tuna	<1	<1	0	0	99

2008	Longline	Troll	Handline	Pole & Line	Purse seine
Albacore	10	90	<1	0	0
Bigeye tuna	18	<1	0	0	81
Skipjack tuna	<1	<1	<1	0	100
Swordfish	100	0	0	0	0
Yellowfin tuna	<1	<1	0	0	100

1.1.3 Fishing patterns

This section describes spatial / temporal trends in catch and effort in each New Zealand tuna fishery (including ET fisheries). Longline effort for the domestic longline fleet by quarter is presented in Figure 3 and total effort in terms of hooks fished by target species is provided in Table 4.

The key target species in the longline fishery are southern bluefin and bigeye tuna. The southern bluefin tuna fishery occurs during the second quarter in the year and mostly off the east coast of the North Island, and the west coast of the South Island. The remainder of the year is focussed on bigeye tuna and other minor target species and occurs off the east coast and northeast tip of the North Island. As a result of a change in management from a competitive to an individually allocated regime for southern bluefin tuna, fishers are able to delay catching their quota until later in the season when prices are better. This has lead to some changes in the seasonal distribution of the fishery before and after 2004. Annual catch distributions for the longline fisheries are provided in Figure 5.

Table 3: Number of vessels fishing for tuna in the WCPFC Convention Area by vessel size class (GRT) and gear type active in the WCPFC Convention Area, for years 2004 to 2008. Note that many vessels use more than one method (e.g. both troll and longline) and will be included in both totals. Troll data are presented by year and for the troll season separately as per the Commissions reporting requirements

	Calendar	Total no.	Vessels size range (GRT)			
Fishing Method	**Year**	**vessels**	**0 – 50**	**51 - 200**	**201 - 500**	**500+**
Surface Longline	2004	99	55	39	5	0
	2005	57	30	25	2	0
	2006	56	30	24	2	0
	2007	44	19	21	3	1
	2008	35	16	15	3	1
Purse Seining			**0 – 500**	**501-1000**	**1001 - 1500**	**1501+**
	2004	11	7	0	2	2
	2005	11	7	0	2	2
	2006	11	7	0	2	2
	2007	10	6	0	2	2
	2008	10	6	0	2	2
Pole & Line			**0-50**	**51-150**		
	2004	4	4	0		
	2005	8	7	1		
	2006	2	1	1		
	2007	2	2	0		
	2008	0	0	0		
Troll			**0 – 50**	**51 - 200**		
	2004	251	213	38		
	2005	213	180	33		
	2006	178	157	21		
	2007	136	117	19		
	2008	168	143	25		
Troll season			**0 – 50**	**51 - 200**		
	2003-04	245	209	36		
	2004-05	211	177	34		
	2005-06	182	157	25		
	2006-07	134	115	19		
	2007-08	154	135	19		

Table 4: Annual longline effort (000s of hooks) by target species. The category other includes Pacific bluefin, yellowfin tuna, and swordfish (able to be targeted since 2005/06). It should be noted that fishers record only one target species on their logsheets but are often targeting multiple species such as bigeye and albacore tunas simultaneously.

Year	Southern bluefin	Bigeye	Albacore	Other	Total
2004	3 199	2 908	449	168	6 725
2005	1659	1777	137	286	3860
2006	1495	1814	60	324	3693
2007	1939	1525	14	212	3690
2008	1105	989	1	161	2255

The albacore troll fishery is based mainly on the west coast of the North and South Islands and operates between December and May each year. The distribution of catch and effort is almost identical (Figure 6).

The purse seine fishery within New Zealand fisheries waters occurs on both the east and west coast of the North Island between January and May (Figure 7). The amount of catch / effort in a given year depends on the presence of the larger purse seine vessels that sometimes move down from the tropics to fish within New Zealand fisheries waters during the summer, as well as the availability of skipjack in New Zealand waters. These larger vessels tend to fish further offshore and in deeper waters than the smaller domestic vessels.

In 2007 and 2008 three out of the four New Zealand purse seine vessels that operated in the Tropical Pacific were from a single company. For reasons of commercial confidentiality, details of the spatial distribution of catch and effort for these vessels are not provided in this report.

1.1.4 Estimated total catches of non-target, associated and dependent species

For bycatch species of commercial interest, reasonably good estimates of landings can be obtained from fisher records, while for less valuable species, observer data provides the best information. Here we provide data on major bycatch species and species of special interest for the longline and purse seine fisheries within, and adjacent to, New Zealand fisheries waters.

The major bycatch species in the longline fishery have been bought into New Zealand Quota Management System (QMS). Blue shark is the most common bycatch species followed by Ray's Bream (Table 5). The large reductions in longline effort have resulted in reductions in landings of the major bycatch species.

Table 5: Landed catch (t) of non-target species currently managed within the QMS that are taken in tuna fisheries within New Zealand fisheries waters. Data are provided by 1 Oct – 30 Sept fishing year and for some species may include catches from non-tuna fisheries.

Species	Scientific name	2003/04	2004/05	2005/06	2006/07	2007/08
Blue shark	*Prionace glauca*	649	734	656	790	681
Mako shark	*Isurus oxyrinchus*	100	107	82	75	74
Moonfish	*Lampris guttatus*	156	111	79	82	43
Porbeagle shark	*Lamna nasus*	65	60	55	54	41
Ray's bream	*Brama brama*	157	259	215	149	151

It is also possible to estimate bycatch from the longline fishery using observer records. While this is important for estimating catches of the less valuable species that are less likely to be retained or recorded, it is difficult to obtain reliable estimates from species rarely caught in longline fisheries. Estimates of catches (in numbers of fish), the percentage of those catches retained, and an indication of the life status of discards are provided in Table 6.

Table 6: Estimated catch (numbers of fish) of common bycatch species in the New Zealand longline fishery as estimated from observer data in 2006 to 2008. Also provided for 2008 only is the percentage of these species retained and the percentage of non-retained fish that were alive when caught, N/A lost or unknown.

Species	2006	2007	2008	%Retained (2008)	%Alive (2008)
Blue shark	56 647	52 777	41 059	68.7	95.1
Lancetfish	11 359	22 068	14 095	0.7	25.2
Rays bream	14 290	28 609	12 107	90.8	9.6
Porbeagle shark	1 886	2 746	4 273	39.9	78.5
Escolar	1 077	2 212	2 666	88.1	40.0
Mako shark	4 801	3 778	2 620	66.5	93.3
Sunfish	3 339	3 201	2 529	2.7	99.6
Moonfish	2 048	3 977	1 830	98.9	n/a
Pelagic stingray	5 228	2 124	1 749	1.4	95.7
Big scale pomfret	779	3 086	1 385	96.1	16.7
Deepwater dogfish	982	1 137	644	0.4	91.6
Oilfish	1 728	1 178	519	62.8	38.5
Dealfish	202	1 154	494	0.0	17.0
Butterfly tuna	434	845	479	58.0	9.8
Dolphinfish	103	158	469	93.3	n/a
Thresher shark	414	324	288	25.8	73.9
Rudderfish	563	1 346	222	45.8	66.7

The major bycatch species can be divided into three groups: species that are typically discarded and are usually alive (e.g. deepwater dogfish and rudderfish), species that are typically discarded and are usually dead (e.g. dealfish and lancetfish), and species that are typically retained, but are alive when discarded (e.g. moonfish, blue shark, and porbeagle shark). For species in this last group, fish were more likely to be retained if they were already dead when brought to the side of the boat.

Seabirds are sometimes caught in longline fisheries and the birds are landed both dead and alive, with an important proportion (24%) landed and then released alive. This indicates that birds are caught both at the set and during the haul which has implications for mitigation techniques. Scaled estimates based on observer coverage are uncertain, but are provided in Figure 8. As part of CMM2007/04 New Zealand longline vessels fishing south of 30˚S are required to use seabird mitigation devices to reduce catches of seabirds during the setting process. In addition, longline vessels fishing for tuna or swordfish in New Zealand fishery waters may only set their lines at night (unless using line weighting) and must use tori lines while setting.

Since 2001 only 15 sea turtles have been reported by fishers and observers within New Zealand fisheries waters (Table 7). Of these, 11 were leatherback turtles, one was a loggerhead turtle, two were reported as green turtles, and one was unidentified.

Overall, sea turtle interactions are very rare in the New Zealand longline fishery. Sea turtles interactions have occurred throughout the year with a slight increase observed during the austral summer (November to March). All but one of the turtles were released alive. The only turtle mortality (2001) that occurred in New Zealand fisheries waters in the past 7 years, was identified as a green turtle (based on photographs taken by the observer). No turtles have been observed or reported from the purse seine or troll fisheries that operate within New Zealand fisheries waters.

Table 7: Observed sea turtle interactions for surface longline vessels based on fisher and observer records. All turtles, except for one green turtle caught in 2001, were alive on capture and released.

Species	Scientific name	2001	2002	2003	2004	2005	2006	2007	2008
Green turtle	*Chelonia mydas*	1				1			
Leatherback turtle	*Dermochelys coriacea*	2	1		1	2	3	1	1
Loggerhead turtle	*Caretta caretta*		1						
Unidentified		1							

Observers have been deployed on purse seine vessels since 2005 to determine levels of bycatch in the fishery that operates within New Zealand fishery waters. The catch composition for the eleven trips covered in 2007 and 2008 is provided in Table 8 and levels of coverage are provided in Table 9. As the fishery is based on free schools of skipjack, bycatch is minimal. No interactions with non-fish bycatch (e.g. seabirds, turtles, and marine mammals) were observed or reported.

Table 8: Catch composition from eleven observed purse seine trips operating within New Zealand fisheries waters in 2007 and 2008.

Species	Scientific Name	Observed catch weight (kg)	% Catch
Skipjack tuna	Katsuwonus pelamis	7,768,139	94.31
Blue Mackerel	Scomber australasicus	426,015	5.17
Jack Mackerel	Trachurus declivis, t.m., t.nz.	38,000	0.46
Jack Mackerel	Trachurus murphyi	3,700	0.04
Flying fish	Exocoetidae	218	0.00
Mako Shark	Isurus oxyrinchus	155	0.00
Albacore Tuna	Thunnus alalunga	132	0.00
Kahawai	Arripis trutta	80	0.00
Frostfish	Lepidopus caudatus	71	0.00
Yellowfin Tuna	Thunnus albacares	60	0.00
Dolphinfish	Coryphaena hippurus	30	0.00
Arrow Squid	Nototodarus sloanii & n gouldi	11	0.00
Porcupine fish	Tragulichthys jaculiferus	6	0.00
Unidentified		6	0.00
Barracouta	Thyrsites atun	5	0.00
Spotted Flounder	Azygopus pinnifasciatus	1	0.00

Table 9: Domestic purse seine sets observed as a percentage of sets made for 2005 to 2008

Calendar year	No. sets observed	% sets observed	% SKJ catch
2005	37	4.7	4.5
2006	104	17.6	35.5
2007	77	14.8	25.2
2008	118	27.6	57.3

Records from observers from the Regional Observer Programme aboard the New Zealand purse seine vessels operating in the tropical Pacific are held by SPC and are available to the Commission. We have not summarised bycatch for these vessels.

1.1.5 Other information

Following the development of domestic longlining in the early 1990s, the number of vessels in the domestic tuna fleet operating in New Zealand fisheries waters peaked in 2001 and has subsequently declined. The rapid expansion particularly in the late 1990s through to 2000 arose because tuna fisheries were among the few open access fisheries in New Zealand at that time. It is also likely to have been encouraged due to the potential for claiming an allowance of quota on the basis of fishing history when tuna species entered the Quota Management System (QMS). As expected, the number of longline vessels targeting tuna declined following Government decisions

on catch history years for several important target species in the longline fishery (only fishing history prior to 30 September 2000 was used in the determination of quota allocations for these species).

On 1 October 2004, bigeye, yellowfin and Pacific bluefin tuna were introduced to the QMS system with catch limits set within New Zealand fisheries waters. Several key bycatch species, namely mako, blue, porbeagle shark, moonfish, Ray's bream, and swordfish were also introduced at this time. Southern bluefin tuna was also bought into the QMS in 2004, but the limit applies to catch by New Zealand flagged vessels regardless of where they fish.

A further driver for rationalisation in the tuna longline fleet has been the allocation of southern bluefin tuna quota. A national allocation applies to New Zealand southern bluefin tuna catch and, as a result of allocation of individual shares in this fishery, many fishers received uneconomic quota amounts for the species. Some responded by purchasing further quota but many chose to exit the fishery.

Recent economic conditions have also resulted in further decreases in participation in domestic longlining and trolling. These conditions include a variable New Zealand dollar, increasing fuel costs and a static market value for fish product.

New Zealand fisheries are at the limits of the range of many highly migratory species. Catches vary from year to year depending on seasonal variations in highly migratory species (HMS) migrations. The availability of juvenile albacore to the troll fishery in New Zealand waters varies from year to year with larger scale climatic events indicated by the ENSO index. The future prospects for New Zealand are strongly dependent on good management of tuna resources in WCPO, in particular on biomass of key stocks remaining at a sufficiently high level that no major changes in distribution occur.

Most tuna caught in New Zealand waters are exported and the destination of exports varies depending on the species. Large tunas caught by longline (including albacore) are mostly exported "chilled" to Japan, with a smaller proportion exported to Australia and the United States. Troll caught albacore are sent to a variety of markets and in the most recent year most was exported to Spain. In 2008 almost half of our skipjack was exported to Thailand with the majority of the remainder exported to Turkey, Iran, Tunisia and Spain. The large purse seine vessels operating in the tropical Pacific unload or tranship their catch in a number of ports including Majuro, Pohnpei, and Pago Pago.

1.2 Research and Statistics

1.2.1 Summary of observer and port sampling programmes

New Zealand has an Observer Programme and two active port sampling programmes. These are described below. Information on the Observer Programme was provided to the Commission in June, 2009, as part of the accreditation process for the Regional Observer Programme.

The Observer Programme is administered by Observer Services within the Ministry of Fisheries, and training courses for new recruits are run generally once or twice a year. The frequency is dependent on attrition of observers and the number of sea-days forecast for the coming fishing year. All observer training is being aligned to fall within the New Zealand Qualifications Authority framework and completion of shore-based training, along with some at-sea assessment, results in an internationally recognised qualification.

Prior to each trip observers receive comprehensive briefings, along with relevant reference material prior to undertaking any at-sea observation of longline vessels. Observers are provided with an observer manual that includes: details of species identification, what to record for each species caught, biological sampling instructions, and details of operational data to record.

On longline vessels the observers collect detailed data on all fish and non-fish catch. Length or weight is collected for all specimens and most have additional data collected, e.g. sex, maturity stage, and stomach contents. We have recorded the stomach contents of over 74,000 highly migratory fish (32,371 tuna; 4,328 billfish; 23,905 sharks and 13,983 for other species). Physical specimens are often collected, e.g. hard parts for ageing. Observers make detailed records of the fishery operation, e.g. hooks per basket, use of floats, light-sticks, hook types, bait types, and snood setup. Observers also record information on the behaviour of seabirds and other non-fish species in relation to the fishing operation, e.g. whether seabirds were present during setting or hauling.

On purse seine vessels it is not possible to sample every individual caught so the observers focus on detailed sampling of the bycatch species and sub-sampling of the target species. To this end New Zealand is working with SPC to conduct trials using observers where different sampling strategies are utilised to assess the effects of sampling bias on species and length composition of the catch.

With respect to HMS fisheries, most observer effort is currently directed at the longline and purse seine fisheries. In addition to strengthening the coverage in the longline fishery, observer effort is also being directed at the albacore troll fishery. The main goal of this coverage is to better understand the fishing process and to allow further development of standardized CPUE indices for this fishery.

The albacore port sampling programme was established during the 1996-97 albacore fishing season. The first two years of sampling were funded through SPC, but the programme has been funded by the Ministry of Fisheries (costs recovered from industry) since 1998-99. Sampling typically occurs at three ports on the west coast of New Zealand, though only two ports were sampled in 2007 and 2008 due to the reduced distribution of fishing effort in those years. Sampling occurs during the Austral summer (December – May).

Over the duration of the programme over 44 000 albacore have been sampled for length and almost 10% of these also sampled for weight. Further to this, otoliths from smaller fish have been collected for use in other SPC research programmes. The length frequency data are provided to SPC annually and have been incorporated into the regional assessment for South Pacific albacore.

In 2005, the Ministry of Fisheries funded the development of a port sampling programme for swordfish and has extended this programme to include other highly migratory species (HMS) taken in the longline fishery. For large HMS, fish processors often collect individual processed weight data as part of their operations. This new programme is collating these individual fish records from the major processors. It is anticipated that it may be possible to collect individual weights for up to 90% of the catch of some species. Where necessary, these data will be supplemented from information from observers, e.g. conversions factors from length to processed weight and sex-structured data for swordfish.

1.2.2 Research activities

Considerable research effort is directed at highly migratory species in New Zealand. The Ministry of Fisheries runs a research planning process each year which involves the updating of the Medium Term Research Plan (MTRPs) for groups of species. Currently the Ministry of Fisheries has, in consultation with stakeholders, developed MTRPs for tunas, billfish, pelagic sharks, other fish species taken in tuna fisheries, and the Gamefish tagging programme. The MTRP describes the current knowledge about the species, lists all historic research (by New Zealand researchers), and sets out a plan for future research activities. Summaries of recent research were provided to WCPFC-SC1 (as paper GN IP-2) so the details of this paper are not repeated here.

Current and recent research[1] on tuna and tuna-related species includes:

Albacore
Biological sampling of albacore
Stock monitoring of albacore
CPUE of troll-caught albacore
All HMS and bycatch
Characterisation of New Zealand tuna fisheries
Commercial catch sampling programme for HMS
Gamefish tag recapture programme
Bycatch
Characterisation of bycatch in pelagic fisheries
Estimation of non-target fish catches in the tuna longline fishery
Productivity of non-target species
Environmental
Data collection of demographic, distributional and trophic information on selected seabirds species to allow estimation of effects of fishing on population viability
DNA database for commercial marine fish and invertebrates
Effects of climate on commercial fish abundance
Ecological Risk Assessment for New Zealand fishery interaction with seabirds and mammals
Estimation of protected species captures in longline fisheries using electronic monitoring.
Estimation of the nature and extent of incidental captures of marine mammals in NZ fisheries
Estimation of the nature and extent of incidental captures of seabirds in NZ fisheries.
Estimation of the nature and extent of sea turtles captures in NZ fisheries
Identification of marine mammals captured in NZ fisheries
Modelling of impacts of fishing-related mortality on NZ seabird populations
Modelling the effects of fishing on population viability of selected seabirds
Great white shark
Electronic tagging of great white sharks
Porbeagle shark
Electronic tagging of porbeagle sharks
Southern bluefin
Catch-at-age of southern bluefin tuna
Electronic tagging of southern bluefin tuna
Striped Marlin
Collection of striped marlin hard parts
Electronic tagging of striped marlin
Stock monitoring of striped marlin
Swordfish
Swordfish stock structure
Electronic tagging of swordfish

If you would like further details regarding any of these studies please contact Stephen Brouwer (Stephen.brouwer@fish.govt.nz).

[1] This includes some research undertaken independently of the Ministry of Fisheries

1.2.3 Statistical data collection systems in use

In order to fish commercially an individual or entity is required to hold a fishing permit. Fishing permit holders may only sell their catch to licensed receivers of fish. Both fishing permit holders (fishers) and fish receivers are required to furnish returns to the Ministry of Fisheries. New Zealand has four data collection systems in place to collect catch and effort data:

- the catch and effort system for all domestic and most high seas fishing;
- monthly harvest returns from fishers
- licensed fish receiver returns for fish processors, and
- a system to collect data from purse seine vessels that are using FFA/SPC logsheets for fishing on the high seas and within the zones of other countries.

New Zealand also has a system for collecting information on non-fish bycatch from fishers. These will each be described below with further details provided in Appendix 1.

Catch and effort data

Catch, fishing effort, fishing operation data, and vessel information are collected on logsheets provided by each permit holder to the Ministry of Fisheries on Catch Effort Landing Returns (CELR) and Tuna Longline Catch Effort Returns (TLCER). CELR forms are completed for each day of fishing for all gear types (e.g. handline, troll, purse seine and some longline) while TLCER forms are filled out only for surface longlining for tunas, these data are recorded for each longline set. The forms are submitted monthly by the 15th of following month.

Tuna landings data are compiled from the Licensed Fish Receiver Returns (LFRR) filed monthly by each Licensed Fish Receiver and Monthly Harvest Returns (MHR) filed by the fishing permit holder. Additional information on catch composition, length and weight, sex ratio, discard and on loss rate of fish, is collected by staff from the Ministry of Fisheries Observer Programme.

Tuna fisheries catch and effort data have been collected by the Ministry of Fisheries (Ministry of Agriculture and Fisheries at that time) since at least 1976. CELR and TLCER data are available beginning with the third quarter of 1989 (start of the 1989–90 fishing year).

Monthly harvest return data

Monthly Harvest Returns (MHR) provide a record of the total catch (monthly harvest) taken by each fisher (permit holder), by fishstock for each calendar month. If there is no catch taken in a month then a nil return is expected. The forms are submitted monthly by the 15th of following month. This data has been collected on these forms October 2001. Prior to 2001 similar data (but for quota species only) is available from the QMR system.

Licensed fish receiver data

All New Zealand Licensed Fish Receivers are required to submit monthly returns (LFRRs). These returns record the quantity of each species the LFR has received from each source (permit holder) for each month. The LFRR data set provides complete coverage of all species that are landed legally in New Zealand, with some minor exceptions. Licensed Fish Receivers must submit a return within 15 days after the last day of the calendar month. If no fish have been received in a month then a nil return is required. Both QMS and non-QMS species are reported in this system. Fish that are not landed to a Licensed Fish Receiver (such as fish that are discarded or sold to the public at the wharf) are not reported through this system. Discarded fish & wharf sale fish are recorded on the landing section if a CELR is used. Where a return doesn't have a landing section a Catch Landing Return (CLR) is used.

These data have been collected on these forms since January 1986.

Out of zone purse seine data
The large purse seine vessels fishing on the high seas and the zones of other countries typically fill in the regional purse seine catch effort form, or the variant used in the country in which they are fishing. When fishing in other zones, logsheets are submitted to the coastal state, who then submits them to SPC. The Ministry of Fisheries also receives a copy from the vessel and these data are currently maintained within a database managed by the National Institute of Water and Atmospheric Research (NIWA). Each year, New Zealand coordinates with SPC to ensure that they have copies of all logsheets filled during the year.

Non-fish bycatch data
Fishers are required to report accidental deaths or injuries to marine mammal and other protected species that occur in the act of fishing under a variety of pieces of legislation (e.g. New Zealand Wildlife Act (1953) and the Marine Mammal Protection Act (1978)). Currently the Ministry of Fisheries and the Department of Conservation is improving the systems for the collection of these data and in 2008 a new protected species bycatch reporting form was instituted and all fishers that land (and where appropriate release) a protected species are required, by law, to record it, this includes incidental catch of the following species by commercial fishers: seabirds, marine mammals, marine reptiles, corals, sponges, bryozoans, and protected fish species (protected under the Wildlife Act 1953). Existing commercial catch and effort returns include a declaration about whether or not non-fish / protected species incidental catch occurred for each set. If these species are caught during a set, fishers also need to complete a Non-fish Protected Species Catch Return (NPC) form.

The form includes more detailed information about the species caught. The form is linked to the catch effort return so that fishers do not need to duplicate information already reported. Fishers are required to report to the species level if they are able to identify the incidental catch, but if not generic group codes will be permitted. Corals, sponges and bryozoans will be reported by estimated weight and all other species will be reported by number of individuals. The count of individuals will include whether the animals were alive and uninjured, alive and injured, or dead. Definitions of what "injured" means is provided. The Ministry of Fisheries is also preparing a species ID guide to distribute to fishers to assist them to meet their reporting obligations. All the New Zealand fishers fishing for highly migratory fish species have had copies of the SPC marine species identification manual sent to them.

Completion of the form is a requirement under the Fisheries (Reporting) Regulations 2001. Fishers are required to use these forms to report, they must do so by a due date and may be penalised for misreporting.

1.2.4 Data coverage of catch, effort and size data for all species

As noted above, all fishers are required to fill in logsheets providing 100% coverage of catch and effort. In addition, for fishing within New Zealand fisheries waters we have two independent records of total catches, the monthly reporting by fishers (MHRs) and licensed fish receivers (LFRRs).

Shore-based catch monitoring of the albacore troll fishery samples about 1% of the catch by weight based on sampling about 30 landings each fishing season. Given the small number of cohorts taken in this fishery, this level of sampling provides good precision on the catch-at-length estimates (e.g. mean weighted coefficient of variation of <0.20 for catch-at-length).

Currently much of the size data for other HMS comes through the Observer Programme. We have coverage of our longline and purse-seine fleets and are planning for coverage aboard some albacore troll vessels. Our target coverage rate for the longline fishery is around 10% of effort, which should reflect approximately 10% of the HMS catch. Historically, our coverage of “hooks fished” is better than this 10% level, but the coverage of the domestic component of the longline fleet is lower than the charter coverage (Table 10). Japanese longline vessels operating under

charter arrangements have always carried observers, but because of the long haul time of these vessels it is not possible for these observers to observe all hooks set. As the composition of the domestic fleet becomes more stable we envisage reaching the 10% observer target for this component of the fleet.

Table 10: Hooks observed from the New Zealand longline fishery as a percentage of hooks set.

Calendar year	Domestic	Charter (Japanese)	Charter (Aust.)	Total
2004	**2.4**	**90.8**		**21.6**
2005	**4.8**	**88.1**		**18.7**
2006	**3.2**	**88.7**	**83.0**	**18.0**
2007	**7.0**	**54.7**	**25.3**	**25.2**
2008	**9.2**	**44.7**		**18.2**

The shore-based port sampling programme, includes the primary species taken in longline fisheries (e.g. bigeye and yellowfin tuna and southern and Pacific bluefin tunas). The sampling programme obtained individual processed weights for 77%, 73% and 53% of the total landed catch in 2007-08 of swordfish, bigeye tuna and yellowfin tuna respectively (Table 11). The commercial landings of striped marlin are presented in Table 12.

Table 11: Number and percent of swordfish and large tunas sampled for fishing years 2006–07 and 2007-08.

	Number sampled			Percentage of catch		
Fishing year	**Swordfish**	**Bigeye tuna**	**Yellowfin tuna**	**Swordfish**	**Bigeye tuna**	**Yellowfin tuna**
2006-07	5148	3855	371	75.6	87.8	72.2
2007-08	4704	2241	434	77.9	73.5	52.5

Table 12: Commercial landings and discards (number of fish) of striped marlin in the New Zealand EEZ reported by fishing nation (CELRs and TLCERs), and recreational landings and number of fish tagged, by fishing year.

Fishing	Japan	Japan	Korea	Philippine	Domestic	NZ Recreational		Total
Year	Landed	Discarded	Landed	Discarded	Discarded	Landed	Tagged	
1979-80	659					692	17	1368
1980-81	1663		46			792	2	2503
1981-82	2796		44			704	11	3555
1982-83	973		32			702	6	1713
1983-84	1172		199			543	9	1923
1984-85	548		160			262		970
1985-86	1503		19			395	2	1919
1986-87	1925		26			226	2	2179
1987-88	197		100			281	136	714
1988-89	23		30		5	647	408	1113
1989-90	138				1	463	367	969
1990-91		1			6	532	232	771
1991-92		17			1	519	242	779
1992-93					7	608	386	1001
1993-94					59	663	929	1651
1994-95					182	910	1206	2298
1995-96					456	705	1104	2265
1996-97					441	619	1302	2362
1997-98					445	543	898	1886
1998-99					1642	823	1541	4006
1999-00		2			798	398	791	1989
2000-01					527	422	851	1800
2001-02					225	430	771	1426
2002-03		3		7	205	495	671	1381
2003-04		1			423	592	1051	2067
2004-05					258	834	1345	2437
2005-06					168	630	878	1676
2006-07					154	675	963	1 792

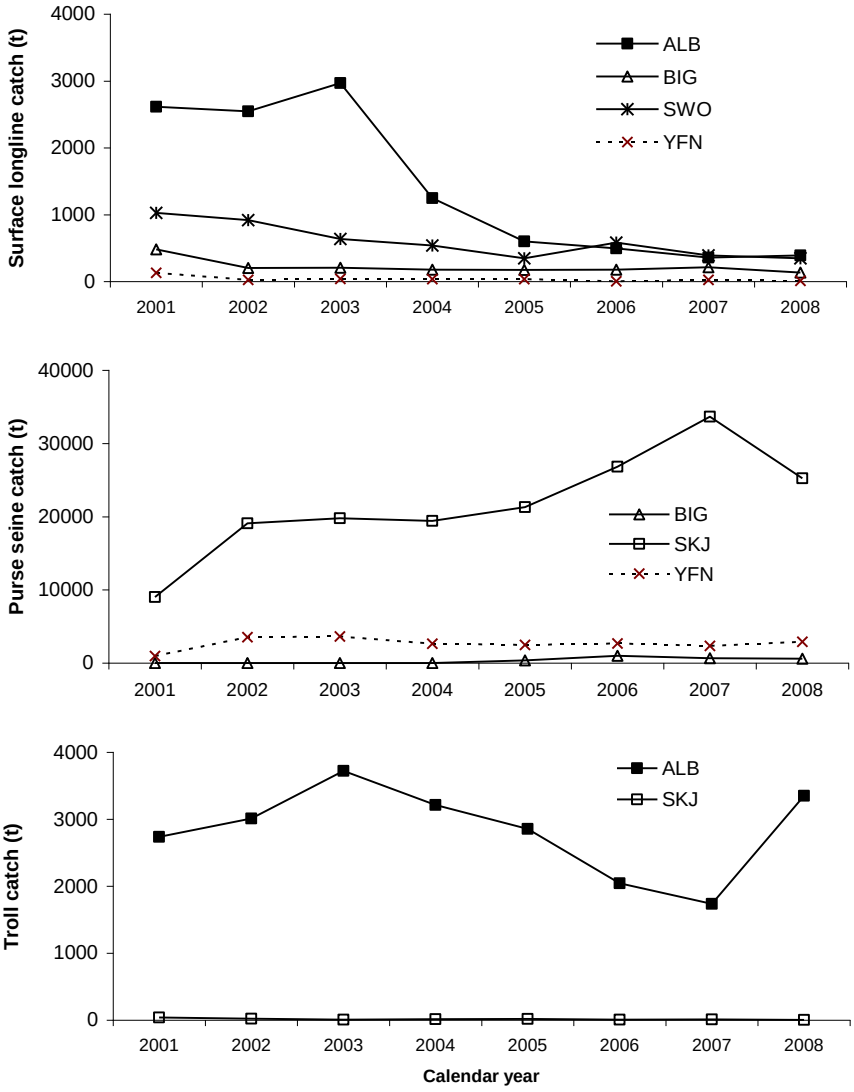

Figure 1: Historical catch (t) by gear and main species for the New Zealand longline, purse-seine and troll fleets operating in the WCPFC Convention area.

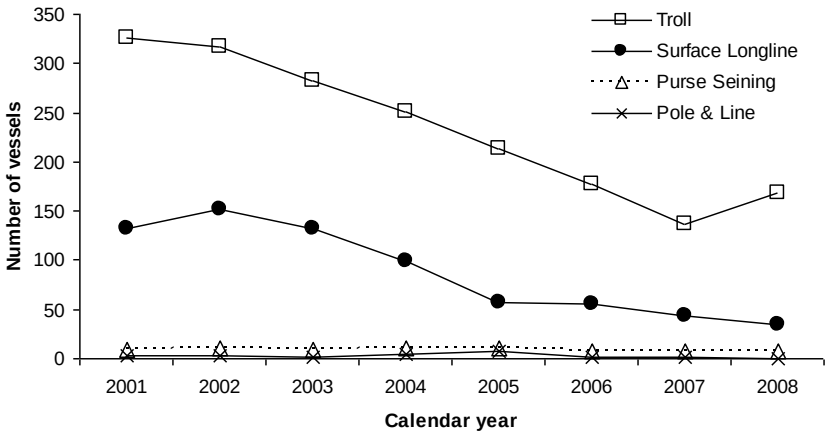

Figure 2: Historical annual vessel numbers for the New Zealand longline, purse seine, troll and pole and line fleets by gear for the WCPFC Convention area. Vessels switch gear seasonally and may be included in more than one category.

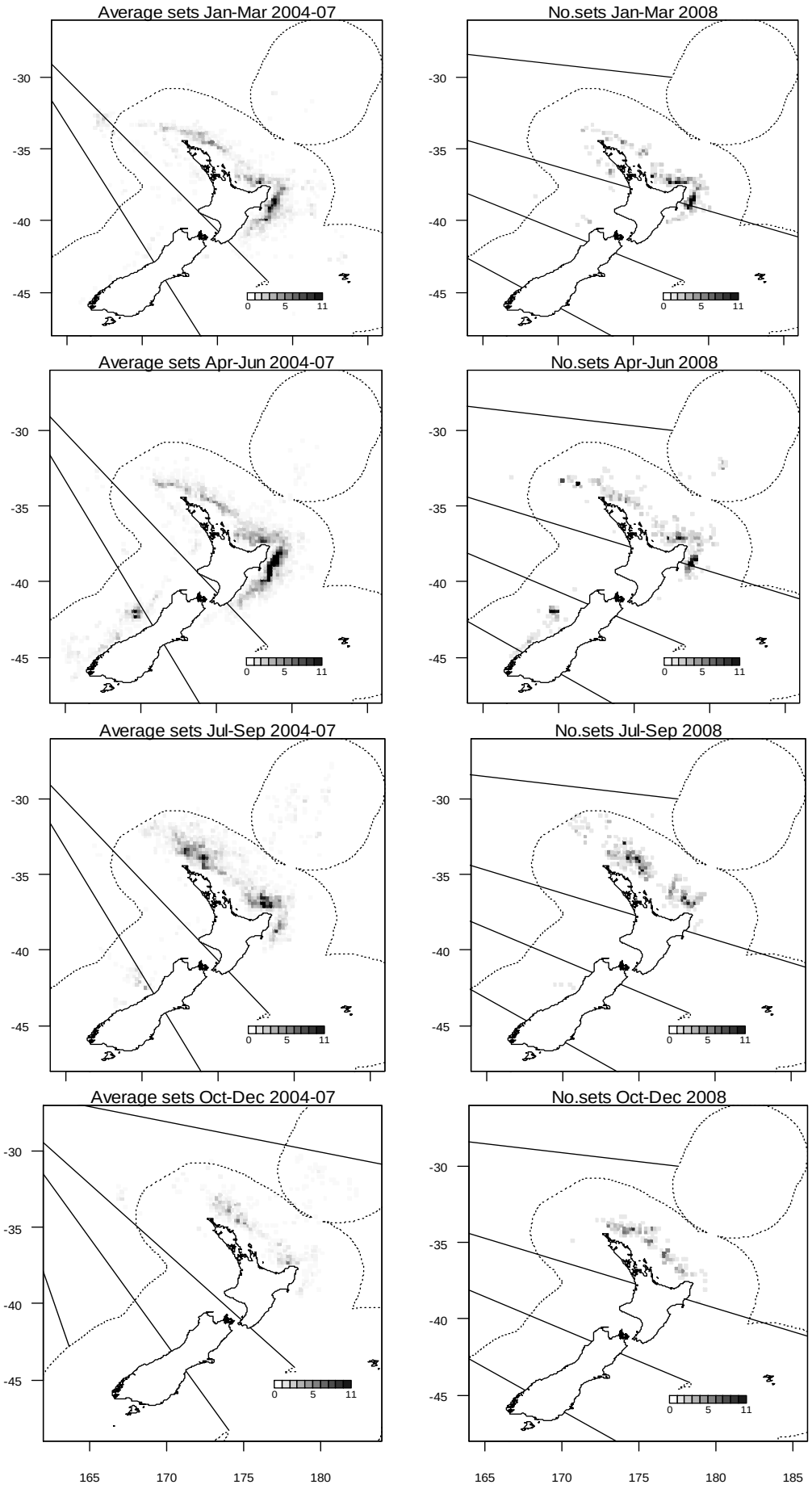

Figure 3: Distribution of effort (number of sets per 1/5 degree square) for the domestic longline fleet by quarter-year for 2001-2006 (average) and 2007 (actual). Max grey scale is 95th percentile for April – June in 2008.

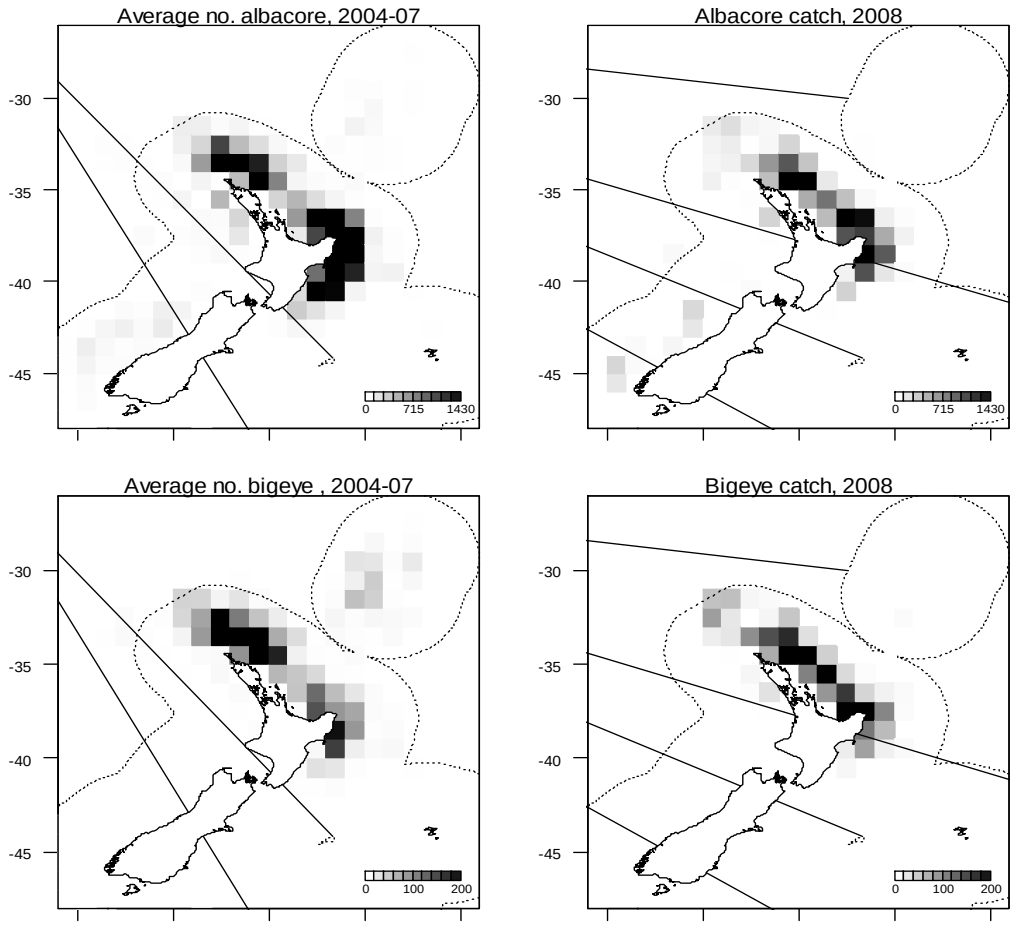

Figure 4: Distribution of longline catch (number of fish in 1 degree squares) for albacore, bigeye, and yellowfin tunas, and swordfish for 2004 to 2007 (average), and for 2008 (actual). All months and all vessels combined. Max grey scale is 95th percentile for 2008.

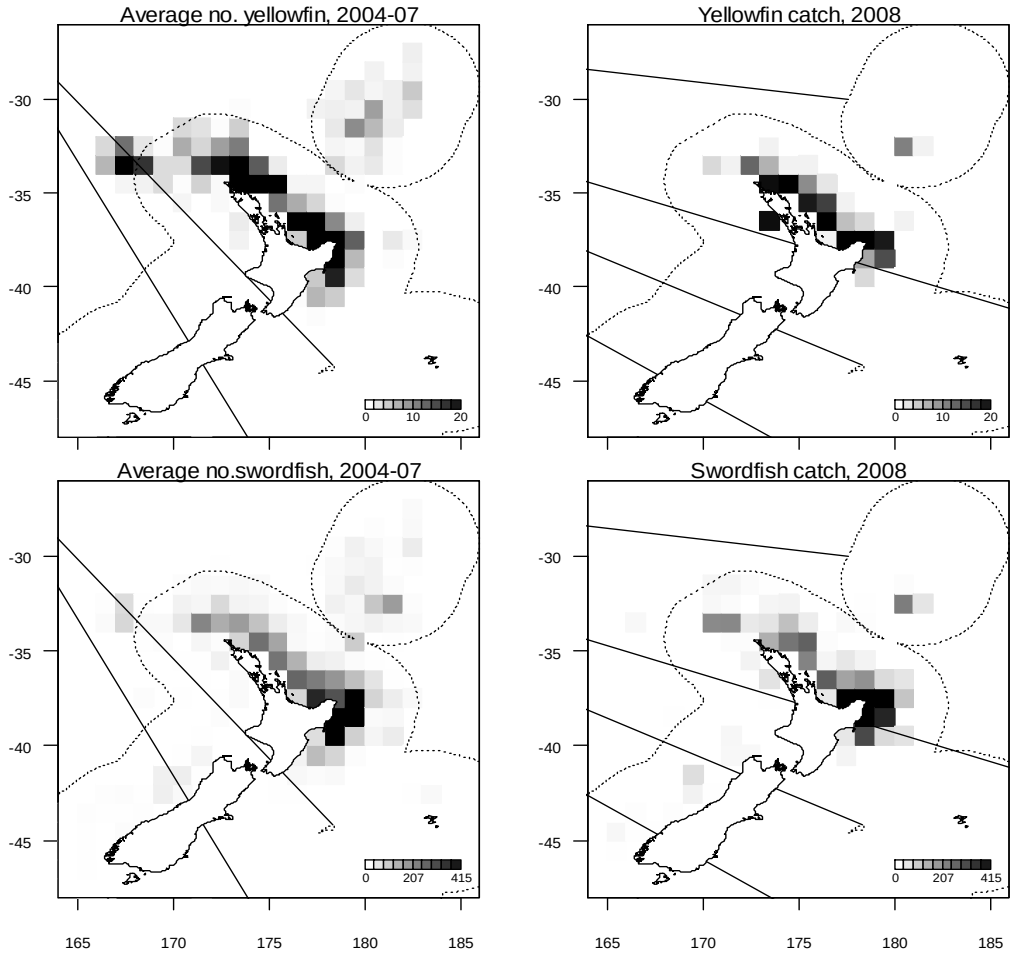

Figure 5 (continued): Distribution of longline catch (number of fish in 1 degree squares) for albacore, bigeye, and yellowfin tunas, and swordfish for 2004 to 2007 (average), and for 2008 (actual). All months and all vessels combined. Max grey scale is 95th percentile for 2008.

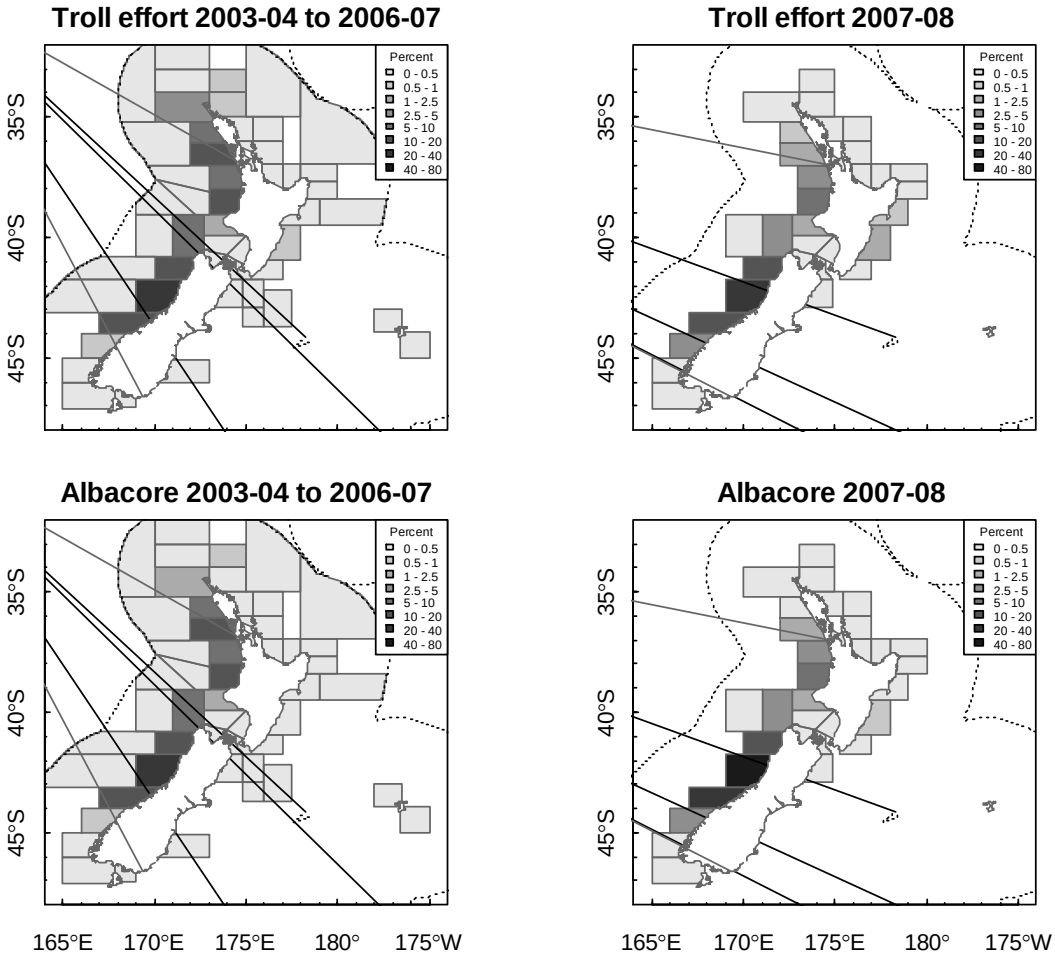

Figure 6: Distribution of troll effort (percent of vessel-days) and troll catch of albacore (percent of total catch) for 2003-04 to 2006-07 troll seasons (left) and l for 2007-08 season (right); Note: Positional data for troll are reported at a NZ statistical area resolution.

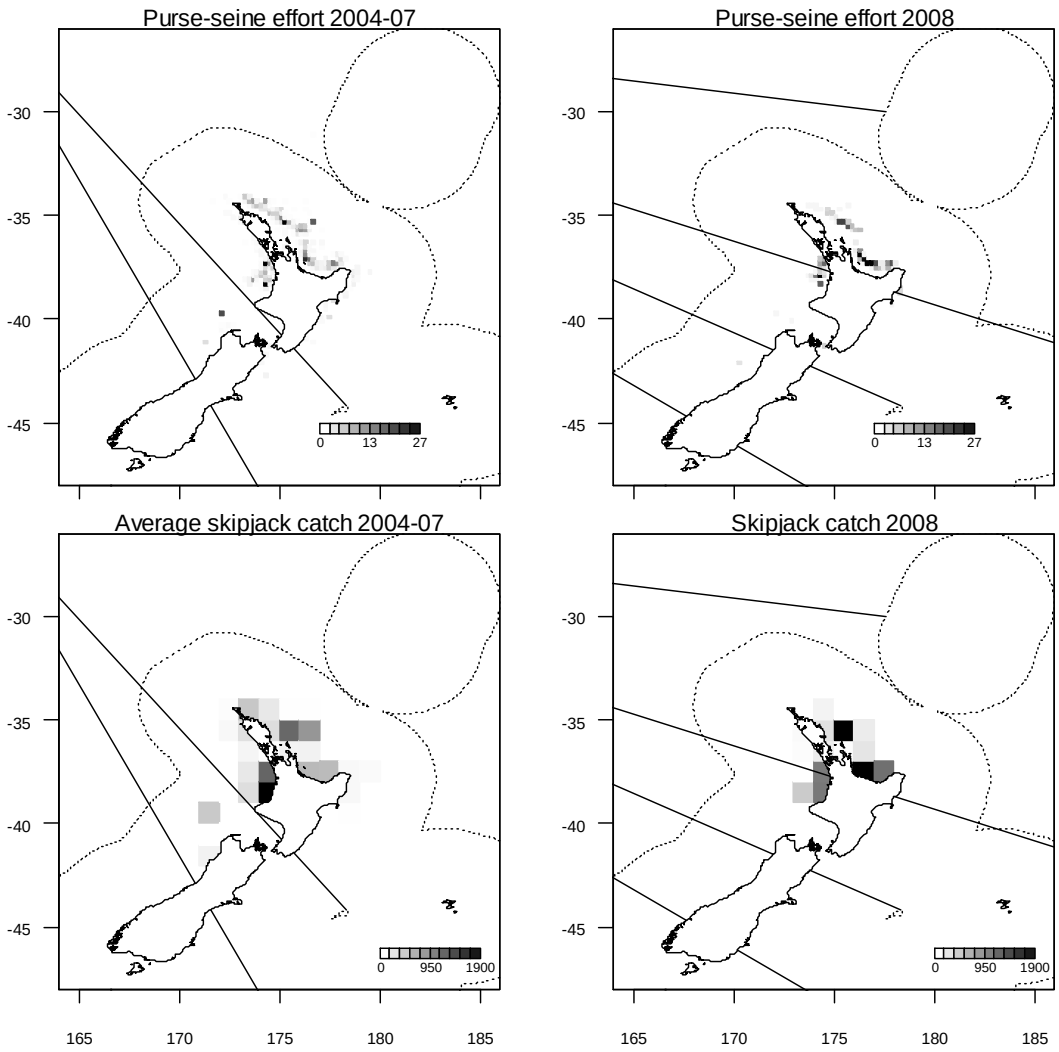

Figure 7: Distribution of purse-seine effort (number of sets per 1 degree square) and purse-seine catch of skipjack (tonnes per 1 degree square), average for 2004-07 calendar years (left) and actual for 2008 (right).

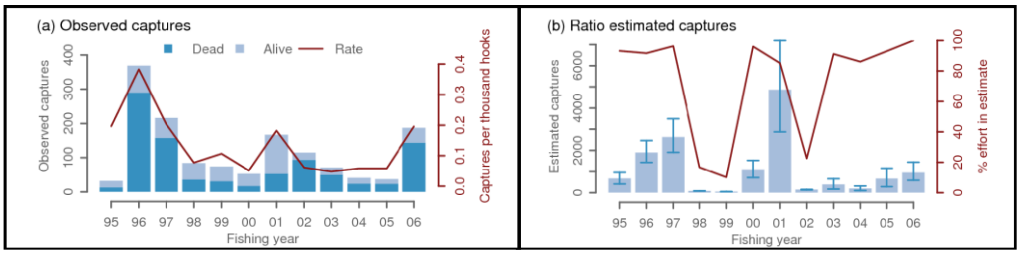

Figure 8: Observed and estimated seabird interactions for surface longline vessels based on fisher and observer records. (Source: Abraham, E.R. and Thompson F.N. 2008. DRAFT - Capture of protected species in New Zealand commercial fisheries, 1995–96 to 2006–07. Draft New Zealand Aquatic Environment and Biodiversity Report. Unpublished Document held by the Ministry of Fisheries New Zealand.

Appendix 1: Description of the types of catch, effort, and size data that are available for HMS species (source: Ministry of Fisheries Catch Effort reference library version 2, August 2003).

Data type	Description	Years available	Comments
CELR (Catch Effort Landing Return)	The CELR is a general purpose form used for recording the taking of fish by any of a variety of methods where there is no more specific form type available. The top part of the form contains details of the fishing activity. A number of method-specific "templates" are used with the CELR form. The templates are overlaid on the standard CELR form and give instructions on filling in the form specific to particular types of method. the fishing details sections of the forms are mainly provided for the purposes of: • stock assessment- to provide a measure of catch per unit effort • policy evaluation –to determine the location and method of fishing • enforcement –to monitor activities of fishers • monitoring environmental performance –to monitor effort The catch effort returns relate details about the fishing activity (including the location of fishing) directly to an estimate of the amount of fish caught. The bottom part of the form contains landing information and records the catch that is landed, lost, discarded at sea, or retained on board after a landing. Landing information is required from all commercial fishing for all species, and hence, this is theoretically the most comprehensive source of information for commercial harvest levels in New Zealand.	January 1988 onwards	In addition to this form there is a version specifically for reporting fishing by New Zealand vessels on the high seas known as the HS-CELR (High Seas CELR). The HS-CELR is nearly identical to the standard version of the form and was introduced 1 March 2001. There are a number of limitations and problems in this data set that need to be considered: • Because there is only space on the form for the catches of five species per unit of effort, species caught in small quantities may not be reported. • The catches reported are only estimates and are not weighed. Tuna catches are reported in numbers rather than weight. Fish reported in the landing section of a CELR form usually cannot be related to any specific fishing event during a trip. If the vessel fished in several statistical areas within one trip then it is usually not possible to deduce how much of the landed catch was taken in each statistical area
CLR (Catch Landing Return)	Catch Landing Returns are completed by vessels that use a form other than a CELR to report their fishing effort. They record the catch that is landed, lost, discarded at sea, or retained on board after a landing. Landing information is required from all commercial fishing for all species, and hence, this is theoretically the most comprehensive source of information for commercial harvest levels in New Zealand.	January 1991 onwards (TLCER forms)	Fish reported in the landings form usually cannot be related any specific fishing event during a trip . If the vessel fished in several statistical areas within one trip then it is usually not possible to deduce how much of the landed catch was taken in each statistical area. The whole weights reported in the landings are calculated from the processed catch weights multiplied by a conversion factor. The calculated whole weights are therefore only as accurate as the conversion. The whole weights of fish that are not landed to a Licensed Fish Receiver (e.g. fish discarded or trans-shipped)

			have historically not been fully recorded.
TLCER (Tuna Longline Catch Effort Return)	The TLCER is required for all fishing that targets tunas using surface longlining. Data reported on the TLCER is for one set and has the date at start of set and end of haul and the time at start and end of setting and hauling. Locations (of start and end of setting) are reported in latitude and longitude. Catches of all species are recorded in number and in total processed weight.	January 1980 to June 1995 (foreign licensed vessels) March 1989 onwards (charter vessels) March 1991 onwards (domestic vessels)	In addition to this form there is a version specifically for reporting fishing by New Zealand vessels on the high seas known as the HS-TLCER (High Seas TLCER). The HS-TLCER is nearly identical to the standard version of the form and was introduced 1 March 2001. The TLCER form was redesigned to include additional information on the position and timing of setting and hauling as well as disposition of catches from April 2003.
MHR (Monthly Harvest Return)	The main purpose of the MHR is for fisheries administration. A secondary purpose is to provide an information source concerning total harvest levels of quota and non-quota species for fisheries assessment.	October 2001 onwards	MHR reports are recorded by permit holder, fishstock and month. Fine scale information such as vessel (unless the permit holder used only one vessel), statistical area or the date of fishing are not available in this dataset. The catch within and beyond the EEZ is reported. Prior to October 2001, equivalent information was collected for species subject to New Zealand's Quota Monitoring System on Quota Monitoring Returns (QMRs). This information was collected from December 1986 onwards until the QMR was replaced by the MHR in October 2001.
LFRR (Licensed Fish Receiver Returns)	The primary purpose of LFRR is for administration of the quota management system. LFRR data provides complete coverage of all species processed by licensed fish receivers. Fish not landed to a Licensed Fish Receiver (e.g. fish that are discarded) are not reported through this system.	January 1986 onwards	This dataset does not contain information about the origin of the fish apart from the quota holder. If a permit holder fishes in more than one fishstock in a month or uses more than one vessel, it may not be possible to relate the LFRR data to the landing records. This dataset is therefore useful mainly to estimate total catches for a species in a year. This dataset does not contain information about fish that was not landed to a Licensed Fish Receiver, such as fish that was discarded, eaten, sold at wharf etc.
Observer Data (from longline, purse seine, and trolling vessels)	To monitor the activities of fishing vessels operating in the New Zealand EEZ and to obtain reliable, accurate and independent catch, effort and biological information.	June 1988 onwards for longline, January 2006 onwards for Purse Seine & January 2007 for trolling vessels	This system does not cover all commercial catch. It covers a sample of the tuna fishing (about 975 observer days budgeted in 2008/09), but for the trips that are covered, more detailed information is available than is available from the commercial catch forms completed by fishers.