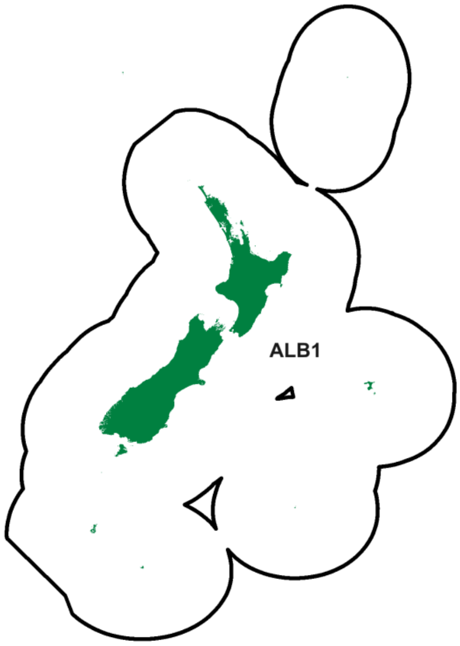
ALBACORE (ALB)

(*Thunnus alalunga)*
Ahipataha



1. FISHERY SUMMARY

Albacore is currently outside the Quota Management System.

Management of albacore stock throughout the South Pacific is the responsibility of the Western and Central Pacific Fisheries Commission (WCPFC). Under this regional convention New Zealand is responsible for ensuring that the management measures applied within New Zealand fisheries waters are compatible with those of the Commission.

At its seventh annual meeting in 2011 the WCPFC passed a Conservation and Management Measure (CMM) (this is a binding measure that all parties must abide by) CMM2010-05 relating to conservation and management measures for South Pacific albacore tuna. Key aspects of this CMM are repeated below:

1. "Commission Members, Cooperating Non-Members, and participating Territories (CCMs) shall not increase the number of their fishing vessels actively fishing for South Pacific albacore in the Convention Area south of 20°S above current (2005) levels or recent historical (2000–2004) levels".

2. The provisions of paragraph 1 shall not prejudice the legitimate rights and obligations under international law of small island developing State and Territory CCMs in the Convention Area for whom South Pacific albacore is an important component of the domestic tuna fishery in waters under their national jurisdiction, and who may wish to pursue a responsible level of development of their fisheries for South Pacific albacore.

3. CCMs that actively fish for South Pacific albacore in the Convention Area south of the equator shall cooperate to ensure the long-term sustainability and economic viability of

the fishery for South Pacific albacore, including cooperation and collaboration on research to reduce uncertainty with regard to the status of this stock.

4. This measure will be reviewed annually on the basis of advice from the Scientific Committee on South Pacific albacore."

1.1 Commercial fisheries

In New Zealand, albacore form the basis of a summer troll fishery, primarily on the west coasts of the North and South Islands. This fishery accounts for a large proportion of the domestic albacore landings. Albacore are also caught throughout the year by longline (1000–2500 t per year). Total annual landings between 2000 and 2011 have averaged 3831 t (largest landing 6744 t in 2003) (Table 1). Figure 1 shows the historical landings and fishing effort for albacore stocks.

The earliest known commercial catch of tuna (species unknown but probably skipjack tuna) was by trolling and was landed in Auckland in the year ending March 1943. Regular commercial catches of tuna, however, were not reported until 1961. These catches are summarised in Table 1 (species unknown but primarily albacore and skipjack and possibly included southern bluefin and yellowfin tuna). Prior to 1973 the albacore troll fishery was centred off the North Island (Bay of Plenty to Napier and New Plymouth) with the first commercial catches off Greymouth and Westport (54% of the total catch) in 1973. The expansion of albacore trolling to the west coast of the South Island immediately followed experimental fishing by the *W. J. Scott*, which showed substantial quantities of albacore off the Hokitika Canyon and albacore as far south as Doubtful Sound. Tuna longlining was not established as a fishing method in the domestic industry until the early 1990s.

While albacore trolling occurs in most FMAs during summer months and accounts for the bulk of the domestic albacore catch, they are also a longline target and are caught incidentally during longline sets for bigeye and southern bluefin tuna. Longline albacore has been important in some years since 1999 and currently represents 10% of annual domestic albacore landings. In addition to troll and longline, some albacore are reported caught by pole-and-line and hand line.

Table 1: Reported total New Zealand landings (t) and landings (t) from the South Pacific Ocean (SPO) of albacore tuna from 1972 to 2013.

Year	NZ fisheries waters	SPO	Year	NZ fisheries waters	SPO	Year	NZ fisheries waters	SPO
1972	240	39 521	1987	1 236	25 052	2002	5 566	73 240
1973	432	47 330	1988	672	37 867	2003	6 744	62 477
1974	898	34 049	1989	4 884	49 076	2004	4 459	61 871
1975	646	23 600	1990	3 011	36 062	2005	3 459	62 566
1976	25	29 082	1991	2 450	35 600	2006	2 542	62 444
1977	621	38 740	1992	3 481	38 668	2007	2 092	58 591
1978	1 686	34 676	1993	3 327	35 438	2008	3 720	62 740
1979	814	27 076	1994	5 255	42 318	2009	2 216	82 901
1980	1 468	32 541	1995	6 159	38 467	2010	2 292	88 942
1981	2 085	34 784	1996	6 320	34 359	2011	3 205	72 234
1982	2 434	30 788	1997	3 628	39 490	2012	2 993	87 429
1983	720	25 092	1998	6 525	50 371			
1984	2 534	24 704	1999	3 903	39 614			
1985	2 941	32 328	2000	4 428	47 338			
1986	2 044	36 590	2001	5 349	58 344			

Source: LFRR and MHR WCPFC Yearbook 2012 Anon (2013).

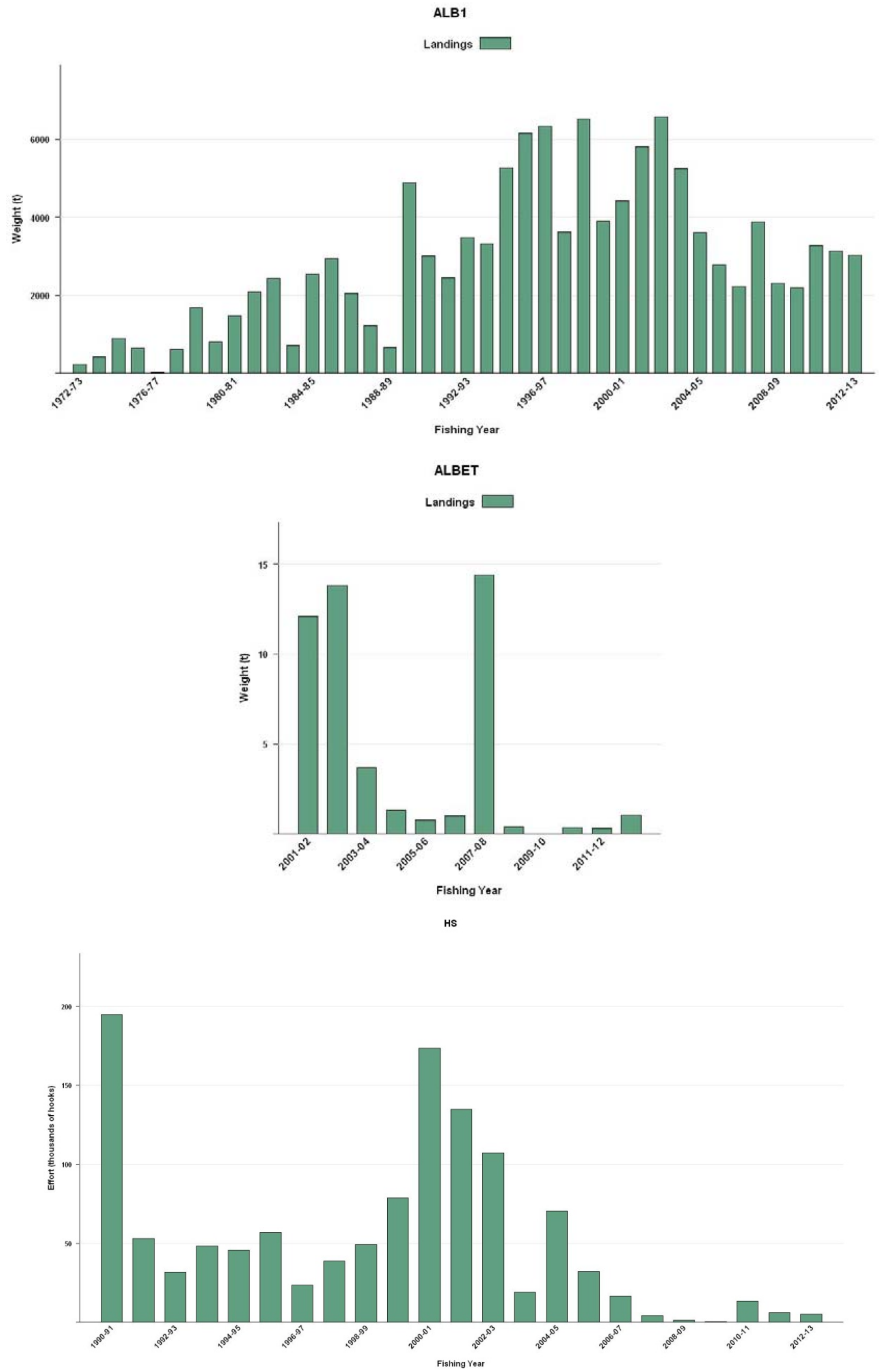


Figure 1: [Top and middle] Albacore catch from 1972–73 to 2012–13 within New Zealand waters (ALB 1) and 2001–02 to 2012–13 on the high seas (ALB ET). [Bottom] Fishing effort (number of hooks set) for all high seas New Zealand flagged surface longline vessels, from 1990–91 to 2012–13. [Figure continued on next page].

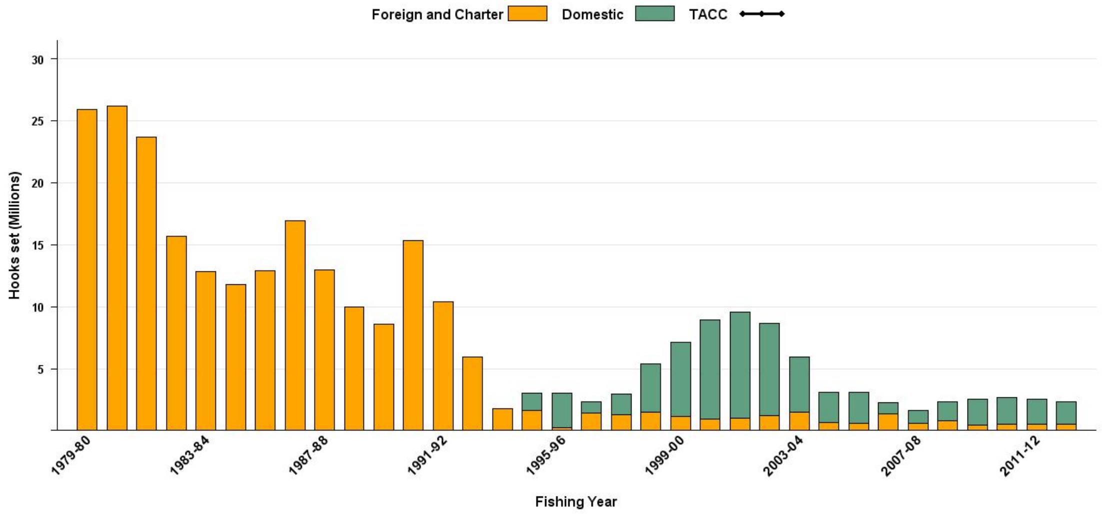


Figure 1 [Continued]: Fishing effort (number of hooks set) for all domestic foreign vessels (including effort by foreign vessels chartered by New Zealand fishing companies), from 1979–80 to 2012–13.

The New Zealand albacore fishery, especially the troll fishery, has been characterised by periodic poor years that have been linked to poor weather or colder than average summer seasons. Despite this variability, domestic albacore landings have steadily increased since the start of commercial fishing in the 1960s. The average catch in the 1960s (19 t) increased in the 1970s to 705 t, in the 1980s to 2256 t, and in the 1990s averaged 4571 t but both catch and effort have declined almost continuously through the 2000s from a high in 2002–03.

The South Pacific albacore catch in 2010 (88919 t) was the highest on record (12 000 t higher than the previous record in 2009 of 76500 t). Catches from within New Zealand fisheries waters in 2010 were about 3% of the South Pacific albacore catch.

Most albacore troll fishery catches are in the first and second quarters of the calendar year, with the fourth quarter important in some years (1994 to 1996). Most of the troll fishery catch comes from FMA 7 off the west coast of the South Island although FMA 1, FMA 2, FMA 8 and FMA 9 have substantial catches in some years. High seas troll catches have been infrequent and a minor component (maximum catch of 42.2 t in 1991) of the New Zealand fishery over the 1991 to 2011 period. Albacore are caught by longline throughout the year as a bycatch on sets targeting bigeye and southern bluefin tuna. Most of the longline albacore catch is reported from FMA 1 and FMA 2 with lesser amounts caught in FMA 9. While albacore are caught regularly by longline in high seas areas, New Zealand effort and therefore catches are small.

Small catches of albacore are occasionally reported using pole-and-line and hand line gear. Pole-and-line catches of albacore have been reported from FMA 1, FMA 2, FMA 5, FMA 7, and FMA 9. Hand line catches have been reported from FMA 1 and FMA 7.

The majority of albacore are caught in the New Zealand surface longline fishery. While 66% of longline fishing effort is directed at bigeye tuna (Figure 2), across all longline fisheries, albacore make up the bulk of the catch (32%) (Figure 3). Albacore catch in longline fisheries is distributed along the east and west coast of the North Island and the west coast of the South Island. The west coast South Island fishery predominantly targets southern bluefin tuna, whereas the North Island fisheries target a range of species including bigeye, swordfish, and southern bluefin tuna. The troll fishery targets albacore and occurs along the entire west coast of the North and South Island with some targeted fishing on the east coast of the North Island (Figure 4).

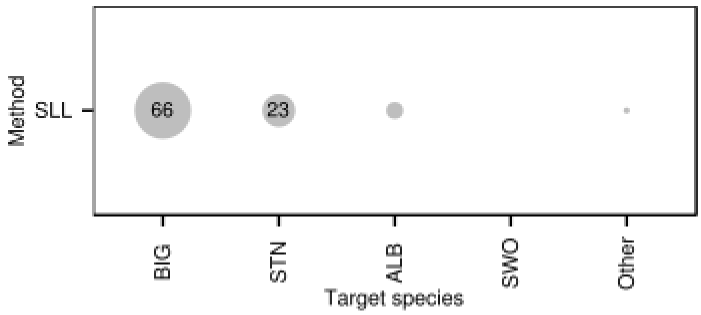


Figure 2: A summary of the proportion of landings of albacore taken by each target fishery and fishing method. The area of each circle is proportional to the percentage of landings taken using each combination of fishing method and target species. The number in the circle is the percentage (Bentley et al 2013).

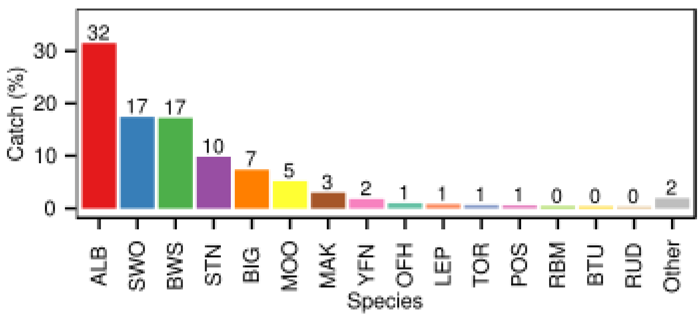


Figure 3: A summary of species composition of the reported surface longline catch. The percentage by weight of each species is calculated for all surface longline trips (Bentley et al 2013).

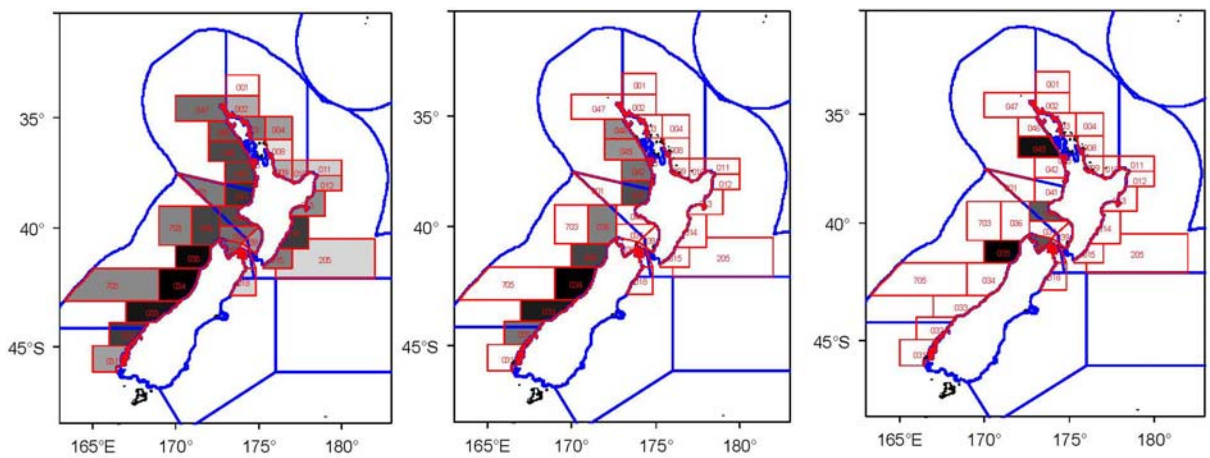


Figure 4: Plots showing the albacore catch by Statistical Area from CELR reporting forms (left); catch sampled in fish processing sheds (centre); and observed catch (right) for the 2011–12 fishing year.

Across all fleets in the longline fishery, 38.2% of albacore tuna were alive when brought to the side of the vessel (Table 2). The domestic fleets retained around 96–98% of their albacore tuna catch, while the foreign charter fleet retain almost all the albacore (98–100%). The Australian fleet that fished in New Zealand waters in 2006–07 also retained most of the albacore catch (92.4%) (Table 3).

Table 2: Percentage of albacore (including discards) that were alive or dead when arriving at the longline vessel and observed during 2006–07 to 2009–10, by fishing year, fleet and region. Small sample sizes (number observed < 20) were omitted Griggs & Baird (2013).

Year	Fleet	Area	% alive	% dead	Number
2006–07	Australia	North	21.5	78.5	79
	Charter	North	61.2	38.8	784
		South	77.3	22.7	587
	Domestic	North	28.1	71.9	1 880
	Total		**44.4**	**55.6**	**3 330**
2007–08	Charter	South	71.3	28.7	167
	Domestic	North	22.7	77.3	1 765
	Total		**26.9**	**73.1**	**1 932**
2008–09	Charter	North	84.6	15.4	410
		South	79.5	20.5	112
	Domestic	North	33.7	66.3	1 986
	Total		**44.0**	**56.0**	**2 511**
2009–10	Charter	South	82.1	17.9	78
	Domestic	North	28.8	71.2	1 766
		South	42.9	57.1	42
	Total		**31.3**	**68.7**	**1 886**
Total all strata			**38.2**	**61.8**	**9 659**

Table 3: Percentage albacore that were retained, or discarded or lost, when observed on a longline vessel during 2006–07 to 2009–10, by fishing year and fleet. Small sample sizes (number observed < 20) omitted Griggs & Baird (2013).

Year	Fleet	% retained	% discarded or lost	Number
2006–07	Australia	92.4	7.6	79
	Charter	97.7	2.3	1 448
	Domestic	96.1	3.9	1 882
	Total	**96.7**	**3.3**	**3 409**
2007–08	Charter	98.8	1.2	170
	Domestic	95.9	4.1	1 769
	Total	**96.1**	**3.9**	**1 939**
2008–09	Charter	99.7	0.3	605
	Domestic	97.8	2.2	1 993
	Total	**98.2**	**1.8**	**2 598**
2009–10	Charter	100.0	0.0	89
	Domestic	97.2	2.8	1 814
	Total	**97.3**	**2.7**	**1 903**
Total all strata		**97.1**	**2.9**	**9 849**

1.2 Recreational fisheries

Recreational fishers catch albacore by trolling. There is some uncertainty with all recreational harvest estimates for albacore as presented below. Bradford (1996, 1998) provides estimates of the recreational catch of albacore. While the information provided is restricted to 1993 and 1996, information on where and when catches are made and by what fishing methods is provided. Bradford indicates that recreational albacore catches are made in summer (91%) and autumn (9%) months by a mixture of trolling (73%) and lining from boats (27%) in the parts of FMA 1, FMA 2 and FMA 9 surveyed. The recreational survey in 1996 provides greater area coverage and Bradford provides estimates of the albacore catch from FMA 1, FMA 2, FMA 3, FMA 5, FMA 8 and FMA 9 as given in Table 4. The historic survey results suggest annual recreational catches of albacore were around 245–260 t.

A key component of estimating recreational harvest from diary surveys is determining the proportion of the population that fish. The Recreational Technical Working Group concluded that the harvest estimates from the diary surveys should be used only with the following qualifications: a) they may be very inaccurate; and b) the 1996 and earlier surveys contain a methodological error.

The provisional results of the national survey of amateur harvest in 2011–12 (Large Scale Multi Species Survey) estimated about 22 000 albacore tuna were kept with an estimated weight of 92 t. This is a similar harvest weight to that for skipjack tuna in the same survey.

Table 4: Estimates of recreational albacore catch by number and weight (t).

Year	Area	Catch (number)	Catch (t)
1993	MFish. North region	48 000	245
1996	FMA 1	16 000	82
	FMA 2	20 000	102
	FMA 3	< 500	< 2.5
	FMA 5	2 000	10
	FMA 8	5 000	26
	FMA 9	8 000	41
	1996 total	51 000 to 51 500	260 to 263

Source: Bradford (1996, 1998).

1.3 Customary non-commercial fisheries

It is uncertain whether albacore were caught by early Maori, although it is clear that they trolled lures (for kahawai) that are very similar to those still used by Tahitian fishermen for various small tunas. Given the number of other oceanic species known to Maori, and the early missionary reports of Maori regularly fishing several miles from shore, albacore were probably part of the catch of early Maori.

An estimate of the current customary catch is not available.

1.4 Illegal catch

There is no known illegal catch of albacore in the EEZ or adjacent high seas.

1.5 Other sources of mortality

Discarding of albacore has not been reported in the albacore troll fishery (based on limited observer coverage in the 1980s). Low discard rates (average 3.3%) have been observed in the longline fishery over the period 1991–92 to 1996–97. Of those albacore discarded, the main reason recorded by observers was shark damage. Similarly, the loss of albacore at the side of the vessel was low (0.6%). Mortality in the longline fishery associated with discarding and loss while landing is estimated at 1.8% of the albacore catch by longline.

2. BIOLOGY

The troll fishery catches juvenile albacore typically 5 to 8 kg in size with the mean fork length for 1996–97 to 2006–07 being 63.5 cm (Figure 5). Clear length modes associated with cohorts recruiting to the troll fishery are evident in catch length distributions. In 2006–07 three modes with median lengths of 51, 61, and 72 cm were visible, that correspond to the 1, 2, and 3 year old age classes.

The mean length of troll caught albacore in 2009–10 was 61.6 cm. The modal progressions in the available catch length frequency time series from 1996–97 to 2010–11 are of utility for estimating annual variations in albacore recruitment. Longline fleets typically catch much larger albacore over a broader size range (56–105 cm) with variation occurring as a function of latitude and season. The mean length of longline-caught albacore from 1987 to 2007 is 80.4 cm. The smallest longline caught albacore are those caught in May to June immediately north of the Sub-tropical Convergence Zone (STCZ). Fish further north at this time and fish caught in the EEZ in autumn and winter are larger. There is high inter-annual variation in the longline catch length composition although length modes corresponding to strong and weak cohorts are often evident between years.

Sampling of troll caught albacore has been carried out annually (except 2008–09) since the 1996–97 fishing year. The sampling programme aims to sample in the ports of Auckland, Greymouth and New Plymouth (which was included for the first time in 2003). Initially the programme aimed to sample 1000 fish per month in each port. In 2010 the sample targets were changed and the programme now aims to sample approximately 5000 fish per year and the sample targets (Table 5) are distributed throughout the season to reflect the fishing effort distribution (Figure 5). In addition, in each port at least 100 fish per month are sub-sampled for weight. Length weight relationships are presented in Table 6 and length frequency distributions are presented in Figure 5.

Table 5: Catch sample targets for length measurements in the New Zealand troll sampling programme.

Month	Target number of fish
December	215
January	1 318
February	1 929
March	1 185
April	314
Total	4 961

Histological gonadosomatic index analysis has shown that female albacore from New Caledonian and Tongan waters spawn from November–February.

Farley et al (2012) have recently completed a comprehensive analysis of South Pacific albacore biology. They found that otoliths were more reliable as ageing material then vertebrae. Their work using otoliths (validated by direct marking with oxytetracycline, and indirect methods) showed that the longevity of albacore was found to be at least 14 years, with significant variation in growth between sexes and across longitudes. They found that growth rates were similar between sexes up until age 4, after which the growth for males was on average greater than that for females, with males reaching an average maximum size more than 8 cm larger than females. Farley et al (2012) contend that the different growth rates between sexes may be responsible for the observed dominance of males among fish in the larger size classes (greater than 95 to 100 cm fork length). This study showed that growth rates were also consistently greater at more easterly longitudes than at westerly longitudes for both females and males. While they were not able to identify the determinants of the longitudinal variation in growth of albacore, they suggest that variation in oceanography, particularly the depth of the thermocline, may affect regional productivity and therefore play a role in modifying growth of South Pacific albacore.

Farley et al (2012) found that spawning was synchronised between 10 and 25°S during the austral summer. They confirmed that albacore spawn during the early hours of the morning and that they are capable of spawning daily, although spawning occurs on average every 1.3 days during peak spawning months. The number of eggs released per spawning event averaged 1.2 million oocytes. Although they were not able to sample females monthly in the region east of 175°E, they found no evidence of large variations in the reproduction or spawning dynamics of females across the southwest Pacific Ocean. Farley et al (2012) did, however, demonstrate that the proportion of females mature-at-length varied significantly with latitude in the Australian region, and that this variation was due to different geographic distributions of mature and immature fish during the year. A method was proposed to account for the latitudinal variation in maturity. Preliminary results of that analysis showed that the predicted age-at-50% maturity was 4.5 years, and the predicted age-at-100% maturity was age 7.

Sex ratios appear to vary with fishery from 1:1 (male:female) in the New Zealand troll and longline fishery and, 2:1 to 3:1 in the Tonga–New Caledonia longline fishery.

Estimates of growth parameters from Farley et al (2012) are presented in Table 7.

Table 6: The ln(length)/ln(weight) relationships of albacore [ln(greenweight) = b_0 + b_1 * ln(fork length)]. Weight is in kilograms and length in centimetres.

	n	b_0	SE b_0	b_1	SE b_1	R^2
Males	160	-10.56	0.18	2.94	0.04	0.97
Females	155	-10.10	0.26	2.83	0.06	0.93
Troll caught	320	-10.44	0.16	2.91	0.03	0.95
Longline caught	21 824	-10.29	0.03	2.90	0.01	0.91

Table 7: Parameter estimates (± standard error) from five candidate growth models fitted to length-at-age data for South Pacific albacore. Parameter estimates also given for the logistic model fitted separately to female and male length-at-age data. The small-sample bias-corrected form of Akaike's information criterion AICc are provided for each model fit, and Akaike differences AICcΔi, and Akaike weights *wi* are given for the fit of the five candidate models to all data. Note that the parameters *k* and *t* are defined differently in each model (see text for definitions), such that values are not comparable across models (Farley et al 2012).

Sex	Model	L_∞	k	t	p	δ	γ	v	AICc	ΔAICc	w_i
All	VBGM	104.52	0.40	-0.49					11831.67	23.89	0
		(0.44)	(0.01)	(0.05)							
	Gompertz	103.09	0.50	0.47					11811.54	3.77	0.08
		(0.37)	(0.01)	(0.03)							
	Logistic	102.09	0.61	1.12					11807.77	0.00	0.53
		(0.33)	(0.01)	(0.03)							
	Richards	102.30	0.58	0.98	1.32				11809.40	1.63	0.24
		(0.49)	(0.04)	(0.24)	(0.68)						
	Schnute-	101.52	0.05			-0.97	3.54	2.07	11810.25	2.48	0.15
	Richards	(0.60)	(0.08)			(0.08)	(2.65)	(0.76)			
Female	Logistic	96.97	0.69	0.99					5746.90		
		(0.37)	(0.02)	(0.03)							
Male	Logistic	105.34	0.59	1.25					5729.26		
		(0.44)	(0.02)	(0.04)							

3. STOCKS AND AREAS

Two albacore stocks (North and South Pacific) are recognized in the Pacific Ocean based on location and seasons of spawning, low longline catch rates in equatorial waters and tag recovery information. The South Pacific albacore stock is distributed from the coast of Australia and archipelagic waters of Papua New Guinea eastward to the coast of South America south of the equator to at least 49ºS. However, there is some suggestion of gene flow between the North and South Pacific stocks based on an analysis of genetic population structure.

Most catches occur in longline fisheries in the EEZs of other South Pacific states and territories and in high seas areas throughout the geographical range of the stock.

Troll and longline vessels catch albacore in all FMAs in New Zealand and there may be substantial potential for expansion to high seas areas.

4. ENVIRONMENTAL AND ECOSYSTEM CONSIDERATIONS

The figures and tables in this section were updated for the November 2013 Fishery Assessment Plenary after review of the text by the Aquatic Environment Working Group in 2012. This summary is from the perspective of the albacore longline fishery; a more detailed summary from an issue-by-issue perspective is available in the Aquatic Environment and Biodiversity Annual Review where the consequences are also discussed (http://www.mpi.govt.nz/Default.aspx?TabId=126&id=1644) (Ministry for Primary Industries 2012).

4.1 Role in the ecosystem

Albacore (*Thunnus alalunga*) are apex predators, found in the open waters of all tropical and temperate ocea ns, feeding opportunistically on a mixture of fish, crustaceans, squid and juveniles also feed on a variety of zooplankton and micronecton species.

4.2 Incidental catch (seabirds, sea turtles and mammals)

The protected species, capture estimates presented here include all animals recovered onto the deck (alive, injured or dead) of fishing vessels but do not include any cryptic mortality (e.g., seabirds caught on a hook but not brought onboard the vessel.

4.3 Troll fishery

From 2006 to 2012 the troll catch averages 93% albacore, the remaining 7% is made up mostly of teleosts (Table 8). The observer coverage of the troll fleet has been ongoing since 2006–07 and coverage has averaged 0.7% of the effort during that time; no protected species have been observed as bycatch in this fishery. The shed sampling programme has sampled on average 4.1% of the fishing effort during that time. Ray’s bream make up the bulk of the bycatch with minor catches of skipjack tuna, barracouta and kahawai (Table 8).

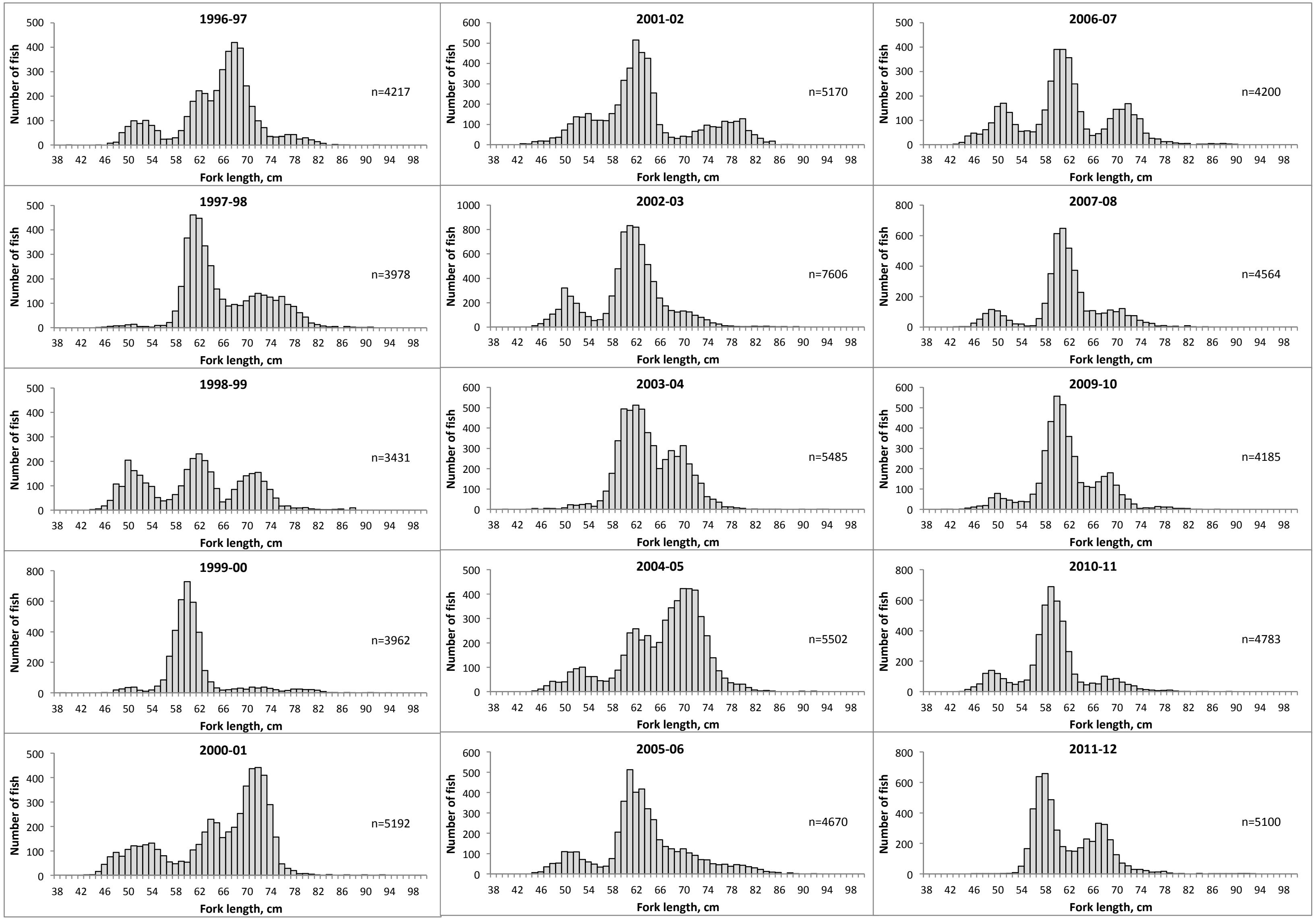


Figure 5: Size composition of albacore taken in the New Zealand domestic commercial troll fishery 1996–97 to 2011–12.

Table 8: Observed species composition of the albacore troll fishery. Number of fish recorded in the observer programme from 2006–07 to 2011–12, number in parentheses is the percentage of total catch.

		Number of fish caught						
Species	Scientific name	2006–07	2007–08	2008–09	2009–10	2010–11	2011–12	Total of 6 years
Albacore tuna	*Thunnus alalunga*	1684 (99.82)	1776 (98.89)	1755 (97.39)	5403 (88.01)	4913 (90.28)	2772 (98.68)	18303 (93.03)
Rays bream	*Brama brama*		18 (1.00)	12 (0.67)	537 (8.75)	35 (0.64)	7 (0.25)	609 (3.10)
Skipjack tuna	*Katsuwonus pelamis*	1 (0.06)	2 (0.11)	26 (1.44)	20 (0.33)	359 (6.60)	2 (0.07)	410 (2.08)
Barracouta	*Thyrsites atun*			1 (0.06)		126* (2.32)	13 (0.46)	140 (0.71)
Kahawai	*Arripis trutta*			6 (0.33)		5 (2.32)	14 (0.46)	25 (0.71)
Kingfish	*Seriola lalandi*			2 (0.11)	4 (0.07)	4 (0.07)		10 (0.13)
Dolphinfish	*Coryphaena hippurus*				1 (0.02)			1 (0.01)
Mako shark	*Isurus oxyrinchus*						1 (0.04)	1 (0.01)
Unidentified		2 (0.12)			174 (2.83)			176 (0.89)

*Includes one trip that landed 102 barracouta

Table 9: Number of albacore troll vessels, albacore landings, hooks set, and days fished and observed and the percentage observed, compared with those shed sampled.

	Fished				Observed				% Observed			
ALB–year	Days	Vessels	Landings	Hooks	Days	Vessels	Landings	Hooks	Days	Vessels	Landings	Hooks
2006–07	3 389	134	845	43 096	10	1	1	120	0.3	0.7	0.1	0.3
2007–08	4 479	153	1 296	54 092	8	1	1	120	0.2	0.7	0.1	0.2
2008–09	4 478	161	1 163	56 404	18	3	4	413	0.4	1.9	0.3	0.7
2009–10	3 196	120	856	39 511	49	6	10	637	1.5	5.0	1.2	1.6
2010–11	4 619	154	1 225	58 309	46	5	8	534	1.0	3.2	0.7	0.9
2011–12	4 817	155	1 370	60 592	24	1-2	9	317	0.5	1.3	0.7	0.5

	Shed sampled				% Shed sampled			
ALB–year	Days	Vessels	Landings	Hooks	Days	Vessels	Landings	Hooks
2006–07	125	14	21	1 817	3.7	10.4	2.5	4.2
2007–08	157	22	31	1 992	3.5	14.4	2.4	3.7
2008–09	0	0	0	0	0.0	0.0	0.0	0.0
2009–10	208	30	41	2 691	6.5	25.0	4.8	6.8
2010–11	237	35	48	3 097	5.1	22.7	3.9	5.3
2011–12	207	30	50	2 752	4.3	19.4	3.6	4.5

4.4 Longline

4.4.1 Seabird bycatch

Between 2002–03 and 2011–12, there were 73 observed captures of birds in albacore longline fisheries. Seabird capture rates since 2003 are presented in Figure 6. Seabird bycatch distributions are more frequent off the east coast of the North Island and Kermadec Island regions (see Table 10 and Figure 7). The analytical methods used to estimate capture numbers across the commercial fisheries have depended on the quantity and quality of the data, in terms of the numbers observed captured and the representativeness of the observer coverage. Ratio estimation is used to calculate total captures in longline fisheries by target fishery fleet and area (Baird 2008) and by all fishing methods (Abraham et al 2010).

Through the 1990s the minimum seabird mitigation requirement for surface longline vessels was the use of a bird scaring device (tori line) but common practice was that vessels set surface longlines primarily at night. In 2007 a notice was implemented under s11 of the Fisheries Act 1996 to formalise the requirement that surface longline vessels only set during the hours of darkness and use a tori line when setting. This notice was amended in 2008 to add the option of line weighting and tori line use if setting during the day. In 2011 the notices were combined and repromulgated under a new regulation (Regulation 58A of the Fisheries (Commercial Fishing) Regulations 2001) which provides a more flexible regulatory environment under which to set seabird mitigation requirements.

Table 10: Number of observed seabird captures in albacore longline fisheries, 2002–03 to 2011–12, by species and area. See glossary above for areas used for summarising the fishing effort and protected species captures. The risk ratio is an estimate of aggregate potential fatalities across trawl and longline fisheries relative to the Potential Biological Removals, PBR (from Richard and Abraham (2013) where full details of the risk assessment approach can be found). It is not an estimate of the risk posed by fishing for albacore tuna using longline gear but rather the total risk for each seabird species. Other data, version 20130305.

Albatross species	Risk ratio	Kermadec Islands	Northland and Hauraki	East Coast North Island	Total
Salvin's	Very high	0	0	1	1
Southern Buller's	Very high	0	0	8	8
Gibson's	High	0	0	7	7
Antipodean	High	0	0	3	3
Campbell black-browed	Medium	0	3	14	17
Total	**N/A**	**0**	**3**	**33**	**36**
Other sea birds					
Black petrel	Very high	0	1	0	1
Westland petrel	Medium	0	0	2	2
White chinned petrel	Medium	0	0	2	2
Grey petrel	Medium	0	2	3	5
Sooty shearwater	Very low	0	0	8	8
Great winged petrel	Very low	11	4	2	17
White headed petrel	Very low	2	0	0	2
Total	**N/A**	**13**	**7**	**17**	**37**

Table 11: Effort, observed and estimated seabird captures by fishing year for the albacore fishery within the EEZ. For each fishing year, the table gives the total number of hooks; the number of observed hooks; observer coverage (the percentage of hooks that were observed); the number of observed captures (both dead and alive); the capture rate (captures per thousand hooks); and the mean number of estimated total captures (with 95% confidence interval). Estimates are based on methods described in Thompson et al (2013) and are available via http://www.fish.govt.nz/en-nz/Environmental/Seabirds/. Estimates from 2002–03 to 2010–11 are based on data version 20120531 and preliminary estimates for 2011–12 are based on data version 20130305.

	Fishing effort			Observed captures		Estimated captures	
Fishing year	All hooks	Observed hooks	% observed	Number	Rate	Mean	95% c.i.
2002–2003	1 893 010	980 772	51.8	72	0.073	324	217–490
2003–2004	463 164	1 600	0.3	0	0	133	79–215
2004–2005	136 812	4 317	3.2	1	0.232	24	10–48
2005–2006	60 360	600	1	0	0	13	3–29
2006–2007	N/A	0	N/A	0	0	2	0–9
2007–2008	N/A	0	N/A	0	0	0	0–3
2008–2009	7 800	2 100	26.9	0	0	2	0–11
2009–2010	20 350	4 979	24.5	0	0	8	0–33
2010–2011	13 610	1 000	7.3	0	0	4	0–16
2011–2012†	0	0	-	0	0	0	0–0

†Provisional data, model estimates not finalised.

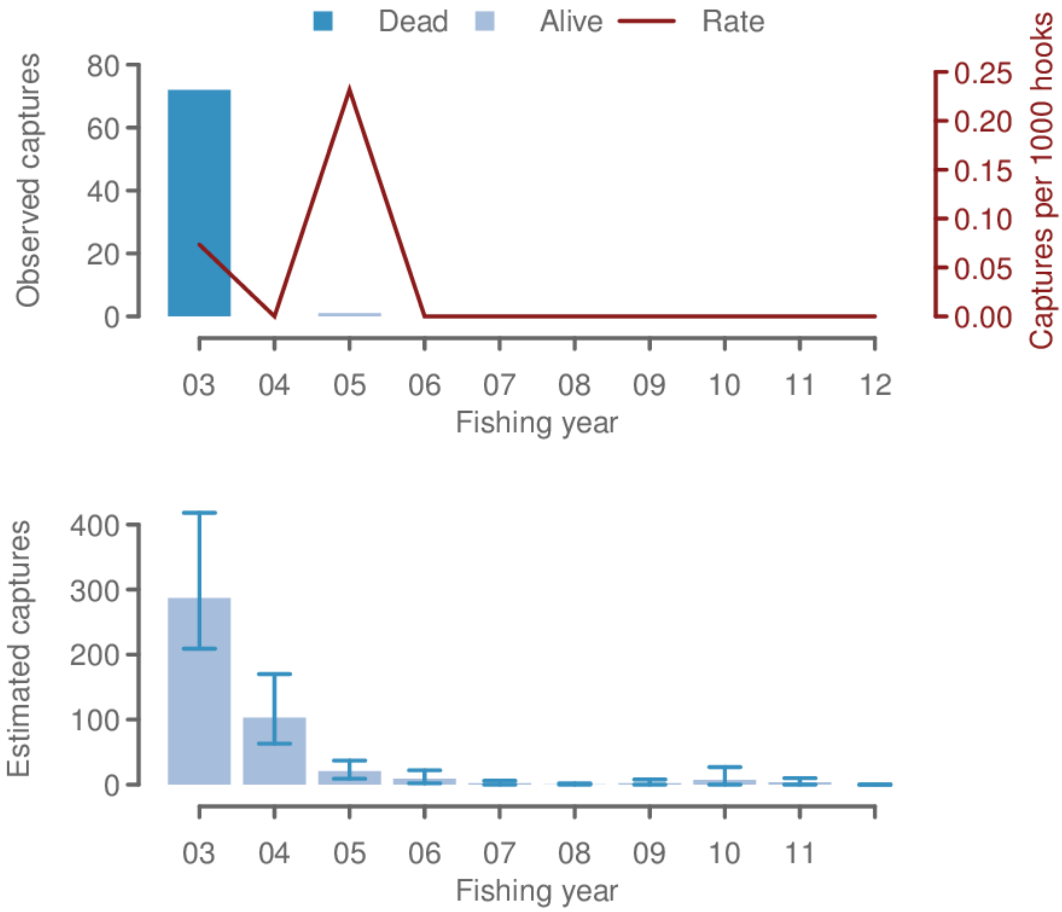


Figure 6: Observed and estimated captures of seabirds in albacore longline fisheries from 2002–03 to 2011–12.

Figure 7: Distribution of fishing effort targeting albacore and observed seabird captures, 2002–03 to 2011–12. Fishing effort is mapped into 0.2-degree cells, with the colour of each cell being related to the amount of effort. Observed fishing events are indicated by black dots, and observed captures are indicated by red dots. Fishing is only shown if the effort could be assigned a latitude and longitude, and if there were three or more vessels fishing within a cell. In this case, 59.4% of the effort is shown. See glossary for areas used for summarising the fishing effort and protected species captures.

4.4.2 Sea turtle bycatch

Between 2002–03 and 2011–12, there were no observed captures of turtles in albacore longline fisheries.

4.2.3 Marine Mammals

4.2.3.1 Cetaceans

Cetaceans are dispersed throughout New Zealand waters (Perrin et al 2008). The spatial and temporal overlap of commercial fishing grounds and cetacean foraging areas has resulted in cetacean captures in fishing gear (Abraham & Thompson 2009, 2011). Between 2002–03 and 2011–12, there was one observed capture of an unidentified cetacean in the albacore longline fisheries (Table 13 and Figure 9) (Thompson et al 2013). This capture was recorded as being caught and released alive (Thompson & Abraham 2010). The cetacean capture took place in the Northland region (Figure 10).

Table 12: Effort and sea turtle captures by fishing year for the albacore fishery within the EEZ. For each fishing year, the table gives the total number of hooks; the number of observed hooks; observer coverage (the percentage of hooks that were observed); the number of observed captures (both dead and alive); and the capture rate (captures per thousand hooks). For more information on the methods used to prepare the data, see Thompson et al (2013).

	Fishing effort			Observed captures	
Fishing year	All hooks	Observed hooks	% observed	Number	Rate
2002–2003	1 892 610	980 772	51.8	0	0
2003–2004	462 264	1 600	0.3	0	0
2004–2005	136 812	4 317	3.2	0	0
2005–2006	60 360	600	1.0	0	0
2006–2007	N/A	0	N/A	0	-
2007–2008	N/A	0	N/A	0	-
2008–2009	7 800	2 100	26.9	0	0
2009–2010	20 350	4 979	24.5	0	0
2010–2011	13 610	1 000	7.3	0	0
2011–2012	N/A	0	N/A	0	-

Figure 8: Distribution of fishing effort targeting albacore and observed sea turtle captures, 2002–03 to 2011–12. Fishing effort is mapped into 0.2-degree cells, with the colour of each cell being related to the amount of effort. Observed fishing events are indicated by black dots, and observed captures are indicated by red dots. Fishing is only shown if the effort could be assigned a latitude and longitude, and if there were three or more vessels fishing within a cell. In this case, 59.4% of the effort is shown. See glossary for areas used for summarising the fishing effort and protected species captures.

Table 13: Number of observed cetacean captures in albacore longline fisheries, 2002–03 to 2011–12, by species and area. Data from Thompson et al (2013), retrieved from http://data.dragonfly.co.nz/psc/. See glossary above for a description of the areas used for summarising the fishing effort and protected species captures.

	Northland and Hauraki	Total
Unidentified cetacean	1	1

Table 14: Effort and cetacean captures by fishing year for the albacore fishery within the EEZ. For each fishing year, the table gives the total number of hooks; the number of observed hooks; observer coverage (the percentage of hooks that were observed); the number of observed captures (both dead and alive); and the capture rate (captures per thousand hooks). For more information on the methods used to prepare the data, see Thompson et al (2013).

	Fishing effort			Observed captures	
Fishing year	All hooks	Observed hooks	% observed	Number	Rate
2002–2003	1 892 610	980 772	51.8	1	0.001
2003–2004	462 264	1 600	0.3	0	0
2004–2005	136 812	4 317	3.2	0	0
2005–2006	60 360	600	1.0	0	0
2006–2007	N/A	0	N/A	0	0
2007–2008	N/A	0	N/A	0	0
2008–2009	7 800	2 100	26.9	0	0
2009–2010	20 350	4 979	24.5	0	0
2010–2011	13 610	1 000	7.3	0	0
2011–2012	N/A	0	N/A	0	0

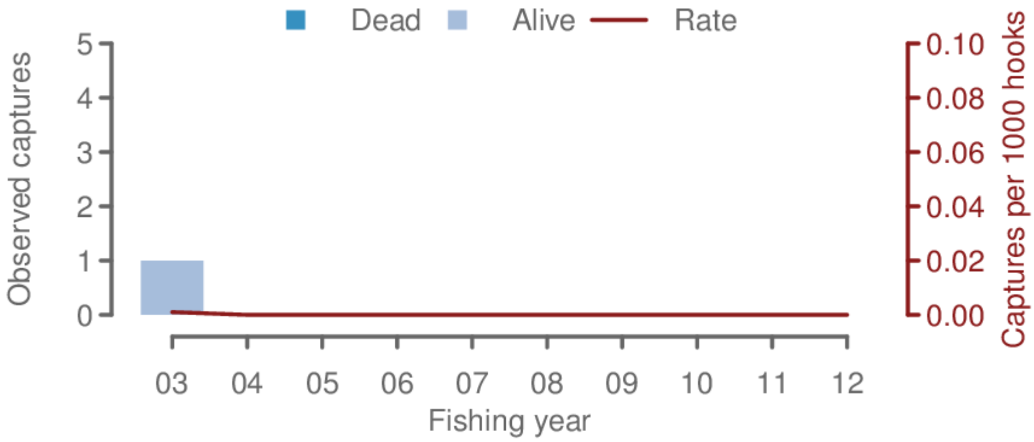


Figure 9: Observed captures of cetaceans in albacore longline fisheries from 2002–03 to 2011–12.

Figure 10: Distribution of fishing effort targeting albacore and observed cetacean captures, 2002–03 to 2011–12. Fishing effort is mapped into 0.2-degree cells, with the colour of each cell being related to the amount of effort. Observed fishing events are indicated by black dots, and observed captures are indicated by red dots. Fishing is only shown if the effort could be assigned a latitude and longitude, and if there were three or more vessels fishing within a cell. In this case, 59.4% of the effort is shown. See glossary for areas used for summarising the fishing effort and protected species captures.

4.2.3.2 New Zealand fur seal bycatch

Currently, New Zealand fur seals are dispersed throughout New Zealand waters, especially in waters south of about 40º S to Macquarie Island. The spatial and temporal overlap of commercial fishing grounds and New Zealand fur seal foraging areas has resulted in New Zealand fur seal captures in fishing gear (Mattlin 1987, Rowe 2009). Most fisheries with observed captures occur in waters over or close to the continental shelf, which around much of the South Island and offshore islands slopes steeply to deeper waters relatively close to shore, and thus rookeries and haulouts. Captures on longlines occur when the seals attempt to feed on the fish and bait catch during hauling. Most New Zealand fur seals are released alive, typically with a hook and short snood or trace still attached.

New Zealand fur seal captures in surface longline fisheries have been generally observed in waters south and west of Fiordland, but also in the Bay of Plenty-East Cape area when the animals have attempted to take bait or fish from the line as it is hauled. Between 2002–03 and 2011–12, there were no observed captures of New Zealand fur seals in albacore longline fisheries (Thompson et al 2013) (Table 15 and Figure 11).

Table 15: Effort and captures of New Zealand fur seals by fishing year for the albacore longline fishery within the EEZ. For each fishing year, the table gives the total number of hooks; the number of observed hooks; observer coverage (the percentage of hooks that were observed); the number of observed captures (both dead and alive); and the capture rate (captures per thousand hooks). Data from Thompson et al (2013), retrieved from http://data.dragonfly.co.nz/psc/.

	Fishing effort			Observed captures	
Fishing year	All hooks	Observed hooks	% observed	Number	Rate
2002–2003	1 892 610	980 772	51.8	0	0
2003–2004	462 264	1 600	0.3	0	0
2004–2005	136 812	4 317	3.2	0	0
2005–2006	60 360	600	1.0	0	0
2006–2007	N/A	0	N/A	0	0
2007–2008	N/A	0	N/A	0	0
2008–2009	7 800	2 100	26.9	0	0
2009–2010	20 350	4 979	24.5	0	0
2010–2011	13 610	1 000	7.3	0	0
2011–2012	N/A	0	N/A	0	0

Figure 11: Distribution of fishing effort targeting albacore and observed fur seal captures, 2002–03 to 2011–12. Fishing effort is mapped into 0.2-degree cells, with the colour of each cell being related to the amount of effort. Observed fishing events are indicated by black dots, and observed captures are indicated by red dots. Fishing is only shown if the effort could be assigned a latitude and longitude, and if there were three or more vessels fishing within a cell. In this case, 59.4% of the effort is shown. See glossary for areas used for summarising the fishing effort and protected species captures.

4.3 Incidental fish bycatch

See above Section 4.3.

4.4 Benthic interactions

N/A

4.5 Key environmental and ecosystem information gaps

Cryptic mortality is unknown at present but developing a better understanding of this in future may be useful for reducing uncertainty of the seabird risk assessment and could be a useful input into risk assessments for other species groups.

The survival rates of released target and bycatch species is currently unknown.

Observer coverage in the New Zealand fleet is not spatially and temporally representative of the fishing effort.

5. STOCK ASSESSMENT

No assessment is possible for albacore within New Zealand fisheries waters as the proportion of the greater stock found within New Zealand fisheries waters is unknown and is likely to vary from year to year. With the establishment of WCPFC in 2004, stock assessments of the South Pacific Ocean (SPO) stock of albacore tuna are now undertaken by the Oceanic Fisheries Programme (OFP) of Secretariat of the Pacific Community (SPC) under contract to WCPFC.

The most recent assessment was undertaken in 2012 using MULTIFAN-CL (Hoyle et al 2012). A summary of that assessment can be found below:

This assessment uses the same underlying structural assumptions as the 2011 assessment, but used improved knowledge of albacore biology from the Farley et al (2012) study. The main conclusions of the assessment are Hoyle et al (2012):

a) Estimated stock status are based on the median of the grid and is similar to 2009 and 2011 estimates (Table 16; Figures 12–15).
b) "The fishing mortality reference point $F_{current}/F_{MSY}$ has a median estimate of 0.21 (90% CI 0.04–1.08), and on that basis we conclude that there is low risk that overfishing is occurring. The corresponding biomass-based reference points $B_{current}/B_{MSY}$ and $SB_{current}/SB_{MSY}$ are estimated to be above 1.0 (median 1.6 with range of 1.4–1.9, and median 2.6 with range of 1.5–5.2, respectively), and therefore the stock is not in an overfished state.
c) The median estimate of *MSY* from the structural sensitivity analysis (99 085 t (46 560 – 215 445 t) is comparable to the recent levels of (estimated) catch from the fishery ($C_{current}$ 78 664 t, C_{latest} 89 790 t).
d) There is no indication that current levels of catch are causing recruitment overfishing, particularly given the age selectivity of the fisheries.
e) Longline catch rates are declining, and catches over the last 10 years have been at historically high levels and are increasing. These trends may be significant for management.
f) Management quantities are very sensitive to the estimated growth curve. Given that biological research indicates spatial and sex-dependent variation in growth, which is not

included in the model, these uncertainties should be understood when considering estimates of management parameters."

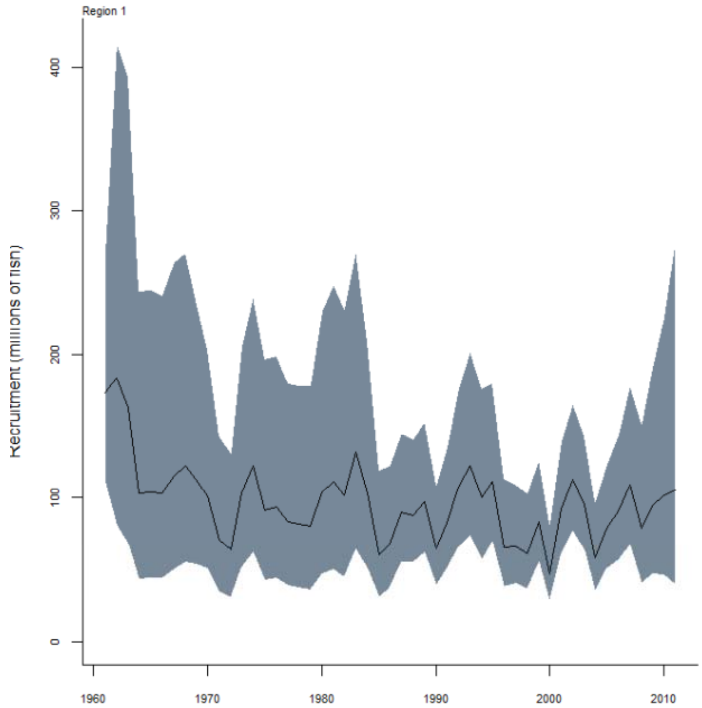


Figure 12: Annual recruitment (number of fish) estimates from the reference case model. The grey area represents parameter uncertainty estimated from the Hessian matrix Hoyle et al (2012).

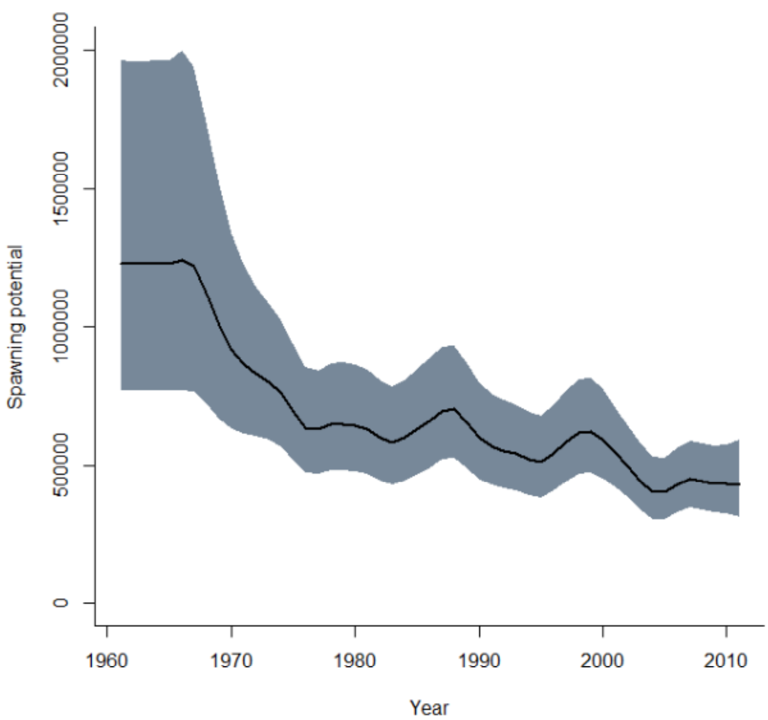


Figure 13: Annual estimates of spawning potential from the reference case model. The grey area represents parameter uncertainty estimated from the Hessian matrix Hoyle et al (2012).

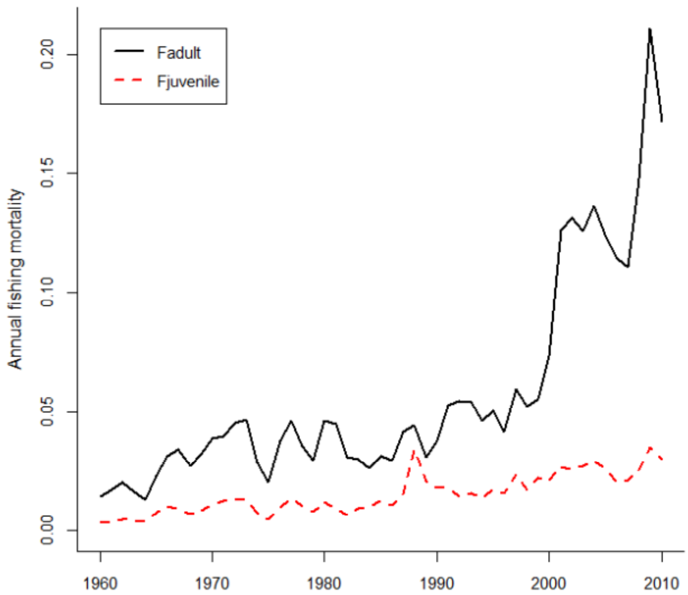


Figure 14: Annual estimates of fishing mortality for juvenile and adult South Pacific albacore from the reference case model Hoyle et al (2012).

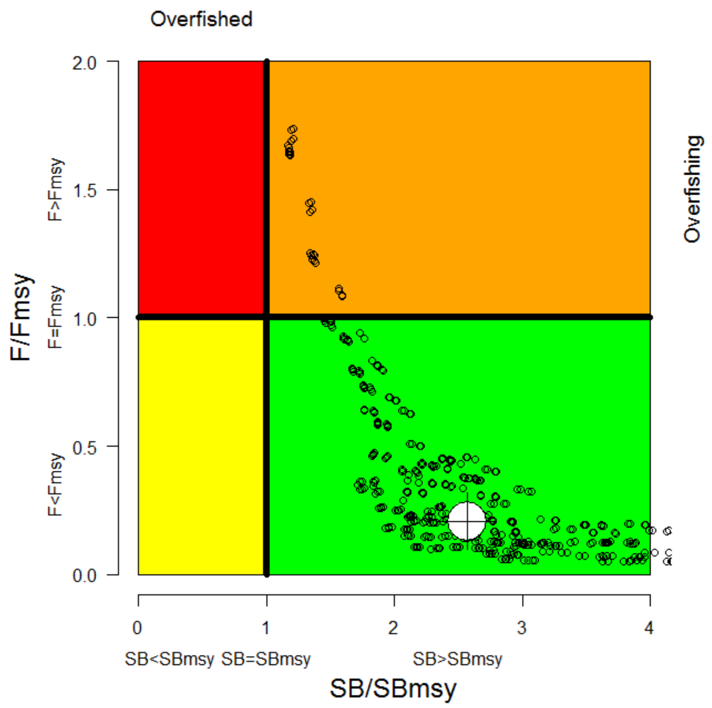


Figure 15: $F_{current}/F_{MSY}$ and $SB_{current}/SB_{MSY}$ for 540 model runs in the uncertainty grid (black hollow circles) and the median (large white circle). Note that some grid model runs extend as far as 7 for $SB_{current}/SB_{MSY}$ Hoyle et al (2012).

Table 16: Management parameters estimated from the 2012 base case (determined as the median from the structural uncertainty grid), the 2011 base case model, and the 2009 assessment, for comparison. Note that the definitions for current change through time Hoyle et al (2012).

Management quantity	2012 base case (grid median)	2011 base case	2009 base case	2009 median
$C_{current}$	78 664	54 520	66 869	65 801
C_{latest}	89 790	56 275		
MSY	99 085	85 130	97 610	81 580
$C_{current}/MSY$	0.79	0.64	0.69	0.80
C_{latest}/MSY	0.90	0.66		
F_{mult}	4.81	3.86		
$F_{current}/F_{MSY}$	0.21	0.26	0.25	0.29
SB_0	442 350	400 700	460 400	406 600
SB_{MSY}/SB_0	0.23	0.26	0.26	0.24
$SB_{current}/SB_0$	0.59	0.59	0.59	0.60
SB_{latest}/SB_0	0.56	0.47		
$SB_{current}/SB_{MSY}$	2.56	2.25	2.28	2.44
SB_{latest}/SB_{MSY}	2.38	1.82		
$SB_{curr}/SB_{curr_{F=0}}$	0.63	0.63	0.68	0.64
$SB_{latest}/SB_{latest_{F=0}}$	0.58	0.6		

Based on the assessment results the Scientific Committee concluded in 2012 that the South Pacific albacore stock is currently not overfished and overfishing is not occurring. Current biomass is sufficient to support current levels of catch. However, for several years the Scientific Committee has also noted that any increases in catch or effort are likely to lead to declines in catch rates in some regions, especially for longline catches of adult albacore, with associated impacts on vessel profitability.

Given the recent expansion of the fishery and recent declines in exploitable biomass available to longline fisheries, and given the importance of maintaining catch rates, the SC recommends that longline fishing mortality be reduced if the Commission wishes to maintain economically viable catch rates.

5.1 Catch per unit effort indices (CPUE)

Relative abundance indices are an essential input to stock assessment models and are typically derived from a standardised CPUE time series. Studies have calculated CPUE indices for albacore caught in longline fisheries and for small juveniles caught in troll fisheries with fishing operational variables and environmental effects at appropriate resolution being examined as potentially significant factors in explaining the variance in CPUE models (Kendrick & Bentley 2010).

Catch and effort data collected using the detailed TLCER forms for the tuna longline fishery from 1993 to 2004 was groomed for input to the standardised CPUE analysis. A total of 51 004 data records were available with detailed effort information for individual fishing operations. These data have been linked to a range of environmental variables including remotely sensed observations for sea surface temperature (SST) and ocean colour (chlorophyll) at a spatial resolution corresponding closely with each individual fishing operation. These variables have been expressed in relation to oceanic fronts, climatology and oceanographic indices of mesoscale dynamics on both a seasonal and monthly temporal scale. Other potential explanatory variables include moon brightness (phase), day length, fraction of longline set during night hours, depth and depth variation.

Catch and effort information from the troll fishery, was collated from 1989–90 to 2007–08 fishing years and linked to sea surface temperature (SST) data at the coarser temporal (day) and spatial (Statistical Area) scale of CELR format data. The large fleet (over 700) of troll vessels was reduced to those that had completed at least five trips a year in at least four years. This still retained more than 220 vessels and the standardised CPUE analysis was repeated for batches of those vessels.

Longline

The categorical variables: year, quarter, nationality, experience, and target species were significant in explaining catch rate variability. Of the continuous variables sea surface temperature (SST) had the strongest effect, with highest catch rates in the range 18 to 19°C. SST features associated with ocean fronts were of lesser significance. In an albacore CPUE analysis, only a weak relationship was found between CPUE and the southern oscillation index (SOI), and this was largely attributed to recruitment fluctuations in response to SST variability associated with the index.

There is a dramatic decline in the longline albacore CPUE time series from 1998 to 2000 that corresponds closely to a large increase in swordfish catch from 1600 fish in 1997 to over 12 000 in 2001. This reciprocal pattern most likely reflects a shift in fishing practice in the longline fleet towards targeting for swordfish since the mid-1990s (Figure 16). This is likely to have altered the catchability of the longline fishery for albacore through a physical change in the configuration of the fishing gear. Despite this operational factor, the general decline since the mid-1990s is consistent with the trend observed in Taiwanese longline CPUE in the southern parts of the South Pacific region, and with the substantial decline in biomass since the late 1990s predicted by the regional assessment model. The decline following a peak in catch rates that occurred in 1995, has been attributed to a 7-year cycle in albacore catch rates that has been evident since 1978, and is a result of YCS variation in response to SOI cycles. This explanation describes a process that would potentially affect catch rates of albacore throughout the South Pacific region, and hence, the New Zealand longline fishery. It is therefore possible that the factors contributing to the dramatic decline observed in the New Zealand fishery include stock-wide changes in availability, as well as a change in fishing practices.

Troll

The year effects from models of two independent batches of core vessels resemble each other closely; each describing a series that oscillates in a 3–4 year cycle around unity with no overall upward or downward trend. The error bars around each point are small in comparison with the interannual variance and the effect on observed CPUE of standardising for variance in hours fished, Statistical Area, month and vessel participation is almost indiscernible. Local scale environmental variables including SST were not accepted into either analysis.

Within a troll season there is little contrast in catches among vessels or among the months and areas in which the fishery operates. The large interannual variance however agrees reasonably well with the El Niño/Southern Oscillation (ENSO) index (Figure 17). The availability of juvenile albacore to the troll fishery appears to correspond negatively with El Niño events and to respond positively and quite sensitively to any trend away from that state.

Larger scale environmental effects appear to match many of the extreme shifts in availability and the effect is more likely to happen outside of New Zealand waters and the New Zealand troll season. This conclusion is in contrast to earlier work that suggested oceanographic features on a smaller spatial scale than troll data are collected might be expected to relate strongly to catch rates.

CPUE of troll caught albacore within New Zealand waters is unlikely to index abundance of the stock but is rather an index of availability of these juvenile fish in New Zealand waters. The effect of SOI does not appear to be selective with respect to the three cohorts observed in the fishery but does negate any additional inference about their relative abundance.

5.2 Estimates of fishery parameters and abundance

There are no fishery-independent indices of abundance for the South Pacific stock. Relative abundance information is available from catch per unit effort data. Returns from tagging programmes provides information on rates of fishing mortality, however, the return rates are very low and lead to highly uncertain estimates of absolute abundance.

5.3 Biomass estimates

Estimates of absolute biomass are highly uncertain, however, relative abundance trends are thought to be more reliable. Spawning potential depletion levels ($SB_{curr}/SB_{currF=0}$) of albacore were moderate at about 37%. However, depletion levels of the exploitable biomass is estimated between about 10% and 60%, depending on the fishery considered, having increased sharply in recent years particularly in the longline fisheries (Figure 18).

5.4 Yield estimates and projections

No estimates of *MCY* and *CAY* are available.

5.5 Other yield estimates and stock assessment results

No other yield estimates are available.

5.6 Other factors

Declines in CPUE have been observed in some Pacific Island fisheries. This is problematic for South Pacific states that rely on albacore for their longline fisheries. Given the recent expansion of the Pacific albacore fishery and recent declines in exploitable biomass available to longline fisheries, maintaining catch rates for Pacific Island states is important for the economic survival of their domestic longline operators.

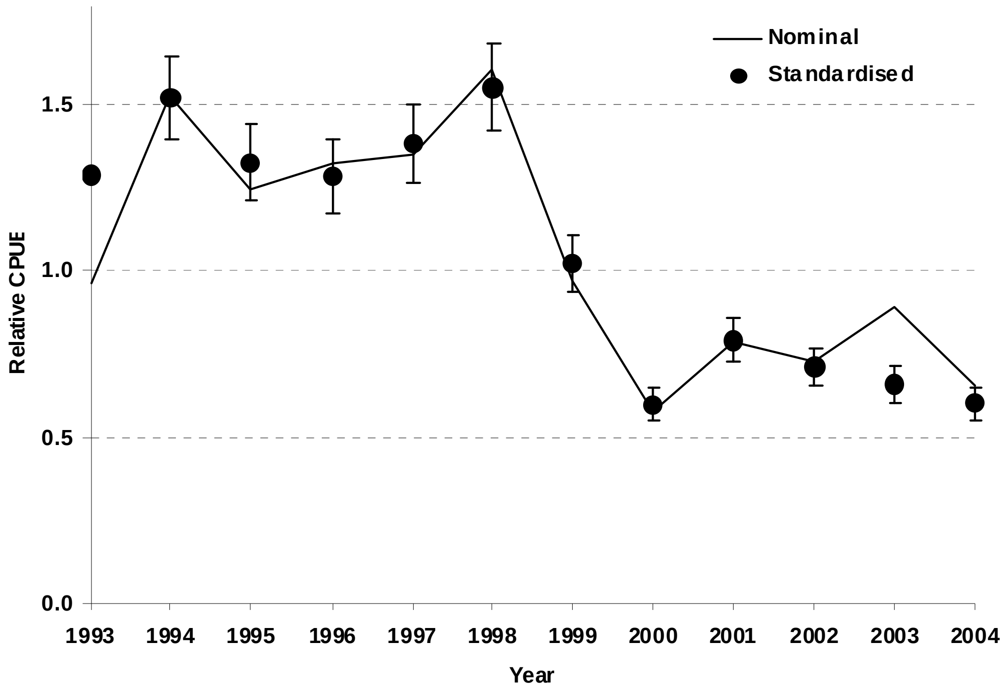


Figure 16: Nominal and standardised annual CPUE indices (normalised about the geometric mean for each time series) for the New Zealand domestic longline fishery, 1993–2004. Vertical bars indicate two standard errors (Unwin et al 2005).

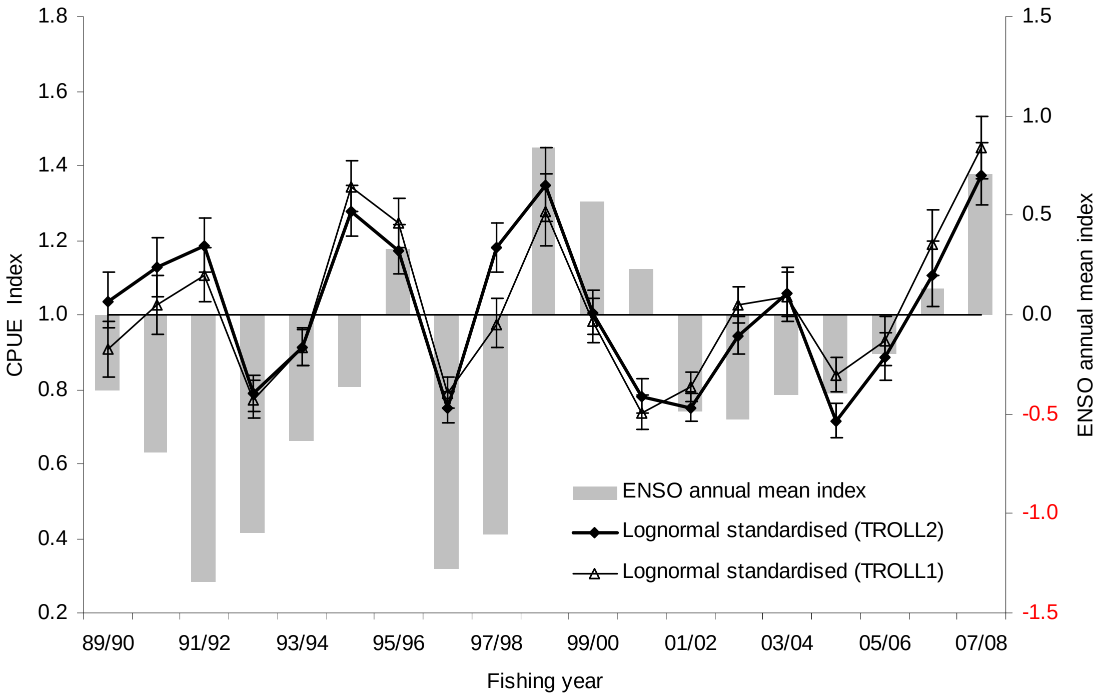


Figure 17: Comparison of annual indices of availability of troll-caught albacore in New Zealand waters (TROLL1 and TROLL2) with annual means of the Multivariate ENSO Index (MEI) an indicator of large climatic shifts affecting the South Pacific. Sign of ENSO index is reversed so that negative values indicate EL Nino events (Kendrick & Bentley 2010).

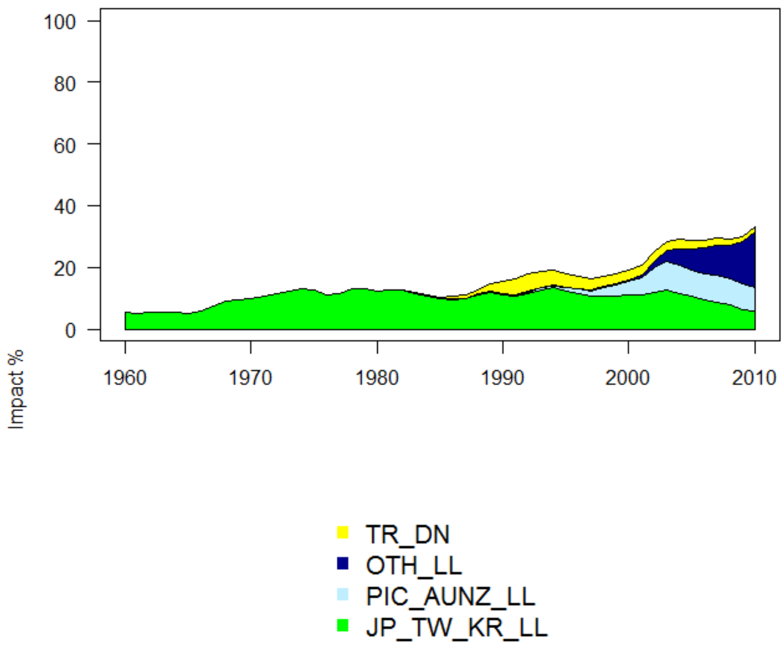


Figure 18: Estimates of reduction in spawning potential due to fishing (fishery impact = 1- $SB_t/SB_{tF=0}$) attributed to various fishery groups (TR_DN = Troll and driftnet fisheries; OTH_LL = 'Other' Longline fisheries; PIC_AUNZ_LL = Pacific Island and Australia and New Zealand longline fisheries; JP_TW_KR_LL = Japanese, Korean and Chinese Taipei distant water longline fisheries) (Hoyle et al 2012).

6. STATUS OF THE STOCK

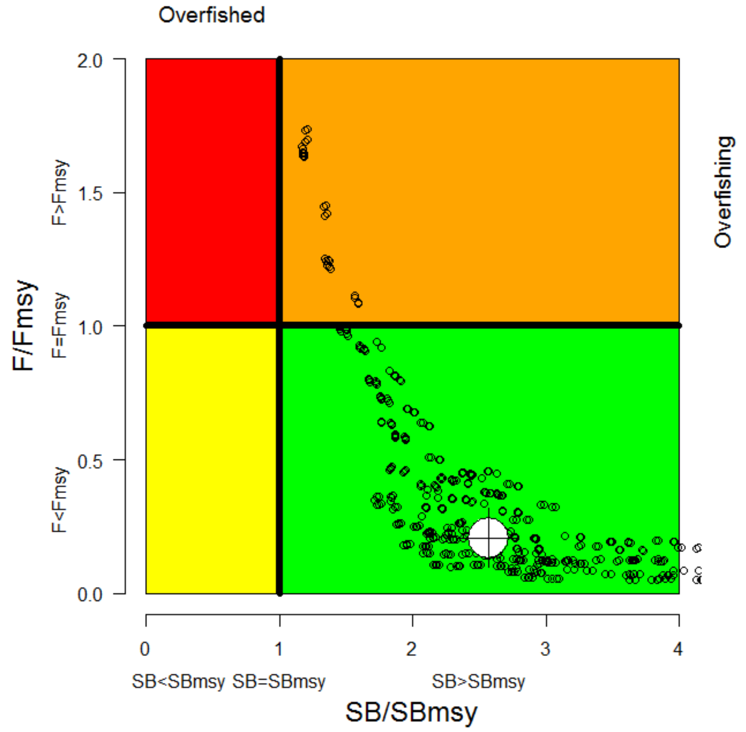
Stock status is summarised from Hoyle (2011).

Stock structure assumptions
In the Western and Central Pacific Ocean, the South Pacific albacore stock is distributed from the coast of Australia and archipelagic waters of Papua New Guinea eastward to the coast of South America south of the equator to at least 49ºS. However, there is some suggestion of gene flow between the North and South Pacific stocks based on an analysis of genetic population structure.

All biomass estimates in this table refer to spawning biomass (SB)

Stock Status	
Year of Most Recent Assessment	A full stock assessment was conducted in 2012.
Assessment Runs Presented	Base case model only
Reference Points	Target: $B > B_{MSY}$ and $F < F_{MSY}$ Soft Limit: Not established by WCPFC; but evaluated using HSS default of 20% SB_0 Hard Limit: Not established by WCPFC; but evaluated using HSS default of 10% SB_0 Overfishing threshold: F_{MSY}
Status in relation to Target	Likely (> 60%) that $B > B_{MSY}$ and Very Likely (> 90%) that $F < F_{MSY}$
Status in relation to Limits	Soft limit: Unlikely (< 40%) to be below Hard limit: Very Unlikely (< 10%) to be below
Status in relation to Overfishing	Overfishing is Very Unlikely (< 10%) to be occurring

Historical Stock Status Trajectory and Current Status



$F_{current}/F_{MSY}$ and $SB_{current}/SB_{MSY}$ for 540 model runs in the uncertainty grid (black hollow circles) and the median (large white circle). Note that some grid model runs extend as far as 7 for $SB_{current}/SB_{MSY}$ (Hoyle et al 2012).

Fishery and Stock Trends	
Recent Trend in Biomass or Proxy	The key conclusions of the models presented are that overfishing is not occurring and the stock is not in an overfished state. The assessment conclusions were broadly similar to those in 2011.
Recent Trend in Fishing Intensity or Proxy	The key conclusions of the assessment were broadly similar to those in 2011. Depletion levels (relative annual estimated biomass in the absence of fishing) of $F_{2007\text{-}2010}/F_{MSY}$ (0.21) and $SB_{2007\text{-}2010}/SB_{MSY}$ (2.56) do not indicate overfishing above F_{MSY}, nor that the fishery is in an overfished state below SB_{MSY}.
Other Abundance Indices	South Pacific albacore is the only WCPFC species that is assessed with standardised CPUE indices constructed with operational data. There was a rapid decline from the early 1960s until 1975 followed by a slower decline thereafter.
Trends in Other Relevant Indicator or Variables	-

Projections and Prognosis		
Stock Projections or Prognosis	There is no indication that current levels of catch are causing recruitment overfishing. However, current levels of fishing mortality may be affecting longline catch rates on adult albacore.	
Probability of Current Catch or TACC causing Biomass to remain below or to decline below Limits	Soft Limit: Unlikely (< 40%) to drop below ½ B_{MSY} Hard Limit: Very Unlikely (< 10%) to drop below ¼ B_{MSY}	
Probability of Current Catch or TACC causing Overfishing to continue or to commence	Very Unlikely (< 10%)	
Assessment Methodology and Evaluation		
Assessment Type	Level 1: Quantitative Stock assessment	
Assessment Method	The assessment uses the stock assessment model and computer software known as MULTIFAN-CL.	
Assessment Dates	Latest assessment: 2012	Next assessment: 2015
Overall assessment quality rank	1 – High Quality	
Main data inputs (rank)	The model is age structured (20 age-classes) and the catch, effort, size composition and tagging data used in the model are classified by 30 fisheries and quarterly time periods from July 1960 through June 2011.	1 – High Quality
Data not used (rank)	-	-
Changes to Model Structure and Assumptions	The structure of the assessment model was similar to the previous (2011) assessment, but there were some substantial revisions to key data sets which are noted above.	
Major Sources of Uncertainty	CPUE is used as an abundance index in the model. However, in the 1990s there was an increase in standardised CPUE in the west (regions 1 and 3) which was not evident in the east (regions 2 and 4). There was a decline in standardized CPUE for the Taiwan distant-water fleet since 2000 that also occurred in most domestic Pacific Island fisheries. It is not	

	certain whether depressed CPUE since 2002 results from a decline in population abundance or a change in the availability of albacore in the South Pacific that affected the Taiwan fleet and domestic Pacific Island fleets (Bigelow & Hoyle 2009). There is also a conflict between the CPUE index and the longline length frequency data.

Qualifying Comments
Although the latest assessment made some good improvements there is still a need to resolve the conflict between the CPUE and the longline length frequency data.
Fishery Interactions
Although no specific seabird/fishery interactions have been observed or reported for the troll fishery in New Zealand fishery waters, anecdotal reports and expert opinion consider that some albatross species are at risk of capture from this method. The troll fishery has a minor bycatch of Ray's bream. While longline albacore target sets are limited within New Zealand fishery waters interactions with protected species are known to occur in the longline fisheries of the South Pacific, particularly south of 25°S. Seabird bycatch mitigation measures are required in the New Zealand and Australian EEZs and through the WCPFC Conservation and Management Measure CMM2007-04. Sea turtles are also incidentally captured in longline gear; the WCPFC is attempting to reduce sea turtle interactions through Conservation and Management Measure CMM2008-03. Shark bycatch is common in longline fisheries and largely unavoidable; this is being managed through New Zealand domestic legislation and to a limited extent through Conservation and Management Measure CMM2010-07.

7. FOR FURTHER INFORMATION

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