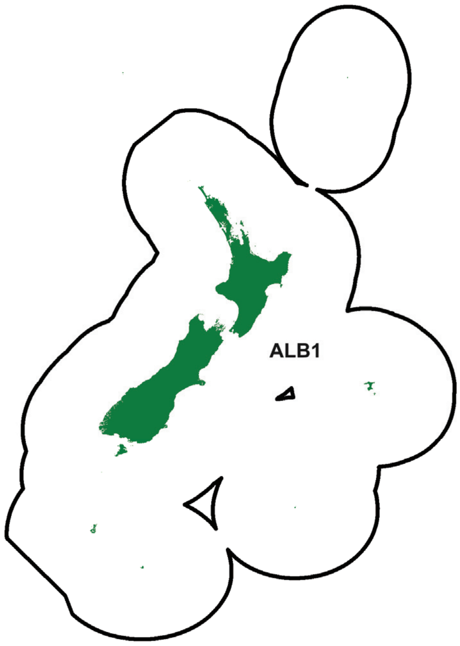
ALBACORE (ALB)

(*Thunnus alalunga)*
Ahipataha



1. FISHERY SUMMARY

Albacore is currently outside the Quota Management System.

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

At its second annual meeting the WCPFC passed a Conservation and Management Measure (CMM) (this is a binding measure that all parties must abide by) relating to conservation and management measures for tunas. 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 in 2006 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 over the past 10 fishing years have averaged 4521 t (largest landing 6744 t in 2003) (Table 1). Figure 1 shows the historical landings and fishing effort for albacore stocks.

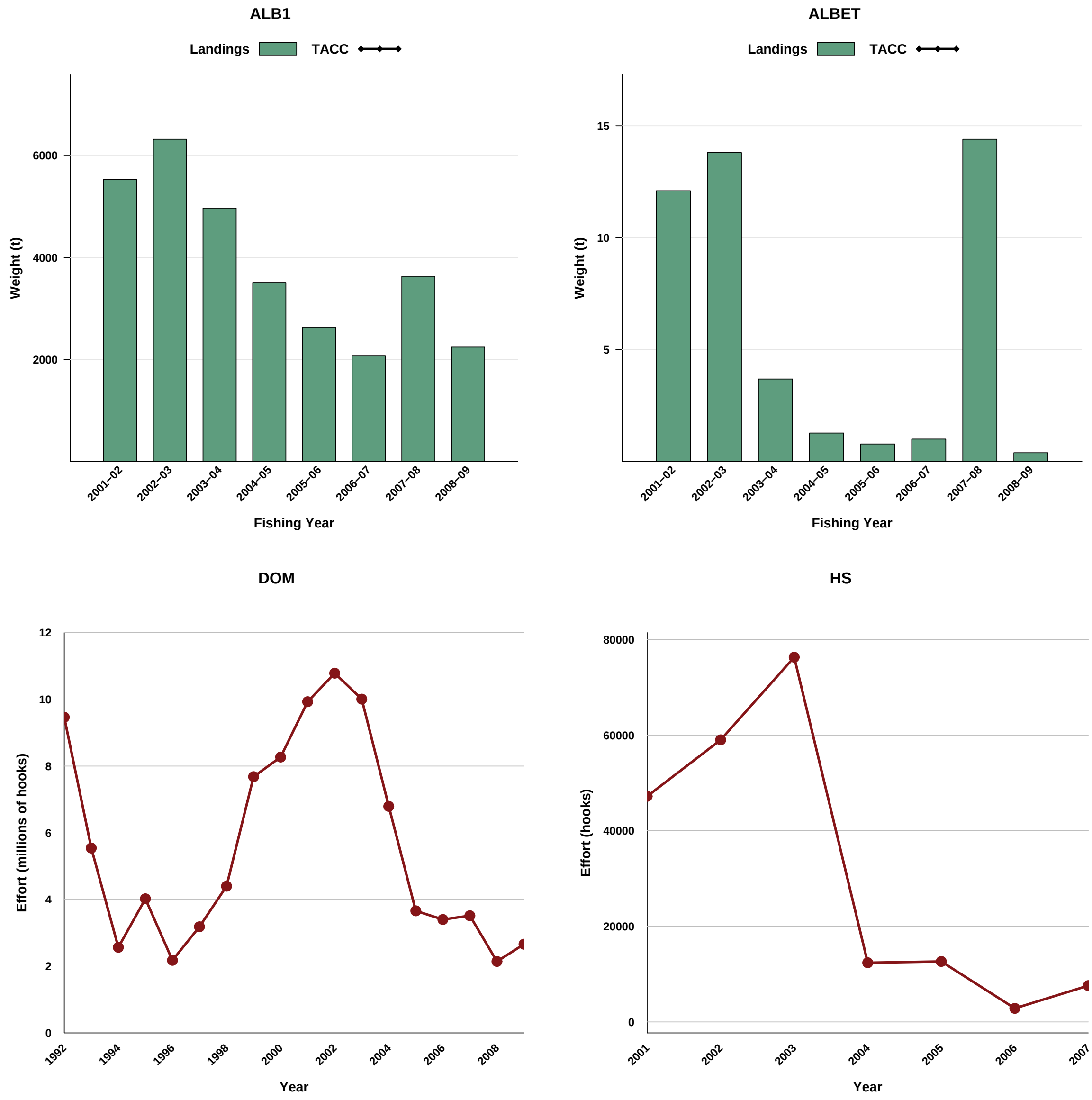


Figure 1: [Top] Albacore catch from 2001-02 to 2008-09 within NZ waters (ALB1) and on the high seas (ALBET). [Bottom] Fishing effort (number of hooks set) for all domestic and high seas surface longline vessels, from 1992 to 2009 and 2001 to 2007, respectively.

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 but 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 trolling and longline, some albacore are reported caught by pole-and-line and hand line.

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, albacore landings have steadily increased since the start of commercial fishing in the 1960s. The average catch in the 1960s of 19t, increased in the 1970s to 705 t, in the 1980s to 2256 t and in the 1990s averaged 4571 t.

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

Year	NZ fisheries waters	SPO	Year	NZ fisheries waters	SPO	Year	NZ fisheries waters	SPO
1972	240	39 521	1987	1 236	25 043	2002	5 566	65 334
1973	432	47 330	1988	672	37 863	2003	6 744	60 378
1974	898	34 049	1989	4 884	48 562	2004	4 459	65 348
1975	646	23 600	1990	3 011	34 126	2005	3 459	60 327
1976	25	29 082	1991	2 450	32 693	2006	2 541	69 202
1977	621	38 740	1992	3 481	37 246	2007	2 092	59 131
1978	1 686	34 676	1993	3 327	34 670	2008	3 739	51 672
1979	814	27 076	1994	5 255	41 439			
1980	1 468	32 541	1995	6 159	37 300			
1981	2 085	34 784	1996	6 320	31 382			
1982	2 434	30 788	1997	3 628	31 937			
1983	720	25 092	1998	6 525	44 198			
1984	2 534	24 704	1999	3 903	35 541			
1985	2 941	32 328	2000	4 428	40 478			
1986	2 044	36 590	2001	5 349	54 016			

Source: Lawson (2008), LFRR and MHR for most recent years

Total South Pacific albacore catches have fluctuated between 25 000 - 65 000 t since 1960, with the average catch over the period 1990 to 2005 being approximately 44 094 t (Table 1). Catches from within New Zealand fisheries waters are about 10% (average for 2000 through 2004) of those from the greater stock inhabiting the South Pacific Ocean.

Most albacore troll fishery catches are in the 1st and 2nd quarters with the 4th quarter important in some years (1994 to 1996). Most of the troll fishery catch comes from FMA7 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 2000 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, 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.

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.

The available estimates of recreational catch of albacore are in Table 2.

Table 2: 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).

The RTWG recommends 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 historic survey results suggest annual recreational catches of albacore were around 245-260 t.

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. Strickland notes the unexpected absence of a Maori name for albacore while giving names for a number of other oceanic pelagic species. However, 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 1). Clear length modes associated with cohorts recruiting 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 2006–07 was 61.4 cm. These modal progressions in the available catch length frequency time series from 1996–97 to 2006–07 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 from the 1996–97 fishing year to the 2006–07 fishing year, and is continuing during the present year, 2008–09. The ports of Auckland and Greymouth have been sampled each year and New Plymouth was briefly included in 2003. Lengths were recorded from at least 1000 fish per month in each port and at least 100 fish per month per port were sub-sampled for weight. Length frequency distributions are presented in Figure 2.

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

Based on histological studies of South Pacific albacore, males larger than 71 cm fork length and females larger than 82 cm fork length can be sexually mature. Although South Pacific albacore reproductive biology is currently under investigation, these values represent minimum size-at-maturity as no maturity ogive has been estimated for South Pacific albacore.

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

The length/weight relationships for South Pacific albacore where weight is in kg and length in cm are presented in Table 4.

Table 4: The ln(length)/ln(weight) relationships of albacore.

	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

Estimates of von Bertalanffy growth parameters for the South Pacific albacore stock based on length frequency analysis using MULTIFAN and counts of vertebral rings are in Table 5.

These estimates were largely based on troll caught albacore. Recent analyses using MULTIFAN on a larger data set, including longline caught albacore, gave a lower estimate of K (0.09 per year) and higher estimate of L_∞ (141.7 cm). Growth rates estimated from a MULTIFAN-CL stock assessment model were slightly higher for the first seven age classes than that derived from the parameters from Labelle et al. (1993).

Preliminary estimates of average annual natural (M) and fishing (F) mortality rates have been estimated from a MULTIFAN-CL stock assessment model developed in 2005 for the south Pacific Ocean regional assessment. A natural mortality rate of 0.34 per year was estimated constant over all age classes.

The annual fishing mortality rates suggest very low fishing mortality on juveniles (around 0.01) until the late 1980s when the driftnet fishery briefly operated, before again declining. In contrast the F's for adults (6+ year classes), are higher (around 0.04 in the past 5 yeas) but when compared to the estimates of M for adults they are also very low. Fishing mortality for adults has increased in the past five years in response to higher catches and lower levels of adult biomass. The estimated impact of fishing is almost negligible for juveniles while that for adults is currently around 15%.

Table 5: Estimates of von Bertalanffy growth parameters for South Pacific albacore.

	Length frequency based	Vertebral ring based
L_∞, cm	97.1	121.0
K, cm per year	0.239	0.134
t_0	–	-1.922
number of age classes	9	10
Youngest age class	3	2

Source: Labelle et al. 1993.

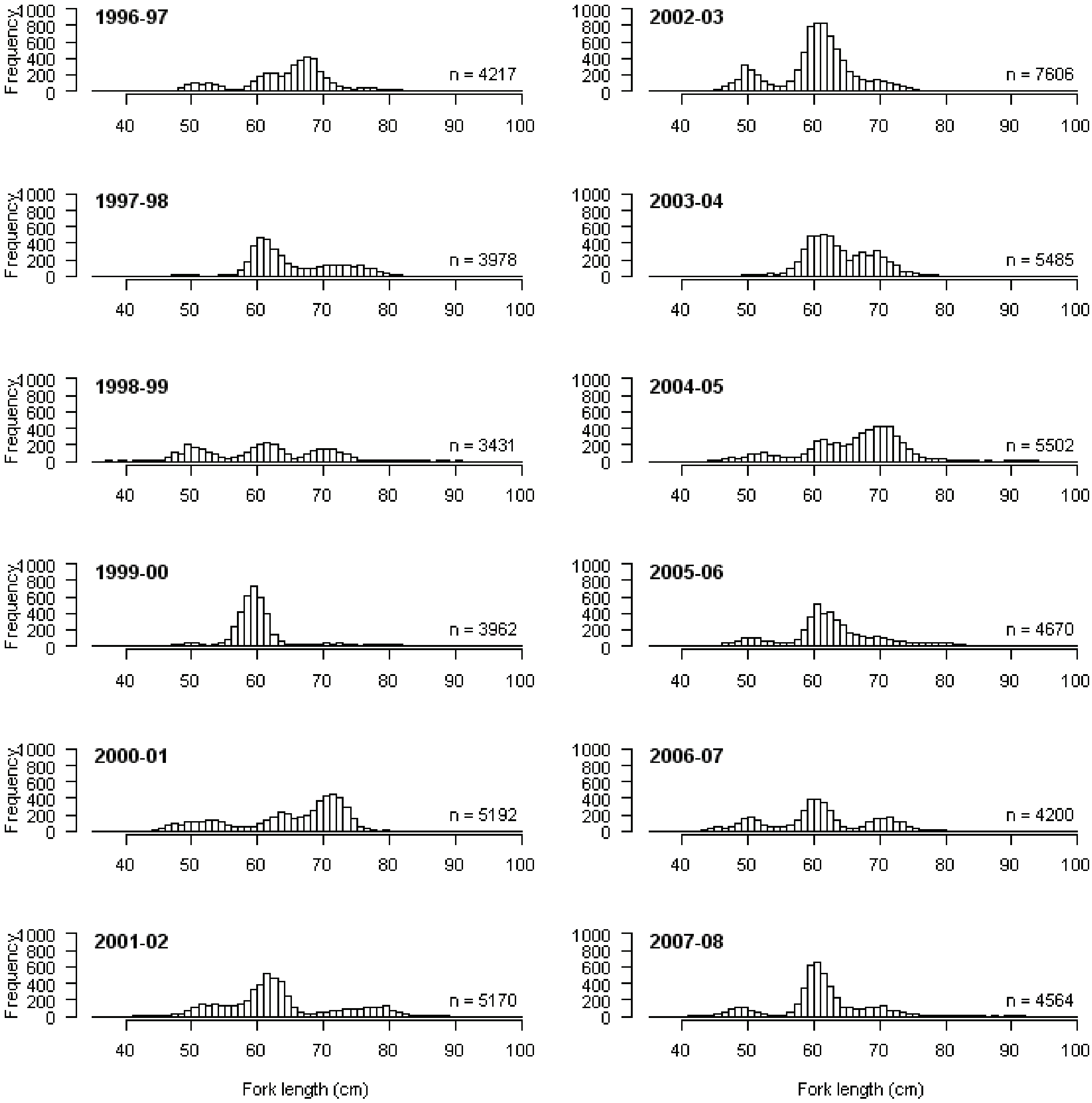


Figure 2: Size composition of albacore taken in the commercial troll fishery for 1996-97 to 2007-08.

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. 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 likely varies 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 2009 using MULTIFAN-CL (Hoyle and Davies 2009). A summary of that assessment can be found below:

"Since the last assessment, many of the model's underlying structural assumptions have been reviewed, with a focus on providing reliable estimates of population dynamics. This is a pre-requisite for providing useful management advice. Major changes to model data inputs and structure in the base case include:

An update of catch, effort, and size data to mid-2008; revised CPUE from a GLM for distant water fishing nation (DWFN) longline fisheries; time-dependent variance in CPUE; changes to growth modelling; monthly data aggregation for troll fisheries; model timing changed to mid-year; time splits in longline selectivity and first age bias in troll selectivity; use of 0.75 rather than 0.9 for steepness; and catchability decline estimated for the initial stages of the fishery.

These changes have resulted in a more realistic and credible model which fits the data better. The problem with bias in the CPUE series that result from switches in targeting and which were identified in 2008 appears to have been largely resolved. The conflict between information in the CPUE and the longline length frequency data remains, but its effects have been reduced. The new growth estimates fit the troll fishery length frequency data well and are close to estimates derived from otoliths."

Hoyle and Davies (2009) offered the following conclusions:

"Levels of stock size and *MSY* appear more realistic than in the 2008 assessment, because many sources of potential bias have been removed. However, moderate uncertainty remains about biomass and fishing mortality levels. Models that down-weight the length frequency data (in order to rely on the index of abundance from the CPUE data), tend to give lower biomass relative to B_{MSY}, and higher fishing mortality relative to F_{MSY}, throughout the time series.

- There is considerable uncertainty about the early biomass trend, but this has negligible effect on the management parameters, or advice to managers regarding the status of the stock.
- Estimates of F2005-2007/FMSY (from 0.1 to 0.5) and SB2005-2007 / SBMSY (from 1.7 to 4.9) are quite variable between model configurations, but all estimates indicate that overfishing is not occurring (i.e. F2005-2007 < FMSY) and that the fishery is not in an overfished state (i.e. SB2005-2007 is greater than SBMSY.)
- Most of the variation in management parameters is attributable to the steepness of the stock recruitment relationship – something we have no information about. Alternative metrics such as the expected CPUE, relative to a target CPUE, may be both more relevant and more precise.
- There is no indication that current levels of catch are not sustainable in terms of recruitment overfishing, particularly given the age selectivity of the fisheries. However, current levels of fishing pressure appear to be affecting longline catch rates."

4.1 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. This information is a fundamental input to the regional stock assessment model for albacore. Recent studies have calculated CPUE indices for albacore caught in the longline and for small juveniles caught in the 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 and Bentley 2009).

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. This data has 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 5 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 a SPO 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. 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 in 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 NZ longline fishery. It is therefore possible the factors contributing to the dramatic decline observed in the NZ fishery include stock-wide changes in availability, and 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. 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 be index of abundance of the stock but rather an index of availability of these juvenile fish to 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.

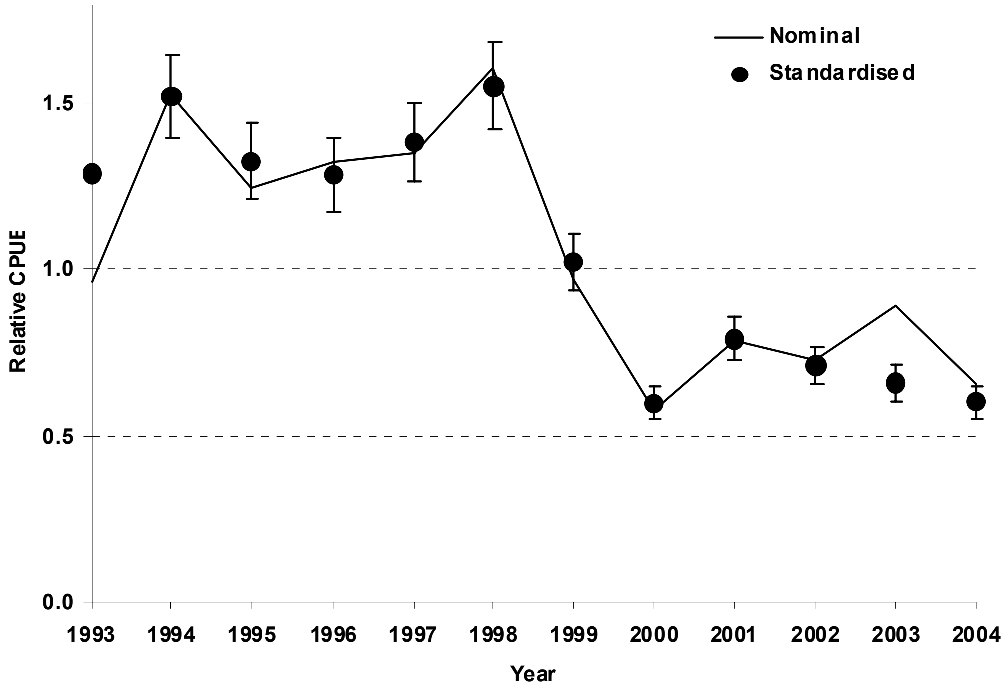


Figure 3: Nominal and standardised annual CPUE indices (normalised about the geometric mean for each time series) for the longline fishery, 1993-2004. Vertical bars indicate two standard errors Unwin et al. (2005).

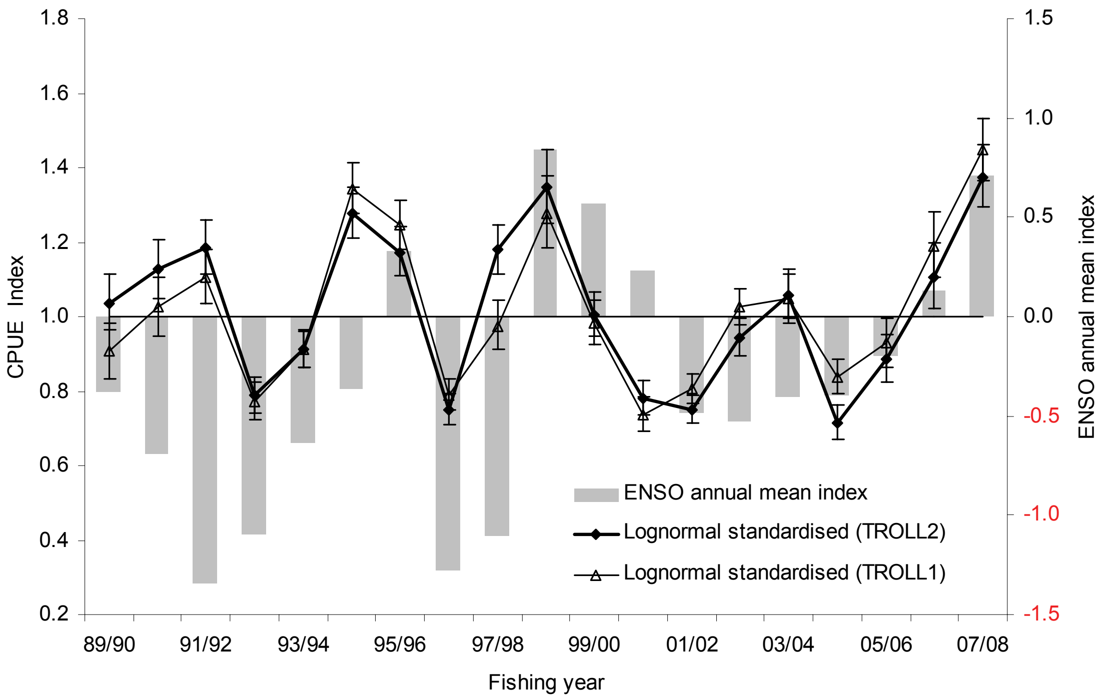
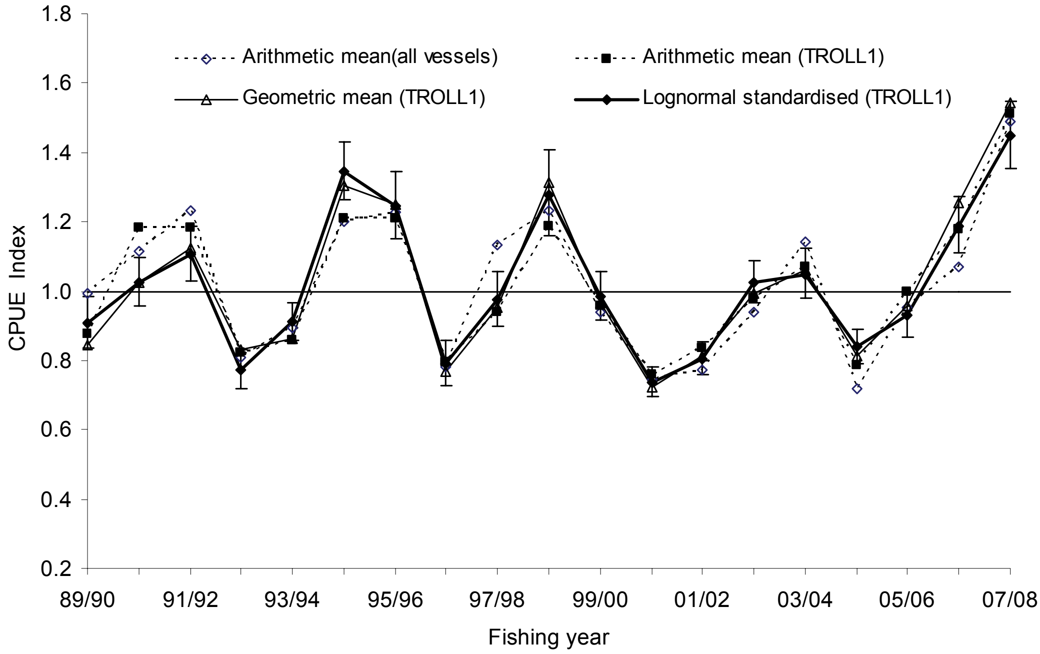


Figure 4: Comparison of annual indices of availability of troll-caught albacore in New Zealand waters (TROLL1 and TROLL2) with annual means of the Multivariate ENSO Index (MEI) an indicator of large climatic shifts affecting the South Pacific. Sign of ENSO index is reversed so that negative values indicate EL Nino events Kendrick and Bentley (2009).



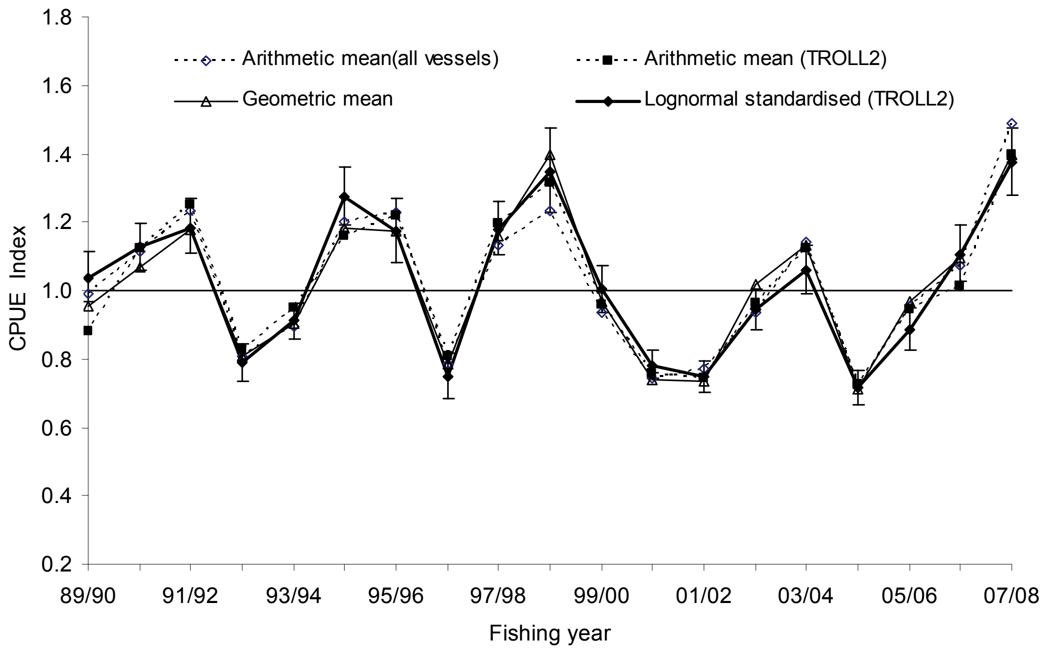


Figure 5: **Nominal and standardised annual CPUE indices (normalised about the geometric mean for each time series) for the troll fishery, 1989–90 to 2007–08. Vertical bars indicate two standard errors. The core vessels comprise 220 vessels that completed a minimum of five troll trips per year in at least four years. TROLL 1 [upper] is a subset of 68 of the core vessels. TROLL 2 [lower] is a subset of 40 of those vessels.**

4.2 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.

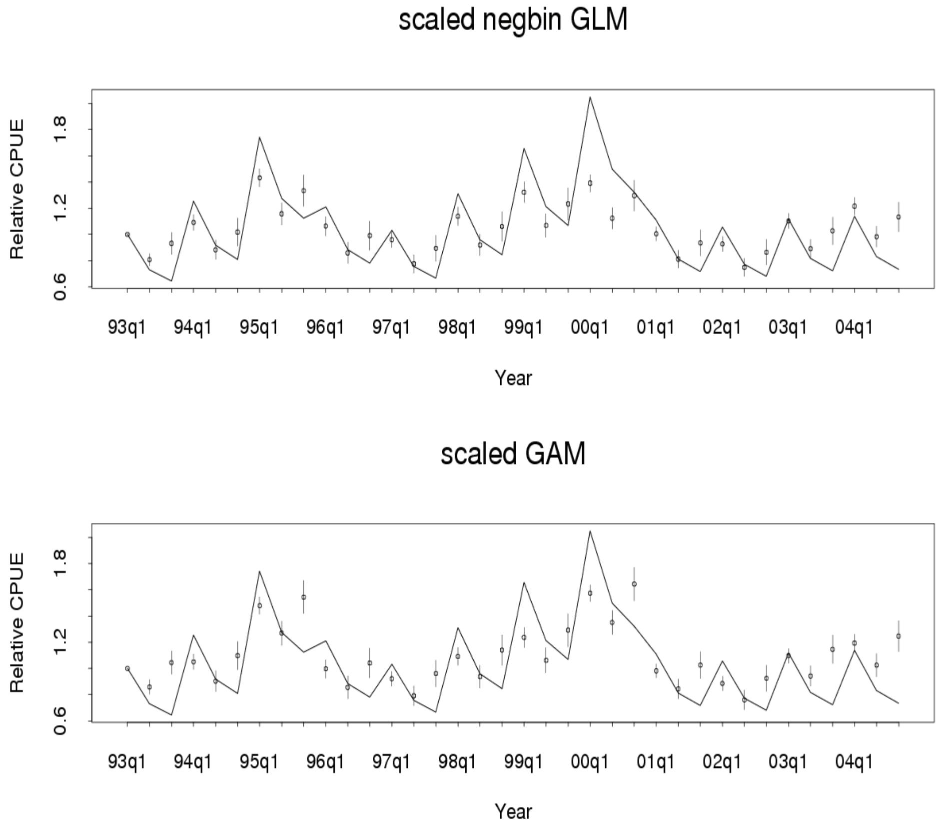


Figure 6: Quarterly time series of nominal and standardised CPUE for troll-caught albacore (line and circles respectively) estimated using the negative binomial GLM and quasi Poisson GAM.

4.2 Biomass estimates
Estimates of absolute biomass are highly uncertain, however, relative abundance trends are thought to be more reliable. Currently, the total biomass is estimated to be 74% of its unexploited level.

4.3 Estimation of Maximum Constant Yield (MCY)
No estimates of MCY are available.

4.4 Estimation of Current Annual Yield (CAY)
No estimates of CAY are available.

4.5 Other yield estimates and stock assessment results
No other yield estimates are available.

4.6 Other factors
In recent years (particularly in 2003), declines in CPUE were observed in some Pacific Island fisheries. Investigations have shown that these declines appear to be a consequence of changed oceanographic conditions, though high levels of localised effort may also be impacting on CPUE in these fisheries.

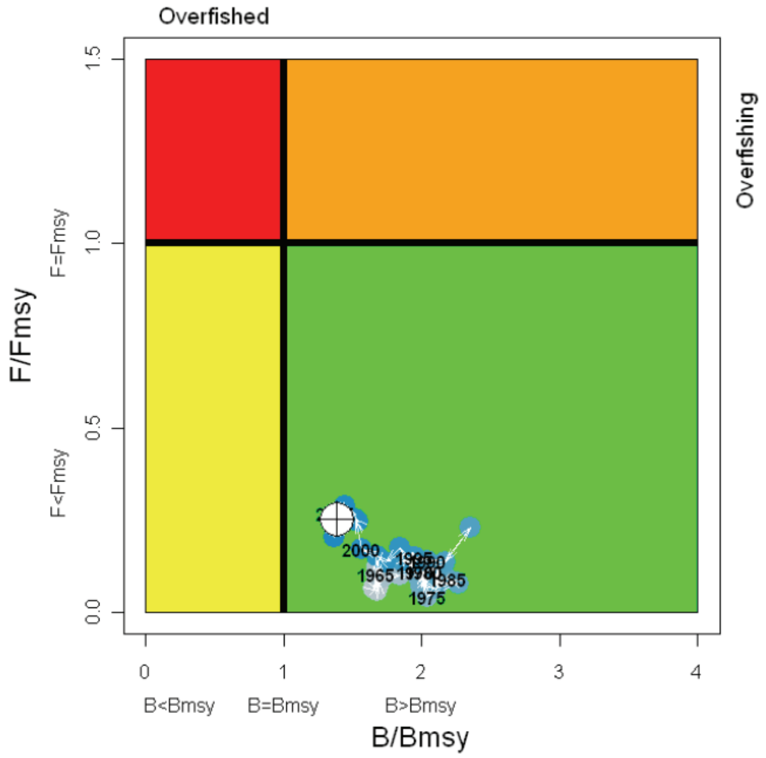
5. STATUS OF THE STOCK

Stock status summarised form Hoyle and Davies (2009).

Stock structure assumptions
Western and Central Pacific Ocean

All biomass in this Table refer to spawning biomass (SB)

Stock Status	
Year of Most Recent Assessment	A full stock assessment was conducted in 2008 and a comparative assessment was conducted in 2009 (WCPFC-SC5-2009/SA-WP-06). In addition to this, an updated CPUE analysis was undertaken in 2009.
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.
Status in relation to Target	Likely $B>B_{MSY}$ and $F<F_{MSY}$
Status in relation to Limits	Unlikely $B<B_{MSY}$ and $F>F_{MSY}$
Historical Stock Status Trajectory and Current Status	



Temporal trend in annual stock status, relative to BMSY (x-axis) and FMSY (y-axis) reference points, for the model period (starting in 1960). The colour of points is graduated from pale blue (1960) to blue (2007), and points are labelled at five-year intervals. The last year of the model (2008) is excluded because it is highly uncertain.

Fishery and Stock Trends	
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. Reference point levels estimated for the 2008 assessment were more pessimistic than for the 2006 assessment. Depletion levels (relative annual estimated biomass in the absence of fishing) estimated in 2008 were 0.70 compared with 0.90 in 2006, $B_{current}$ /B_{MSY} was 1.26 compared with 1.34 in 2006 and $SB_{current}$/SB_{MSY} was 2.21 compared with 4.10 in 2006.
Trend in Fishing Mortality or Proxy	The key conclusions of the models presented are that overfishing is not occurring and the stock is not in an overfished state. Reference point levels estimated for the 2008 assessment were more pessimistic than for the 2006 assessment, $F_{current}$/F_{MSY} was 0.44 compared with 0.04 in 2006.
Other Abundance Indices	South Pacific albacore is the only WCPFC species that is assessed with standardized 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	A full stock assessment was conducted in 2008 and a comparative assessment was conducted in 2009. The latest results produced realistic levels of stock size and MSY based on a credible model with many sources of potential bias being removed. There is considerable uncertainty about the early trend in biomass, although the trend has a negligible effect on management advice. Estimates indicate that overfishing is not occurring and that the stock is not in an overfished state. There is no indication that current levels of catch are not sustainable with regard to recruitment overfishing. However, current levels of fishing mortality may be affecting longline catch rates on adult albacore.
Probability of Current Catch causing decline below Limits	Soft Limit: Unlikely to drop below ½ B_{MSY} Hard Limit: Very unlikely to drop below ½ B_{MSY}

Assessment Methodology		
Assessment Type	Level 1: Quantitative Stock assessment	
Assessment Method	The assessment uses the stock assessment model and computer software known as MULTIFAN-CL.	
Main data inputs	• Catch, effort data revised from a GLM for distant water fishing nation (DWFN) longline fisheries; • size data to mid-2008; • growth data; and • monthly data aggregation for troll fisheries.	
Period of Assessment	Latest assessment: 2009	Next assessment: 2011
Changes to Model Structure and Assumptions	Since the last assessment, many of the model's underlying structural assumptions have been reviewed. Major changes to model data inputs and structure in the base case include: • an update of catch, effort, and size data to mid-2008; • revised CPUE from a GLM for distant water fishing nation (DWFN) longline fisheries; • time-dependent variance in CPUE; • changes to growth modelling; • monthly data aggregation for troll fisheries; • model timing changed to mid-year; • time splits in longline selectivity and first age bias in troll selectivity; • use of 0.75 rather than 0.9 for steepness; and • catchability decline estimated for the initial stages of the fishery.	
Major Sources of Uncertainty	CPUE is used as an abundance index in the model, however, in the 1990s, there was an increase in standardized 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 south Pacific availability of albacore that affected the Taiwan fleet and domestic Pacific Island fleets (SC5-SA-WP-5). 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 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. 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 30^{o}S. Seabird bycatch mitigation measures are required in the New Zealand, Australian EEZ's and through the WCPFC Conservation and Management Measure (CMM2007-04). Sea turtles also get 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 some extent through Conservation and Management Measure (CMM2008-06).

6. FOR FURTHER INFORMATION

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