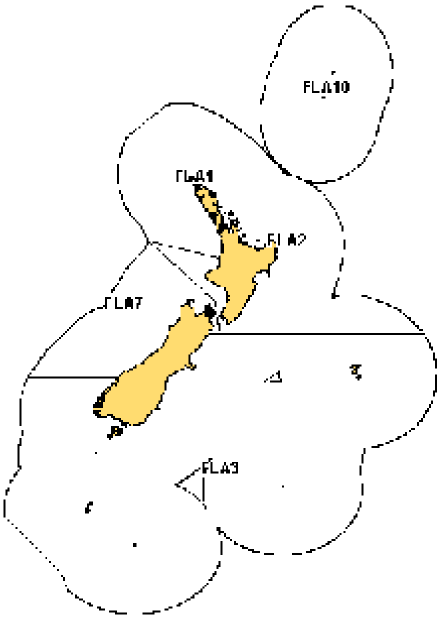
FLATFISH (FLA)



1. FISHERY SUMMARY

(a) Commercial fisheries

Flatfish ITQ provides for the landing of eight species of flatfish. These are: the yellow-belly flounder, *Rhombosolea leporina*; sand flounder, *Rhombosolea plebeia*; black flounder, *Rhombosolea retiaria*; greenback flounder, *Rhombosolea tapirina*; lemon sole, *Pelotretis flavilatus*; New Zealand sole, *Peltorhamphus novaezeelandiae*; brill, *Colistium guntheri*; and turbot, *Colistium nudipinnis*. For management purposes landings of these species are combined.

Flatfish are shallow water species, taken mainly by the inshore trawl fleet. Set and drag net fishing is important in the northern harbours and the Firth of Thames. Important fishing areas are:

Yellow-belly flounder	–	Firth of Thames, Kaipara and Manukau harbours;
Sand flounder	–	Hauraki Gulf, Tasman/Golden Bay, Bay of Plenty, and Canterbury Bight;
Greenback flounder	–	Canterbury Bight, Southland;
Black flounder	–	Canterbury Bight;
Lemon sole	–	west coast South Island, Otago and Southland;
New Zealand sole	–	west coast South Island, Otago and Canterbury Bight;
Brill and turbot	–	west coast South Island.

The current TACC of 6670 t was introduced in the 1990–91 fishing year. TACs were originally set at the level of the sum of the provisional ITQs for each fishery. Between 1983–84 and 1992–93 total flatfish landings fluctuated between 5160 t and 2750 t; from 1992–93 to 1997–98, landings were relatively consistent, between about 4500 t and 5000 t per year. Since then, total landings have declined to levels in the region of 3000 t, with only 2963 t recorded in 1999–00, the lowest recorded since 1986–87. However catches have increased over the past year with 3872 t reported for the 2004-05 fishing year. Landings and TACCs are given in Table 1.

The fishery is mainly confined to the inshore domestic trawl fleet except for small incidental by-catch of soles, brill and turbot by deepwater trawlers, and some localised set-netting, particularly in the north.

Table 1: Reported landings (t) of flatfish by Fishstock from 1983–84 to 2004–05 and actual TACs (t) from 1986–87 to 2004–05.

Fishstock	FLA 1		FLA 2		FLA 3		FLA 7		FLA 10			
FMA (s)	1 & 9		2 & 8		3, 4, 5 & 6		7		10		Total	
	Landings	TACC	Landings	TACC	Landings	TACC	Landings	TACC	Landings	TACC	Landings§	TACC
1983–84*	1 215	–	378	–	1 564	–	1 486	–	0	–	5 160	–
1984–85*	1 050	–	285	–	1 803	–	951	–	0	–	4 467	–
1985–86*	722	–	261	–	1 537	–	385	–	0	–	3 215 ‡	–
1986–87†	629	1 100	323	670	1 235	2 430	563	1 840	0	10	2 750 ‡	6 050
1987–88†	688	1 145	374	677	2 010	2 535	1 000	1 899	0	10	4 072 ‡	6 266
1988–89†	787	1 153	297	717	2 458	2 552	757	2 045	0	10	4 299	6 477
1989–90†	791	1 184	308	723	1 637	2 585	745	2 066	0	10	3 482	6 568
1990–91†	849	1 187	292	726	1 340	2 681	502	2 066	0	10	2 983	6 670
1991–92†	940	1 187	288	726	1 229	2 681	745	2 066	0	10	3 202	6 670
1992–93†	1 106	1 187	460	726	1 954	2 681	1 566	2 066	0	10	5 086	6 670
1993–94†	1 136	1 187	435	726	1 926	2 681	1 108	2 066	0	10	4 605	6 670
1994–95†	964	1 187	543	726	1 966	2 681	1 107	2 066	0	10	4 580	6 670
1995–96†	628	1 187	481	726	2 298	2 681	1 163	2 066	1	10	4 571	6 670
1996–97†	741	1 187	363	726	2 573	2 681	1 117	2 066	0	10	4 794	6 670
1997–98†	728	1 187	559	726	2 351	2 681	1 020	2 066	0	10	4 657	6 670
1998–99†	690	1 187	274	726	1 882	2 681	868	2 066	0	10	3 714	6 670
1999–00†	751	1 187	212	726	1 583	2 681	417	2 066	0	10	2 963	6 670
2000–01†	792	1 187	186	726	1 702	2 681	447	2 066	0	10	3 127	6 670
2001–02†	596	1 187	177	726	1 693	2 681	614	2 066	0	10	3 080	6 670
2002–03†	686	1 187	144	726	1 650	2 681	819	2 066	0	10	3 299	6 670
2003–04†	784	1 187	218	726	1 286	2 681	918	2 066	0	10	3 206	6 670
2004–05†	1 038	1 187	254	726	1 352	2 681	1 228	2 066	0	10	3 872	6 670

* FSU data.
† QMS data.
‡ Includes 11 t Turbot, area unknown but allocated to QMA 7.
§ Includes landings from unknown areas before 1986–87.

Fishermen and processors often use a generic flatfish (FLA) code to report estimated catches of flatfish species rather than using the individual species codes to separately identify their catch. Beentjes (2003) showed that, for all QMAs combined between 1989–90 and 2001–02, about half of the estimated catch of flatfish was recorded using the generic species code FLA, and the remainder was reported using a combination of 12 other species codes (Table 2). Flatfish species that comprised a large proportion of the total estimated catch over the 13 year period included ESO (16%), LSO (12%), SFL (12%) and YBF (6%). Species that are important contributors to catch in each QMA are FLA 1: YBF, SFL, GFL; FLA 2: ESO, SFL; FLA 3: ESO, LSO, SFL, BFL, BRI; FLA 7: GFL, SFL, TUR (Table 3; codes provided in the caption to Table 2).

Table 2: Total estimated flatfish catch (t) by species and fishing year for all flatfish QMAs combined. Codes: black flounder (BFL), brill (BRI), New Zealand sole (ESO), flatfish not specied (FLA, FLO, SOL), greenback flounder (GFL), lemon sole (LSO), sand flounder (SFL), Turbot (TUR), witch (WIT), yellow belly flounder (YBF).. * October 2001 to August 2002) (Beentjes 2003).

Year	BFL	BRI	ESO	FLA	FLO	GFL	LSO	SFL	SOL	TUR	WIT	YBF	Total (t)
1989–90	0	0	0	2 750	0	0	0	<1	0	0	<1	<1	2 750
1990–91	114	44	238	1 566	0	75	103	284	0	24	1	182	2 629
1991–92	23	45	384	1 530	0	64	151	336	<1	64	2	209	2 809
1992–93	40	74	904	1 948	0	119	521	688	0	87	3	235	4 619
1993–94	24	54	836	1 457	0	94	446	755	0	63	2	249	3 980
1994–95	66	54	742	1 546	<1	92	466	689	3	69	19	277	4 024
1995–96	95	48	730	1 523	12	50	607	515	15	61	0	154	3 810
1996–97	39	43	731	1 714	32	61	561	477	4	42	5	153	3 863
1997–98	14	33	550	1 718	29	59	714	452	4	39	1	162	3 775
1998–99	24	41	418	1 294	28	45	667	297	4	37	3	202	3 060
1999–00	61	44	355	1 075	7	36	408	247	2	30	1	267	2 534
2000–01	42	42	479	1 086	13	29	392	245	3	40	45	316	2 733
2001–02	85	27	495	1 098	9	35	271	199	1	41	28	210	2 498*
Total	627	550	6 864	20 305	130	759	5 306	5 184	36	595	110	2617	43 084
Percent	1.4	1.3	15.9	47.1	0.3	1.8	12.3	12.0	0.1	1.4	0.3	6.1	

Table 3: Distribution (%) of the total estimated catch of 13 flatfish species by QMA for the period 1989–90 and 2001–02 (Beentjes 2003). Species codes are provided in the caption to Table 1. Catches were allocated to specific QMAs based on the reported statistical area of catch.

QMA	BFL	BLF	BRI	ESO	FLA	FLO	GFL	LSO	SFL	SOL	TUR	WIT	YBF	All species
FLA 1	6		3	2	27	1	26	2	23	8	2	0	83	22
FLA 2	15		0	8	13	5	12	1	13	79	4	2	2	10
FLA 3	74	99	62	64	41	94	28	92	29	12	26	87	11	48
FLA 7	5	1	34	27	19	1	34	5	36	1	69	11	3	20
Total	100	100	100	100	100	100	100	100	100	100	100	100	100	100

(b) Recreational fisheries

There are important recreational fisheries, mainly for the four flounder species, in most harbours, estuaries, coastal lakes and coastal inlets throughout New Zealand. The main methods are set netting, drag netting and spearing. In the northern region, important areas include the west coast harbours, the lower Waikato, the Hauraki Gulf and the Firth of Thames. In the Bay of Plenty, Ohiwa and Tauranga Harbours are important. In the Challenger FMA, there is a moderate fishery in Tasman and Golden Bays and in areas of the Mahau-Kenepuru Sound and in Cloudy Bay. In the South-East and Southland FMAs, flatfish are taken in areas such as Lake Ellesmere, inlets around Banks Peninsula and the Otago Peninsula, the Oreti and Riverton estuaries, Bluff Harbour and the inlets and lagoons of the Chatham Islands (for further details see the 1995 Plenary Report). Harvest estimates from recreational surveys are given in Table 4.

Table 4: Estimated number and weight of flatfish harvested by recreational fishers by Fishstock and survey. Surveys were carried out in different years in the Ministry of Fisheries regions: South in 1991–92, Central 1992–93, North 1993–94 (Teirney et al., 1997) and Nationally in 1996 (Bradford, 1998) and 1999-00 (Boyd & Reilly, 2005). – Data not available.

Fishstock	Survey	Number	*c. v.%*	Harvest range (t)	Point estimate (t)
1991-92					
FLA 1	South	3 000	-	-	-
FLA 3	South	152 000	31	50-90	-
FLA 7	South	3 000	-	-	-
1992-93					
FLA 1	Central	6 100	-	-	-
FLA 2	Central	73 000	26	20-40	-
FLA 7	Central	37 100	59	10-30	-
1993-94					
FLA 1	North	520 000	19	225-275	-
FLA 2	North	3 000	-	0-5	-
1996					
FLA 1	National	308 000	11	95-125	110
FLA 2	National	67 000	19	13-35	24
FLA 3	National	113 000	14	30-50	40
FLA 7	National	44 000	18	10-20	16
1999-00					
FLA 1	National	702 000	25	203-336	-
FLA 2	National	380 000	49	82-238	-
FLA 3	National	395 000	33	128-252	-
FLA 7	National	114 000	53	23-73	-

A key component of the estimating recreational harvest from diary surveys is determining the proportion of the population that fish. The Recreational Working Group has concluded that the methodological framework used for telephone interviews produced incorrect eligibility figures for the 1996 and previous surveys. Consequently the harvest estimates derived from these surveys are considered to be considerably underestimated and not reliable. However relative comparisons can be made between stocks within these surveys. The Recreational Working Group considered that the 2000 survey using face-to-face interviews better estimated eligibility and that the derived recreational harvest estimates are believed to be more accurate. FMA2 catches are nevertheless considered to be over-estimate, probably because of an unrepresentative diarist sample. The 1999/2000 Harvest estimates for each Fishstock should be evaluated with reference to the coefficient of variation.

(c) Maori customary take

Quantitative information on the current level of Maori customary take is not available.

(d) Illegal catch

There is no quantitative information on the current level of illegal catch available.

(e) Other sources of mortality

Flatfish have always been subject to ‘high-grading’, and market preference has led to the establishment of ‘processor’ grading and size limits. Fishers often have no market for lower grade flatfish, and although greater than the minimum size limit, this fish is discarded. The extent of this unrecorded fishing mortality is unknown.

2. BIOLOGY

The New Zealand flatfish species studied are fast-growing and mainly short-lived, generally only surviving to 3–4 years of age, with very few reaching 5–6 years. A recent study has indicated that brill and turbot are longer lived, reaching a maximum age of 21 years and 16 years respectively (Steven et al., 2001). However, these estimates have yet to be fully validated. Size limits (for most species at 25 cm) are generally at or above the size at which the fish reach maturity and confer adequate protection to the juveniles.

Juveniles congregate in sheltered inshore waters, e.g., estuarine areas, shallow mudflats and sandflats, where they remain for up to two years. Juvenile survival is highly variable. Flatfish move offshore for first spawning at 2–3 years of age during winter and spring. Adult mortality is high, with many flatfish spawning only once and few spawning more than two or three times. However, fecundity is high, e.g., from 0.2 million eggs to over 1 million eggs in sand flounders.

Available biological parameters relevant to stock assessment are shown in Table 5. The estimated parameters in sections 1 & 3 apply only to sand flounder in Canterbury and brill and turbot in west coast South island – growth patterns are likely to be different for these species in other areas and for other species of flatfish.

Table 5: Estimates of biological parameters of flat fish.

Fishstock	Estimate				Source
1. Natural mortality (M)					
Brill - West coast South Island (FLA 7)	0.20				Stevens et al (2001)
Turbot - West coast South island (FLA 7)	0.26				Stevens et al (2001)
Sand flounder - Canterbury (FLA 3)	1.1–1.3				Colman (1978)
Lemon sole - West coast South island (FLA 7)	0.62–0.96				Gowing et al (2006)
2. Weight = a (length)^b (weight in g, length in cm total length)					
	Females		**Males**		
Brill (FLA 7)	a = 0.01443	b = 2.9749	a = 0.02470	b = 2.8080	Hickman & Tait (unpub.)
Turbot (FLA 7)	a = 0.00436	b = 3.3188	a = 0.00571	b = 3.2389	Hickman & Tait (unpub.)
Sand flounder (FLA 1)	a = 0.03846	b = 2.6584	–	–	McGregor (unpublished)
Yellow-belly flounder (FLA 1)	a = 0.07189	b = 2.5117	a = 0.00354	b = 3.3268	McGregor (unpublished)
New Zealand sole (FLA 3)	a = 0.03578	b = 2.6753	a = 0.007608	b = 3.0728	McGregor (unpublished)

Table 5 ***(Continued)***
3. von Bertalanffy growth parameters

	Females			Males			
	K	**t_0**	**L_∞**	**K**	**t_0**	**L_∞**	
Brill							
West coast South Island (FLA 7)	0.10	-15.87	43.8	0.37	-1.70	38.4	Stevens et al (2001)
Turbot							
West coast South island (FLA 7)	0.39	0.30	57.1	0.34	-0.09	49.2	Stevens et al (2001)
Sand flounder							
Canterbury (FLA 3)	0.235	-0.083	59.9	0.781	n.a.	37.4	Mundy (1968), Colman (1978)
Lemon sole							
West coast South island (FLA 7)	1.29	-0.088	26.1	1.85	0.23	25.6	Gowing et al (2006)

3. STOCKS AND AREAS

There are no new data which would alter the stock boundaries used in previous assessment documents.

Flatfish are shallow-water species, generally found in waters less than 50 m in depth. There is evidence of many fairly localised stocks. However, the inter-relationships of neighbouring populations have not been thoroughly studied. The best information is available from studies of the variation in morphological characteristics of sand flounders and from the results of tagging studies, conducted mainly on sand and yellow-belly flounders. Variation in morphological characteristics indicate that sand flounder stocks off the east and south coasts of the South Island are clearly different from stocks in central New Zealand waters and from those off the west coast of the South Island. There also appear to be differences between west coast sand flounders and those in Tasman Bay, and between sand flounders on either side of the Auckland-Northland peninsula. Tagging experiments show that sand flounders, and other species of flounder, can move substantial distances off the east and south coasts of the South Island. However, among fish tagged in Tasman Bay and in the Hauraki Gulf, none have been recaptured very far from their point of release.

Thus, though the sand flounders off the east and south of the South Island appear to be a single, continuous population, fish in fairly enclosed waters may be effectively isolated from neighbouring populations and should be considered as separate stocks. Examples of such stocks are those in Tasman Bay and the Hauraki Gulf and possibly areas such as Hawkes Bay and the Bay of Plenty. In order to maintain harvesting flexibility, the number of management boundaries placed in the flatfish fishery has been kept to a minimum.

4. STOCK ASSESSMENT

There are no new data which would alter the yield estimates given in the 1996 Plenary Report. The yield estimates are based on commercial landings data only and have not changed since the 1992 Plenary Report.

(a) Estimates of fishery parameters and abundance

Standardized CPUE was investigated as tool for monitoring FLA 1 (Coburn et al 2005). The inshore FAWG concluded that the derived indices probably reflect abundance. At least 90% of flatfish catch in FLA 1 West consists of yellowbelly flounder (sand flounder makes up the remainder) and there was no evidence of a trend in catch composition during the analysis period (1989-90 to 2003-04). Standardized CPUE trends were derived for four sub-areas on west coast: North west, Kaipara, Manukau and Lower Waikato. Three quarters of the west coast catch is taken from Kaipara and Manakau Harbours. The Manakau CPUE series declined at a moderate rate between 1989/90 and 1995/96, declined gradually to 2002/03 and then increased slightly to 2003/04. The Kaipara series declined at a moderate rate from 1989/90 to 1997/98, and was stable until 2003/04.

Most of the flatfish catch from the FLA 1 East, including a substantial and variable proportion of sand flounder, is taken from the Firth of Thames (Statistical area 007). Separate indices were calculated for sand and yellowbelly flounder. The area 007 yellowbelly CPUE index declined steeply from 1990/91 to 1995/96 and remained fairly stable after that. The sand flounder index increased from 1990/91 to 1993/94 and then declined somewhat dramatically. Accounting for a 2-year lag between egg production and recruitment, a fairly strong negative relationship between sea surface temperature and sand flounder abundance was established. The abundance of yellowbelly flounder did not appear to be related to temperature in the Firth of Thames.

Estimates of fishery parameters and abundance are not available.

(b) Biomass estimates

Estimates of current and reference biomass are not available for flatfish.

(c) Estimation of Maximum Constant Yield (MCY)

MCY was estimated using the equation, MCY = cYav (Method 4). Yav is the reported catch over the period October 1983 to September 1988, and c was set equal to 0.6 based on the estimate of M = 1.1–1.3. These estimates of MCY are based on reported landings during a period of decreasing effort and are considered conservative. The MCY estimates for each Fishstock are given in Table 6.

Table 6: Yield estimates (t) (rounded to the nearest 10 t) for flatfish.

Parameter	Fishstock	Estimate
MCY	FLA 1	520
	FLA 2	200
	FLA 3	980
	FLA 7	530
	FLA 10	–
	Total	2230
CAY	All	Cannot be determined

The level of risk to the stock by harvesting the population at the estimated MCY value cannot be determined.

(d) Estimation of Current Annual Yield (CAY)

No estimate of CAY is available for flatfish stocks.

(e) Other Factors

Flatfish ITQ provides for the landing of eight species of flatfish. For management purposes all species are combined to form a unit fishery. The proportion that each species contributes to the catch is expected to vary annually. It is not possible to estimate MCY for each species and stock individually.

Because the adult populations of most species generally consist of only one or two year classes at any time, the size of the populations depends heavily on the strength of the recruiting year class and is therefore thought to be highly variable. Brill and turbot are notable exceptions with the adult population consisting of a number of year classes. Recent CPUE analyses revealed that although yellow belly flounder are short lived, inter-annual abundance in FLA 1 was not highly variable, suggesting that some factor, e.g. size of estuarine nursery area, could be smoothing the impact of random environmental effects on egg and larval survival.

Flatfish TACCs have purposely been set at high levels so as to provide fishers with the flexibility to take advantage of the inherent variability associated with annual flatfish abundance. For this reason TACCs should not be expected to be reached each year. Current catch levels appear to impose no threat to the productivity of the stock, as the minimum size limit provides protection for spawning fish before they recruit into the fishery.

In certain areas fishers target fishing for flatfish run out of quota for associated by-catch species, but use their uncaught flatfish quota to continue target fishing, regardless of by-catch. This is a problem particularly with multi-species trawl fisheries. The high TACCs set for species like flatfish, whose availability is highly variable, provides an incentive to maximise target catch regardless of how much by-catch quota is held.

The inclusion of flatfish in the QMS was based partly on the assumption that a TAC would act to decrease competition for catch in poor years. However, current flatfish TACCs do not effectively decrease competition for fish in years of poor abundance. A number of fishers have entered the fishery through purchase of flatfish ITQ with no, or minimal by-catch species quota. This increases competition for flatfish in poor years, both among commercial fishers and between commercial and recreational fishers, accentuating bycatch problems.

Fishing effort can vary with flatfish abundance and the relative profitability of alternative fisheries (e.g., albacore tuna, oysters, rock lobster and snapper).

5. STATUS OF THE STOCKS

Estimates of current and reference biomass are not available.

TACCs have never been reached since the introduction of the QMS, although landings approached the TACC for FLA 1 in 1992–93 and 1993–94, and for FLA 3 in 1988–89 and 1996–97. Adult flatfish populations generally consist of only one or two year classes at any time. The sizes of the populations depend heavily on the strength of the recruiting year classes and are therefore highly variable. For this reason a constant catch at the level of the current TACCs is unlikely to be attainable or sustainable, nor would it be likely to allow the stock to move towards a size that will support the MSY. It is unknown if recent catches will allow the stock to move towards a size that will support the MSY.

Flatfish could be managed more appropriately using a CAY approach rather than an MCY approach, with strong or weak pre-recruit year classes being identified by surveys or monitoring. This approach would reduce the level of bycatch problems when biomass is low while allowing the fishing industry to take advantage of increased biomass following good recruitment. Adoption of this strategy would require increased information on flatfish abundance.

Summary of yields (t), TACCs (t), and reported landings (t) of flatfish for the most recent fishing year.

Fishstock	QMA		MCY	2004–05 Actual TACC	2004-05 Reported landings
FLA 1	Auckland (East) (West)	1 & 9	520	1 187	1 038
FLA 2	Central (East) (West)	2 & 8	200	726	254
FLA 3	South-East (Coast) (Chatham), Southland and Sub-Antarctic	3, 4, 5, & 6	980	2 681	1 352
FLA 7	Challenger	7	530	2 066	1 228
FLA 10	Kermadec	10	–	10	0
Total			2 230	6 670	3 872

6. FOR FURTHER INFORMATION

Beentjes, M. P. (2003). Review of flatfish catch data and species composition. *New Zealand Fisheries Assessment Report 2003/17*. 22 p.

Boyd, R.O., Reilly, J.L. (2005). 1999/2000 national marine recreational fishing survey: harvest estimates. *Draft New Zealand Fisheries Assessment Report*

Bradford, E. (1998). Harvest estimates from the 1996 national recreational fishing surveys. *New Zealand Fisheries Assessment Research Document 1998/16*. 27p.

Coburn, R.P., Beentjes, M.P. (2005). Abundance estimates for flatfish in FLA 1 from standardized catch per unit effort analysis of the set net fisheries, 1989-90 to 2003-04. *New Zealand Fisheries Assessment Report* 2005/57, 46pp.

Colman, J.A. (1972). Size at first maturity of two species of flounders in the Hauraki Gulf, New Zealand. *N.Z. Journal of Marine and Freshwater Research 6(3)*: 240–245.

Colman, J.A. (1973). Spawning and fecundity of two flounder species in the Hauraki Gulf, New Zealand. *N.Z. Journal of Marine and Freshwater Research 7(1 & 2)*: 21–43.

Colman, J.A. (1974). Movements of flounders in the Hauraki Gulf, New Zealand. *N.Z. Journal of Marine and Freshwater Research 8(1)*: 79–93.

Colman, J.A. (1978). Tagging experiments on the sand flounder, *Rhombosolea plebeia* (Richardson), in Canterbury, New Zealand, 1964 to 1966. *Fisheries Research Bulletin No. 18*. 42 p.

Colman, J.A. (1985). Flatfish. *In:* Colman, J.A., McKoy, J.L., and Baird, G.G. (Comps. and Eds.,). Background papers for the 1985 Total Allowable Catch recommendations, pp. 74–78. (Unpublished report, held in the MAF Fisheries Greta Point library, Wellington.)

Kirk, P.D. (1988). Flatfish. *N.Z. Fisheries Assessment Research Document 88/13*.

Mundy, A.R. (1968). A study of the biology of the sand flounder, *Rhombosolea plebeia* (Richardson), off the Canterbury coast. (Unpublished Ph.D. thesis lodged in University of Canterbury library, Christchurch, New Zealand.)

Stevens, D.W.; Francis, M.P.; Shearer, P.J.; McPhee, R.P.; Hickman, R.W.; Tait, M. (2001). Age and growth of brill (*Colistium guntheri*) and turbot (*C. nudipinnis*) from the west coast South Island. Final research report for Ministry of Fisheries research project FLA2000/01. 35 p.

Teirney, L.D.; Kilner, A.R.; Millar, R.E.; Bradford, E.; Bell, J.D. (1997). Estimation of recreational catch from 1991/92 to 1993/94 *N.Z. Fisheries Assessment Research Document 97/15*. 43 p.