



ISSN 1175-1584

MINISTRY OF FISHERIES

Te Tautiaki i nga tini a Tangaroa

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Tasman/Golden Bay (SNA 7), 2000–01**

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**Published by Ministry of Fisheries
Wellington
2002**

ISSN 1175-1584

©
**Ministry of Fisheries
2002**

Citation:
Blackwell, R.G.; Gilbert, D.J. (2002).
Age composition of commercial snapper landings in Tasman/Golden Bay
(SNA 7), 2000–01.
New Zealand Fisheries Assessment Report 2002/49. 17 p.

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

EXECUTIVE SUMMARY

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This report fulfils the requirements of Objective 1 of Project SNA2000/04, "To estimate the year-class strengths of snapper *Pagrus auratus* in SNA 7." It summarises the estimates of commercial catch at age for the Tasman Bay/Golden Bay portion of the SNA 7 fishstock (excluding the Marlborough Sounds sub-stock) for the 2000–01 fishing year, and compares relative year-class strengths with previous estimates.

The catch at age estimates for Tasman Bay/Golden Bay indicate that the fishery comprises a number of strong year-classes, and that fish over 20 y remain an important part of this fishery. The 1998 year-class (3 y) appears to be relatively strong, whilst the 1986, 1988, 1990, 1995, and 1996 year-classes (15, 13, 11, 6, and 5 y) continue to dominate the fishery. We estimate that one-third of the total catch by weight comes from the 15-year-olds.

The relatively high mean weight of 3.0 kg and large numbers of fish in excess of 20 y indicate that this fishstock continues to be lightly fished, and that it is continuing to rebuild. The years of weak recruitment (1991–94) in Tasman Bay/Golden Bay are consistent with trawl survey data.

1. INTRODUCTION

1.1 Overview

Snapper (*Pagrus auratus*) is an inshore demersal species of the family Sparidae, found in depths of 10–200 m throughout the northern and central areas of the New Zealand EEZ (QMAs 1, 2, 7, 8, & 9). The number of juveniles that result from a spawning may vary widely, which results in strong or weak year-classes entering the stock (Smith & Francis 1991). Francis (1993) determined a high positive correlation between year-class strength and sea surface temperature in the Hauraki Gulf. A similar result has been found by Gilbert et al. (2000) and similar relationships have been shown for SNA 2, SNA 8, and the Tasman Bay/Golden Bay (SNA 7) fishstock (Davies & McKenzie 2001, Gilbert & Taylor 2001).

This report describes the results of the fourth year of a commercial catch sampling programme. Sampling to estimate catch at age was carried out during the 2000–01 fishing year in the Tasman Bay/Golden Bay section (Figure 1) of the SNA 7 fishstock, and repeats the sampling described by Blackwell et al. (2000). These data add to age structure data taken from several previous estimates for the Tasman Bay/Golden Bay substock (Mace 1982, Mace & Drummond 1982, Drummond & Kirk 1986, Kirk et al. 1988, Drummond 1994, Annala & Sullivan 1996, Blackwell et al. 1999, 2000). Catch at age is not estimated for the Marlborough Sounds substock of SNA 7 in this report.

1.2 Description of the fisheries

Commercial fishing for snapper in Tasman Bay/Golden Bay has occurred since at least 1945, and landings of between 500 and 1500 t were reported from the 1960s (Mace 1982) to the late 1970s (Annala et al. 2001). Following the identification of near-surface schools of spawning snapper (Drummond 1994) by aerial spotting, pair trawling and purse-seine methods were introduced into the fishery. Whilst landings initially increased and peaked at 2700 t in the 1978 calendar year, landings declined throughout the 1980s. The initial TACC of 330 t was introduced in 1986 to allow the stock to rebuild (Colman et al. 1985), but the decline in landings continued. The TACC was further reduced to 160 t in 1989–90, following a tagging study carried out in 1987 (Annala et al. 2001). In 1996–97 the TACC was increased from 160 to 200 t. For several years landings have been lower than, or equal to, the TACC (Annala et al. 2001). Input controls remain, including regulatory and voluntary closed areas (Anon. 1994).

Most snapper in SNA 7 are now taken as bycatch of trawling during late summer, particularly for red gurnard and flatfish. Snapper are also taken as bycatch of set netting for rig, warehou, and school shark and line fishing for school shark during the summer. A small target fishery now occurs on the spawning stock during spring-summer, with landings by longline, single trawlers, and two sets of pair trawlers, but effort in these fisheries appears to be inversely related to the relative strength of the fisheries for albacore tuna and dredge oysters in SNA 7. After the 1996–97 TACC increase, this target fishery now extends into early autumn (Blackwell et al. 1999).

1.3 Previous research

The SNA 7 fishstock stock is recognised as separate from the SNA 8 (Auckland-West Coast North Island) fishstock, based on tagging recovery data (Drummond 1994). Within SNA 7, two separate substocks in Tasman Bay/Golden Bay and in the Marlborough Sounds are recognised, based on stock separation studies carried out during 1978–81, 1984, and 1986–87 (Drummond 1994). The small catch on the west coast of the South Island is taken to be part of the Tasman Bay/Golden Bay substock.

Harley & Gilbert (2000) modelled the Tasman Bay/Golden Bay stock using an age-structured population model fitted to a tag-recapture stock biomass estimate and commercial and research proportion at age estimates from samples taken between 1968–69 and 1997–98. They estimated current stock biomass at the start of 1998–99 as $1.43B_{MSY}$ and MSY at 650 t. The latter included an assumed recreational catch of 84 t and commercial under-reporting of 10% (Hartill et al. 1998).

The previous catch-at-age estimates (Blackwell et al. 2001) suggested that the fishery was numerically dominated by the strong 1986, 1988, 1990, 1995, and 1996 year-classes, as well as the 20+ group. Recruitment had been particularly poor between 1991 and 1994 and the 1997 year-class was also weak.

2. METHODS

Sampling in SNA 7 was restricted to the Tasman Bay/Golden Bay substock. The Marlborough Sounds substock was not sampled.

2.1 Stratification

The purpose of stratification is to increase the precision of the catch at age estimates and to reduce the effects of departure from strictly random sampling. Sampling theory shows that this will be achieved if the strata are well chosen, i.e., if variability between strata is larger than that within strata. Estimation requires the sampling of landings to be random. Strict adherence to this is impractical. However, departure from strict randomness has less effect under a stratified sampling regime, if the strata are well chosen. We used the same stratification with the same planned numbers of samples per stratum as had been used in the previous two years.

Trawlers were ranked by mean landing size during 1996–97 to 1998–99. The higher landings class, BT1, was defined by a list of vessels (not given here) that had together landed 50% of the total snapper catch during this period. As the non-trawl component of this fishery was small, the other trawlers were combined with the non-trawl methods to form the OTH strata. Seasonal catches by vessel class were defined as six strata: BT1-Spr (October–December 2000); BT1-Sum (January–March 2001); BT1-Aut/Win (April–September 2001); OTH-Spr (October–December 2000); OTH-Sum (January–March 2001); OTH-Aut/Win (April–September 2001).

2.2 Sampling

More landings were sampled than were planned in all strata except the BT1-Sum stratum. Sampling started in October, and extra samples were taken largely in the OTH strata to correspond to an apparent increase in fishing by these vessels. Landings in the OTH-Spr and OTH-Sum strata were particularly high and in spite of opportunistically increasing the sample numbers during periods when landings were numerous, the OTH-Sum stratum was still somewhat under-sampled. A summary of the numbers of landings sampled and landed weights over recent years is given in Table 1. The large changes in the timing of the fishery from year to year make it difficult to sample the strata optimally.

The 2000–01 actual catch for SNA 7 (all) was 159 t, which compares favourably with the estimated (landed) catch for SNA 7 (all) of 156 t. The estimated 2000–01 catch for Tasman Bay/Golden Bay was 122 t and for the Marlborough Sounds (statistical area 17) was 35 t. These totals do not include a further 8 t reported from statistical area 37 because these landings cannot be separated from the SNA 8 fishstock.

2.3 Sampling procedure

A random sample of about 30 fish (more or less for larger or smaller landings) was collected from each landing from a random selection of fish bins, as described by Blackwell et al. (1999). The sagittal otoliths were collected from each fish and the length (to the nearest centimetre below the fork length) was measured. The sex was not determined, as snapper show no differential growth between sexes (Paul 1976). The otoliths were inventoried and stored in the otolith collection maintained by NIWA.

2.4 Ageing

The numbers of otoliths collected exceeded the target of 1000, so random subsamples were selected for ageing. Subsample sizes were chosen to bring the number of fish towards proportionality with the landing weight (with a minimum of 10).

Snapper otoliths collected were processed individually following the methods described by Davies & Walsh (1995). Each otolith was prepared by cutting dorsal-ventrally through the nucleus, then the cut surface was polished by wet grinding using 200 grit and 400 grit diamond polishing wheels, and read under a binocular dissecting microscope at x20–30 magnification, as described by Blackwell et al. (1999).

A standardised procedure for reading the otoliths and ageing the snapper was followed (after Davies & Walsh 1995). Ages were defined from a nominal birthday at 1 January. Age was recorded to one decimal place, based on the date of sampling, e.g., a 1989 year-class fish would be aged 8.7 years if sampled in early October 1997, 8.9 years in December and 9.4 years in May 1998. Because sampling was from October to September, fish were combined into an age-class by rounding down to the nearest year and adding an extra year to the ages of the fish sampled between October and December 2000.

Proportions at age, \hat{p}_i , were calculated for each stratum and coefficients of variation for the proportion at age estimates, with a finite population correction, $c\hat{v}(\hat{p}_i)$, were calculated by bootstrapping, as described by Blackwell et al. (2000) (Appendix 1). The sampled landings and age data were stored on the Ministry of Fisheries *market* and *age* databases, respectively, maintained by NIWA.

3. RESULTS

Samples were collected from a representative cross-section of the fishery to include both targeting and bycatch. The numbers of snapper aged from each stratum are given in Table 2, and the proportions at age, \hat{p}_i , and the estimated coefficients of variation, $c\hat{v}(\hat{p}_i)$, are presented in Figures 2 and 3. Values are given in Appendices 1 and 2. The mean weighted c.v. was 0.29 (0.27 when the age-classes exceeding 19 y were lumped). Appendices 3 and 4 give age-length matrices of actual numbers sampled and estimated proportions in the annual catch.

Comparison of proportions at age and mean weights (Figure 3 and Table 3) indicates some differences in the age distributions between strata. The fishery had considerable variability in mean size between strata, from 4.0 kg (OTH-Spr), to 1.9 kg (OTH-Aut/Win). Mean weight was 3.0 kg and varied from 2.5 kg (1998–99) and 3.2 kg (1999–2000) (Blackwell et al. 1999, 2000).

4. DISCUSSION

The fishery comprised a wide range of age-classes and variability occurred in age distributions between landings within strata and between strata. There was a tendency for older fish to be caught in spring-summer and for younger fish to be caught in autumn-winter. No stratum contained the full set of age-classes. This resulted in the superficially surprising result that the mean weighted c.v. of each stratum was less than the overall mean weighted c.v. The mean weighted c.v. achieved, of 0.29 (0.27 when the age-classes exceeding 19 y were lumped) was somewhat higher than the target c.v. of 0.20, even though the planned number of samples was increased from 50 to 60. This compares with 0.25 (0.19) achieved in sampling during 1999–2000. It reflects the wide spread of age-classes present in this population and the suboptimal sampling caused by the unexpectedly large catch taken in the OTH-Sum stratum. Although additional samples were collected, this stratum was under-sampled. The variability in the landings pattern between years and among strata is essentially unpredictable. Our use of dynamically adjustable sampling targets appears to be the best available method of sample allocation.

The relatively large sizes of 2–4 y fish appear to be consistent with the sizes of the older fish sampled. They were larger than snapper from the west coast North Island (Walsh et al. 2001) where growth is fast. This is consistent with previous observations that SNA 7 has the fastest snapper growth rates in New Zealand. Because the younger fish were predominantly caught in the autumn-winter strata (Figure 3), they were sampled at the end of the summer growth period whereas fish sampled in spring, say, were seen at the beginning of the year's growth. Fishing selectivity that favours larger fish means that these catch samples would tend to over-estimate the mean sizes of the younger fish in the population (but not in the catch).

The fishery continued to be dominated numerically by the 1986, 1988, 1990, 1995, and 1996 year-classes and the 20+ y age-class, which were joined by the recruiting 1998 year-class (Figure 2; cf. Blackwell et al. (2001)). The weak 1991 to 1994 year-classes that correspond to the cold El Niño years continue to be apparent. This is consistent with the trawl surveys in Tasman Bay/Golden Bay during 1995 and 1996 in which the catches of juveniles were extremely low (Stevenson 1996, Blackwell & Stevenson 1997). The proportion of 3-year-old fish (1998 year-class) was much larger than last year's 3-year-olds (1997 year-class), indicating strong recent recruitment. By weight, approximately one-third of the catch was made up of 15-year-old fish (1986 year-class) and one-quarter of 20+ y fish.

In recent years the Tasman Bay/Golden Bay stock has consistently shown the highest proportions of 20+ y fish of any New Zealand snapper stock (Blackwell et al. 2001, Walsh et al. 2001). Strong year-classes have continued to occur in the same erratic manner as they have done in the past in this stock (see Gilbert & Phillips in press). These facts suggest that the fishstock has been experiencing low levels of fishing mortality over recent years.

5. ACKNOWLEDGMENTS

We thank Philip Wells (AGR, Nelson), Cameron Walsh (NIWA, Auckland) for their assistance in the interpretation of prepared otoliths, and Nick Davies (NIWA, Whangarei) for assistance in development of the catch-at-age software. We thank the following for assisting in the market sampling programme: Rob Merrilees, Ralph Dickson, Michael Stevenson, Peter Horn, Stuart Hanchet, and Kelly May (NIWA, Nelson). We also thank David Fisher, Kim George, and Darren Stevens for their assistance with the handling and storage of age data, Kim Duckworth and Seren Penty (Ministry of Fisheries), who provided data from the catch-effort system, and the reviewer who commented on a previous version of this report.

We acknowledge the assistance of the staff of fish processors in SNA 7 for their cooperation in enabling NIWA staff to sample catches: Amaltal Fisheries Ltd (Nelson), Aquafresh Fisheries Ltd (Nelson), Guyton's Fisheries Ltd (Nelson), Sanford Ltd (Nelson), and Talley's Fisheries Ltd (Nelson and Motueka).

This work was funded by the Ministry of Fisheries Project SNA2000/04.

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Table 1: Proportion of estimated landings in Tasman Bay/Golden Bay (SNA 7) and planned and actual number of samples for 2000–01.

2000–01 stratum	Planned number of landings to sample	1996–97 to 1998–99 proportion of catch in stratum by weight	1999–2000 proportion of catch in stratum by weight	2000–01 proportion of catch in stratum by weight	Number of landings sampled
BT1-Spr	16	0.49	0.25	0.16	16
BT1-Sum	7	0.16	0.16	0.17	5
BT1-Aut/Win	3	0.04	0.05	0.01	4
OTH-Spr	14	0.14	0.16	0.17	20
OTH-Sum	7	0.10	0.14	0.37	9
OTH-Aut/Win	3	0.05	0.22	0.10	6
Total	50	145 806 (kg)	178 102 (kg)	121 698 (kg)	60

Table 2: Summary of snapper otolith samples, in Tasman Bay/Golden Bay (SNA 7), 2000–01.

Stratum	Length range (cm)	Mean length (cm)	Number aged
BT1-Spr	25–81	55.5	302
BT1-Sum	30–82	54.0	125
BT1-Aut/Win	31–64	45.0	57
OTH-Spr	22–85	59.1	337
OTH-Sum	29–80	53.2	152
OTH-Aut/Win	26–79	45.8	62
Total			1035

Table 3: Summary of estimates for 2000–01 by sampling stratum in Tasman Bay/Golden Bay (SNA 7).

	Stratum						Total
	BT1-Spr	BT1-Sum	BT1-Aut/Win	OTH-Spr	OTH-Sum	OTH-Aut/Win	
Landings sampled	16	5	4	20	9	6	60
Mean weight, \hat{w}_j (kg)	3.9	3.6	1.7	4.3	2.8	1.9	3.0
Weight sampled landings, t_j (t)	11.3	12.7	1.4	13.3	8.5	0.7	47.9
Total landings, T_j (t)	19.8	21.2	3.3	20.9	45.1	11.3	121.7
Mean weighted c.v. of proportions at age (1–20+ y)	0.03	0.05	0.03	0.02	0.21	0.10	0.27

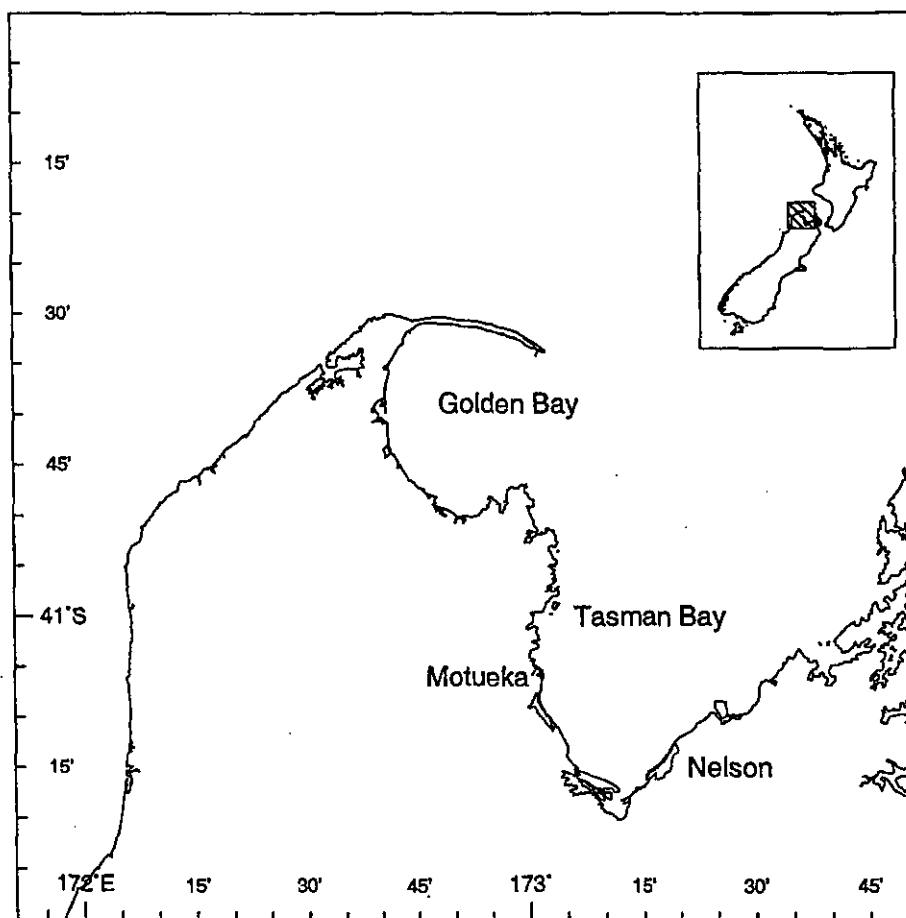


Figure 1: Location of Tasman Bay and Golden Bay at the north of the South Island.

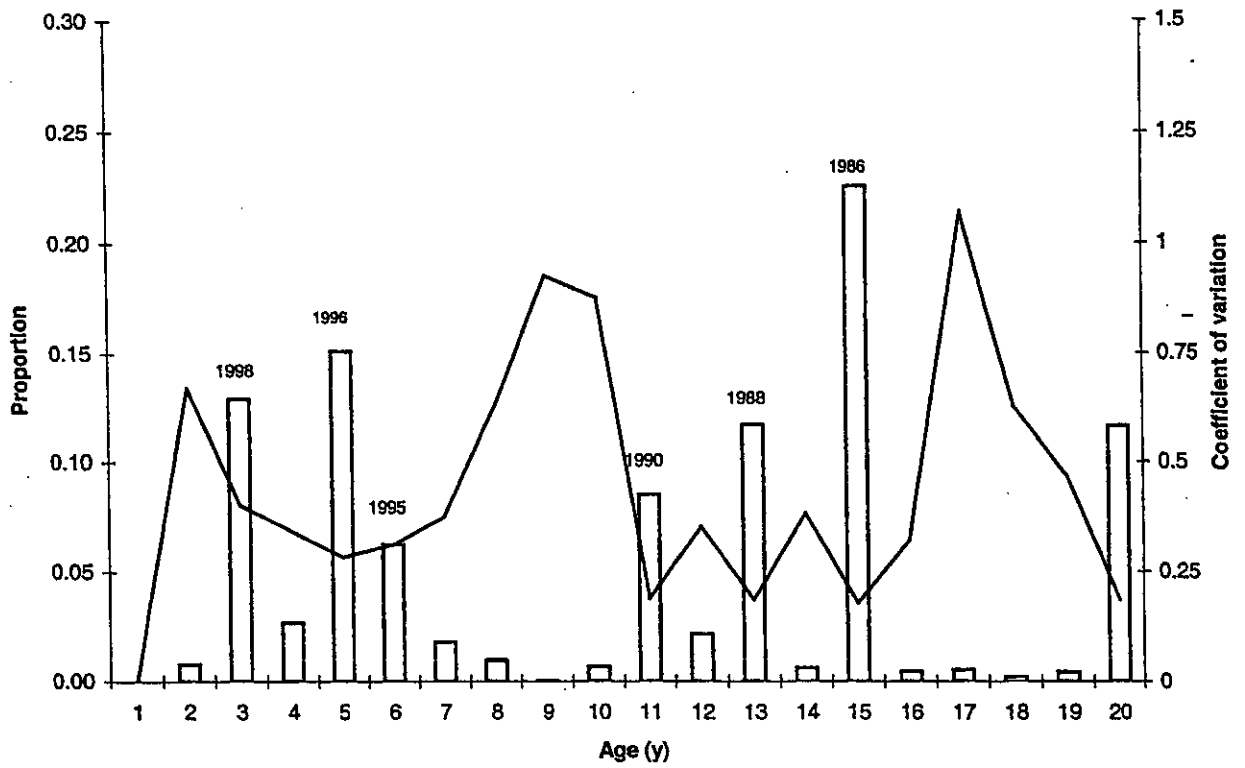


Figure 2: Proportion at age estimates (histogram) and c.v.s (line) for Tasman Bay/Golden Bay (SNA 7) landings, fishing year 2000-01.

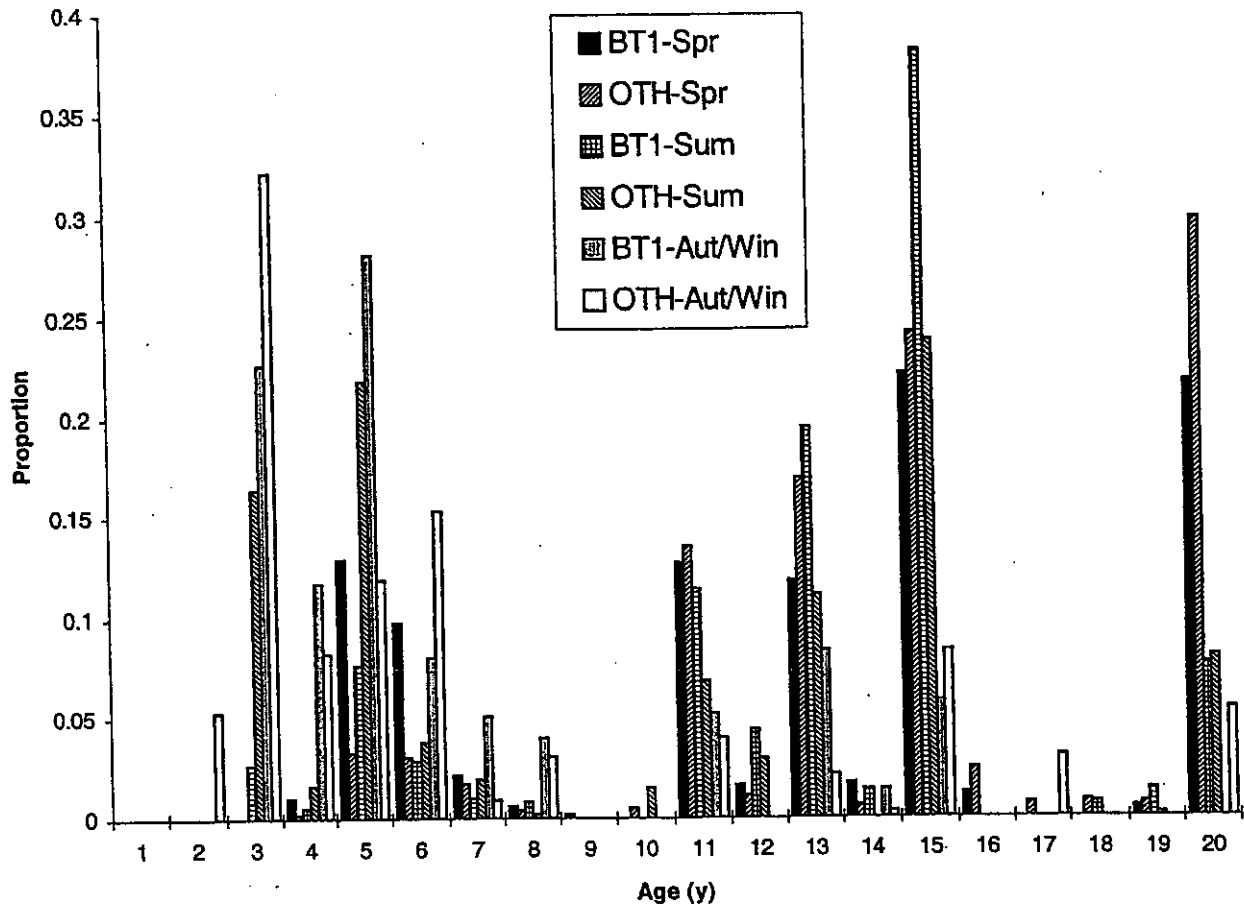


Figure 3: Proportion at age estimates for Tasman Bay/Golden Bay (SNA 7) landings, fishing year 2000-01 by sampling stratum (see Section 2.1 for stratum definitions).

Appendix 1: Estimated proportions at-age for 2000-01 Tasman Bay/Golden Bay (SNA 7) landings

Age	Stratum						Overall
	BT1-Spr	OTH-Spr	BT1-Sum	OTH-Sum	BT1-Aut/Win	OTH-Aut/Win	
1							0.0000
2						0.0530	0.0079
3			0.0265	0.1647	0.2262	0.3221	0.1292
4	0.0104	0.0022	0.0053	0.0161	0.1169	0.0818	0.0268
5	0.1289	0.0329	0.0785	0.2182	0.2808	0.1190	0.1512
6	0.0973	0.0302	0.0283	0.0378	0.0798	0.1532	0.0625
7	0.0215	0.0171	0.0106	0.0189	0.0503	0.0094	0.0179
8	0.0059	0.0042	0.0077	0.0022	0.0393	0.0300	0.0097
9	0.0024						0.0003
10		0.0055		0.0152			0.0067
11	0.1265	0.1352	0.1141	0.0677	0.0513	0.0394	0.0854
12	0.0162	0.0112	0.0441	0.0291			0.0217
13	0.1179	0.1699	0.1951	0.1111	0.0834	0.0214	0.1169
14	0.0168	0.0062	0.0139		0.0142	0.0031	0.0062
15	0.2210	0.2414	0.3803	0.2372	0.0580	0.0833	0.2251
16	0.0124	0.0243					0.0046
17		0.0069				0.0300	0.0053
18		0.0083	0.0071				0.0021
19	0.0055	0.0072	0.0139	0.0016			0.0043
20	0.0103	0.0170	0.0071	0.0184			0.0119
21	0.0125	0.0191					0.0039
22	0.0288	0.0278		0.0214		0.0077	0.0169
23	0.0182	0.0129	0.0417	0.0238			0.0197
24		0.0061					0.0007
25	0.0027	0.0044		0.0016		0.0029	0.0019
26	0.0733	0.0609		0.0076		0.0108	0.0216
27		0.0143		0.0030			0.0029
28	0.0101	0.0223		0.0016			0.0047
29	0.0138	0.0318		0.0030			0.0068
30	0.0074	0.0204	0.0139				0.0055
31	0.0086	0.0253					0.0042
32	0.0027	0.0101					0.0016
33							0.0000
34							0.0000
35		0.0028					0.0003
36		0.0055					0.0007
37		0.0031					0.0004
38	0.0027						0.0004
39	0.0092	0.0033					0.0016
40	0.0028						0.0004
41							0.0000
42	0.0057						0.0007
43	0.0058	0.0012				0.0300	0.0054
44						0.0029	0.0004
45							0.0000
46		0.0033	0.0139				0.0025
47	0.0027						0.0004
48		0.0029					0.0004
49							0.0000
50							0.0000
51							0.0000
52							0.0000
53							0.0000
54							0.0000
55							0.0000
56							0.0000
57							0.0000
58							0.0000
59							0.0000
60		0.0029					0.0004

Appendix 2: Standard errors and overall c.v.s of proportions at age with finite population correction, estimated by simulation for 2000-01 Tasman Bay/Golden Bay (SNA 7) landings

Age	Stratum						Overall c.v.
	BT1-Spr	OTH-Spr	BT1-Sum	OTH-Sum	BT1-Aut/Win	OTH-Aut/Win	
2						0.0053	0.6691
3			0.0031	0.0457	0.0058	0.0241	0.4030
4	0.0007	0.0002	0.0008	0.0052	0.0021	0.0072	0.3427
5	0.0039	0.0013	0.0081	0.0399	0.0060	0.0107	0.2829
6	0.0034	0.0015	0.0030	0.0095	0.0020	0.0162	0.3121
7	0.0010	0.0009	0.0014	0.0057	0.0018	0.0023	0.3751
8	0.0005	0.0003	0.0009	0.0013	0.0015	0.0056	0.6257
9	0.0003						0.9252
10		0.0005		0.0059			0.8757
11	0.0026	0.0038	0.0052	0.0132	0.0023	0.0054	0.1880
12	0.0010	0.0006	0.0035	0.0067			0.3519
13	0.0038	0.0027	0.0065	0.0196	0.0022	0.0040	0.1851
14	0.0008	0.0004	0.0017		0.0009	0.0009	0.3833
15	0.0038	0.0028	0.0118	0.0369	0.0028	0.0085	0.1778
16	0.0007	0.0013					0.3221
17		0.0005				0.0057	1.0692
18		0.0008	0.0010				0.6257
19	0.0005	0.0004	0.0017	0.0009			0.4662
20	0.0009	0.0008	0.0010	0.0061			0.5315
21	0.0009	0.0008					0.3014
22	0.0019	0.0009		0.0066		0.0021	0.4284
23	0.0008	0.0007	0.0039	0.0084			0.4730
24		0.0005					0.7349
25	0.0003	0.0003		0.0009		0.0009	0.6852
26	0.0023	0.0020		0.0029		0.0024	0.2234
27		0.0007		0.0017			0.6189
28	0.0008	0.0009		0.0009			0.3325
29	0.0011	0.0013		0.0016			0.3415
30	0.0006	0.0009	0.0017				0.3619
31	0.0005	0.0010					0.2725
32	0.0003	0.0006					0.4576
33							
34							
35		0.0003					0.8697
36		0.0005					0.8213
37		0.0003					0.8582
38	0.0003						0.9194
39	0.0006	0.0003					0.4457
40	0.0003						0.8706
41							
42	0.0005						0.6565
43	0.0005	0.0001				0.0054	1.0113
44						0.0009	2.1899
45							
46		0.0003	0.0017				0.7049
47	0.0003						0.8976
48		0.0003					0.8225
49							
50							
51							
52							
53							
54							
55							
56							
57							
58							
59							
60		0.0003					0.8496
Mean weighted c.v.	0.0360	0.0322	0.0570	0.2195	0.0274	0.1077	0.2983

Appendix 3: Numbers of commercially caught snapper sampled by age and length from Tasman Bay/Golden Bay throughout 2000-01

Length (cm)	Age at 1 January 2001																			Total	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19		>19
27																					0
28		2																			2
29			6																		6
30		2	4																		6
31			10																		10
32		1	7	2	2																12
33			7		2																9
34			3		4																7
35			1	2	6	1															10
36			2	4	12	1	1														20
37				3	14	4															21
38				6	18	9															33
39					24	6															30
40			1	4	14	5															24
41					13	8															21
42					9	8	2														19
43					3	8	2														13
44					3	3	4				1		1								12
45					2	7	3				1	1									14
46						5	1	1													7
47						2	1	2			1	1	1								8
48					1	3	3	1			5		1								14
49								2			4		1								7
50								2		1	9	2	2		1						17
51							1		1		6		3								11
52							3	1			8	1	6		2						21
53								1			9	2	6	1	7						26
54											16	1	11		2	1					31
55									1		12	1	8	2	11						35
56								1			3	2	12	2	8						28
57											9	4	12		8						33
58											9	1	14	3	18			1			46
59											6	1	14		18	1				1	41
60											2		14	1	24	2	1			3	47
61											5		9	2	27		2			4	49
62											6	1	6	1	21	2				7	44
63										1			8		21		1	1			39
64											2		4		22					11	39
65															14				1	11	26
66													1		13	1			1	14	30
67													3		10	1			2	17	33
68															5					20	25
69															3					12	15
70															2					12	14
71															4	1				15	21
72																		1	2	11	13
73																1			1	15	17
74																			1	12	12
75																				11	11
76																				1	1
77																					0
78																					0
79																				2	2
80																				1	1
81																					0
82																					0
83																				1	1
84																					0
85																				1	1
Total	0	5	41	21	127	70	21	11	1	3	114	18	137	12	242	9	4	2	8	189	1035

Appendix 4: Estimates of percentage at age and length for snapper from Tasman Bay/Golden Bay caught commercially throughout 2000-01. Table sums to 100

Length (cm)	Age at 1 January 2001																			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	>19
25																				
26																				
27																				
28		0.48																		
29			0.65																	
30		0.49	0.57																	
31			1.83																	
32		0.12	0.97	0.15	0.23															
33			1.00		0.13															
34			0.14		0.94															
35			0.05	0.85	1.15	0.08														
36			0.46	0.80	1.91	0.07	0.03													
37				0.62	1.06	0.34														
38				0.68	1.67	0.45														
39					2.12	0.22														
40			0.09	0.36	2.85	0.29														
41					2.28	0.51														
42					1.31	0.80	0.44													
43					0.78	1.23	0.10													
44					0.68	0.33	0.21				0.09		0.07							
45					0.06	0.26	0.66				0.03	0.07								
46						0.48	0.34	0.09												
47						0.18	0.09	0.42				0.46	0.01	0.10						
48					0.08	0.66	0.20	0.11				0.78		0.08						
49								0.14				0.16		0.18						
50								0.12		0.03	0.69	0.15	0.09		0.10					
51							0.14		0.08		0.30		0.10							
52							0.08	0.39			0.77	0.39	0.63		0.17					
53								0.18			0.74	0.15	0.39	0.08	0.48					
54											1.16	0.18	1.16		0.23	0.02				
55										0.09	0.57	0.09	0.75	0.12	1.02					
56								0.06			0.14	0.13	1.40	0.18	0.78					
57											0.46	0.21	1.52		0.72					
58											0.49	0.03	1.19	0.19	1.60			0.02		
59											0.32	0.10	1.45		2.06	0.05				0.05
60											0.08		1.08	0.12	2.15	0.07	0.06			0.14
61											1.00		1.31	0.06	2.23		0.23			0.60
62											0.55	0.09	0.96	0.04	2.14	0.06				0.24
63										0.34		0.47		1.75		0.04	0.07			0.53
64											0.07		0.73		1.63					0.80
65															1.57				0.10	0.90
66													0.39		1.88	0.03			0.05	0.82
67													0.23		0.46	0.08			0.35	1.01
68															0.57					1.16
69															0.13					1.26
70															0.06					0.42
71															0.14	0.08			0.03	1.17
72																			0.06	0.91
73																0.03			0.09	0.87
74																				1.37
75																				0.44
76																				0.03
77																				
78																				
79																				0.21
80																				0.29
81																				
82																				
83																				0.03
84																				