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2005–06

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## **EXECUTIVE SUMMARY**

**Langley, A.D. (2009). Length and age composition of trevally in commercial landings from TRE 1 and TRE 7, 2005–06.**

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During 2005–06, trevally catches from the target TRE 7 single trawl fishery and the TRE 1 purse-seine fisheries were sampled. The length and age composition of the catch was determined for each fishery.

The TRE 1 purse-seine catch was sampled from the Bay of Plenty and east Northland. The length composition of the catch was characterised by a strong unimodal distribution occupying the 34–50 cm (F.L.) length range with a modal peak at about 40 cm F.L. The age composition contained a wide range of age classes, dominated by 5–10 year age classes. There was a general decline in the proportion of fish in each age class with increasing age and a relatively high proportion of older fish (20+ years).

Trevally recruit to the TRE 7 single trawl fishery from age 3 years, and the 2005–06 catch was dominated by fish in the 4–11 year age classes. There was a high proportion of younger fish in the catch from the 5–8 year age classes, representing the 1998 to 2001 year classes. The age composition also reveals the presence of the strong 1988 and 1995 year classes, at ages 18 and 11 years, and a relatively high proportion of old fish (20+ years).

The length and age compositions of the sampled catch were consistent with the results of sampling conducted during the late 1990s and early 2000s. The time series of age compositions derived from the TRE 7 fishery will be incorporated in an updated stock assessment scheduled for 2008.

## **1. INTRODUCTION**

The TRE 1 and TRE 7 fishstocks support an important inshore fishery for trevally (*Pseudocaranx georgianus*) around the northern North Island (Figure 1). The current TACCs for TRE 1 and TRE 7 are 1506 t and 2153 t, respectively. Most of the catch from TRE 7 is taken by trawl, either targeting trevally or as a bycatch of the target snapper fishery. Similarly, a large proportion of the TRE 1 catch is taken as a bycatch of the snapper trawl fishery, although an important target purse-seine fishery also operates in TRE 1 (Walsh et al. 1999).

In 1997–98, the Ministry of Fisheries instigated a catch sampling programme to monitor the length and age composition of the main commercial trevally fisheries in TRE 1 and TRE 7. The programme initially included the single trawl and purse-seine fisheries in TRE 1 and the single trawl (peak season and off-peak) and pair trawl fisheries in TRE 7 (Walsh et al. 1999). The four method fisheries were resampled during the 1998–99 fishing year, though sampling of the off-peak TRE 7 fishery was discontinued (Walsh et al. 2000).

For the 1999–2000 fishing year, catch sampling was continued in the single trawl and purse-seine fisheries in TRE 1 and the peak-season single trawl fishery in TRE 7 (Langley 2001). In 2000–01, the TRE 1 purse-seine fishery and the TRE 7 single trawl fishery were sampled (Langley 2002) and sampling of the former fishery was continued in 2001–02 (Langley 2003).

There is currently no stock assessment for the TRE 1 fishery (Ministry of Fisheries 2007). The Pelagic Working Group considered that in the absence of a reliable index of abundance for this fishstock the most appropriate approach for the monitoring of the fishery was to routinely determine the age composition of the catch from the commercial fishery. The three years of sampling from the TRE 1 single trawl fishery revealed a high level of inter-annual variability in the age composition of the catch that was attributed to variability in the temporal and spatial distribution of the target trawl fisheries in TRE 1 (Langley 2001). Sampling of the single trawl fishery was discontinued in 2000–01, although annual sampling of the TRE 1 purse-seine fishery has been maintained to establish a time-series of age frequency data from the fishery.

The age composition of the TRE 7 catch from the single trawl fishery has been incorporated in the stock assessment of TRE 7 (Hanchet 1999, Maunder & Langley 2004). It is intended to update the stock assessment to include the age compositions from the additional years of catch sampling in 2008.

This report provides a summary of the catch sampling data collected from the main TRE 1 and TRE 7 fisheries during the 2005–06 fishing year under the Ministry of Fisheries contract TRE2005/01. The specific objective of the project was to conduct the sampling and determine the length and age composition of commercial catches in TRE 1 and TRE 7 during the 2005–06 fishing year. The principal fisheries sampled were the target purse-seine in TRE 1 and the peak season single trawl fishery in TRE 7.

## **2. METHODS**

### **2.1 Sample collection**

During the 2005–06 fishing year, the landed catches of the purse-seine fishery in TRE 1 and the peak-season (November 2005 to April 2006) single trawl fishery in TRE 7 were sampled. In addition, a few TRE 7 pair trawl landings were sampled opportunistically from the fishery. For the pair trawl fishery, a landing was defined as the catch landed by an individual vessel.

A two-stage sampling procedure was used to determine the length composition of the catch, where the first stage in the sampling selection was the unbiased selection of the landed catches of trevally from

vessels operating exclusively within a given fishery. All sampling was conducted from the trevally catch discharged to Sanford Limited processing plants in either Auckland or Tauranga.

The sampling regime specified a target sample size of 40 landings from the TRE 7 single trawl fishery. Only landings from TRE 7 exceeding a minimum catch weight of 1 t were considered for sampling. The sampling regime for the TRE 1 purse-seine fishery required the sampling of all trevally landings exceeding 10 t.

The second stage of the sampling procedure was the random selection of a subsample of the catch from the individual landing. For the single trawl fisheries, this involved the random selection of 20–30 bins containing 400–600 fish. All fish in the selected bins were measured to the nearest centimetre below the fork length (F.L.). The growth rate of trevally is comparable between sexes (James 1984) and, consequently, it was not necessary to determine the sex of the fish sampled. The sampling strategy was slightly modified for sampling purse-seine landings, with each of the four fish holds (wells) treated as a separate stratum. A random sample of two bins of trevally was selected from the top, middle, and bottom of each hold during discharge.

Where possible, individual purse-seine landings were assigned to one of the two sub-areas of the TRE 1 fishery (east Northland and Bay of Plenty) and TRE 7 landings were assigned to four sub-areas within TRE 7 (Ninety Mile Beach, Kaipara/Manukau, North Taranaki Bight, and South Taranaki Bight) (Figure 1). Landings were assigned to each of these areas based on the location of the trevally catch recorded on the Ministry of Fisheries catch and effort returns. Landings from the TRE 7 fishery often comprised catches from more than one sub-area.

For each landing, the total weight of the landed catch of trevally and the sampled fraction were recorded.

## **2.2 Otolith collections and ageing**

Otoliths were collected from the TRE 1 purse-seine and TRE 7 single trawl fisheries during November 2005 to September 2006 and November 2005 to March 2006, respectively. Otoliths were collected in accordance with a fixed allocation per length interval, with the allocation skewed towards the dominant length classes in the length composition.

An initial target of 508 pairs of otoliths was required from the TRE 1 fishery; 18 pairs of otoliths were to be collected from each of the main length classes (33–50 cm) and 8 pairs of otoliths from the remaining length intervals sampled (25–32 cm and 51–65 cm). A similar sampling protocol was implemented for the collection of otoliths from the TRE 7 fishery.

Ageing of the two otolith collections was conducted by NIWA, in accordance with the procedures documented by Walsh et al. (1999).

## **2.3 Data analysis**

For each fishery-method, the sampling coverage was determined by comparing the monthly and, where available, the spatial distribution of the sampled component of the catch with the total fishery. The latter was determined from an extract of catch and effort data provided by the Client Services Group of the Ministry of Fisheries (Report No. 6518). Catch and effort data from each fishery-method were summarised to determine the total number of landings and cumulative weight of landings in the sampled population by month and statistical area.

Combined length compositions were determined for each fishery-method by scaling the individual samples by the weight of the landing. The c.v. of the estimate of the proportion at length for each

length interval was determined following the statistical approach described by Davies & Walsh (1995). Separate amalgamated length compositions were also determined for the individual subareas sampled from the TRE 7 fishery and the TRE 1 purse-seine fishery.

Separate age-length keys were derived from the age readings of the otolith collections from the TRE 1 and TRE 7 fisheries. The age-length keys determine the proportion of fish at each age in each length interval (Gavaris & Gavaris 1983). The age-length key was applied to the amalgamated length frequency distribution to determine the estimate of the age composition for the individual method fishery. All fish older than 19 years were amalgamated in a single age class (“plus group”). The c.v. of the individual age classes was determined following the approach of Southward (1976). The overall precision of the age composition was calculated as the average coefficient of variation for each age class, weighted by the proportion of the fish in the interval (MWCV).

### **3. RESULTS**

#### **3.1 TRE 1 purse-seine**

##### **3.1.1 Sampling coverage**

Five landings were sampled from the TRE 1 purse-seine fishery during 2005–06. The sampled landings included many of the significant landings (5 from 8 of the landings exceeding over 10 t) of trevally from the TRE 1 purse-seine fishery and accounted for 60% of the total TRE 1 catch taken by this method. A total of 1961 fish was measured from the sampled catch of 204 t. Otoliths were collected from each sampled landing and a total of 257 otoliths were sampled.

The sampled catch was all taken by a single vessel operating from the Tauranga branch of Sanford Limited (Appendix 1). All landings were taken during November 2005 and March and September 2006. Three landings sampled were from catches taken exclusively from along the east Northland coast and the remainder of the sampled catches were taken in the Bay of Plenty (Appendix 1).

The fixed allocation otolith sample from the TRE 1 fishery required the collection of 18 otoliths per centimetre length class from the 33–50 cm F.L. length range, with an additional 8 otoliths collected from each length class beyond the extremes of this range. The target otolith sample was achieved for each length class within the 37–49 cm length range, although a limited number of otoliths were collected from the length classes beyond this range (Figure 2). Most of the otoliths collected were subsequently aged (see Appendix 6).

##### **3.1.2 Length and age composition**

The length composition of the 2005–06 TRE 1 purse-seine catch was characterised by a strong unimodal distribution, occupying the 34–50 cm F.L. length range with a modal peak at about 40 cm F.L. (Figure 3). The length composition was determined with moderate precision, with a c.v. of 5–35% for the main length classes (36–44 cm) and a MWCV of 25.1%.

There was considerable variation in the length composition among the individual landings samples; however, from the limited number of samples available, it is not possible to attribute such differences to the two subregions fished.

The estimated age composition of the 2005–06 TRE 1 purse-seine catch included a wide range of age classes and was dominated by 5–10 year age classes. There was a general decline in the proportion of fish in each age class with increasing age and a relatively high proportion of older fish (20+ years) (Figure 4). The age composition reveals the presence of a weak 1996 year class (age 10 years). The c.v. associated with the estimate of proportion at age is about 20% for the dominant 5–10 year age classes (Figure 4). The MWCV for the entire age composition is 28.7%.

## **3.2 TRE 7 single trawl**

### **3.2.1 Sampling coverage**

During 2005–06, 11 landings were sampled from the TRE 7 single trawl fishery between November 2005 and March 2006 (Appendix 2). This was considerably below the target of 40 landings due to operational issues related to the simultaneous sampling of other species (snapper and kahawai) from the landed catches of the trawl fishery. Sampling of the trevally catch was directed towards the larger landings. Consequently, while the number of landings sampled was low, the sampled landings represented 23.4% (by weight) of the total TRE 7 single bottom trawl catch. The level of sampling resulted in the measurement of 7259 fish from a sampled catch of 397.1 t.

Sampling of the 2005–06 TRE 7 single trawl fishery was conducted throughout November–March. This period accounted for 59% of the single trawl TRE 7 catch from landings exceeding 1 t (Table 1).

In 2005–06, most of the TRE 7 single trawl catch was taken from the South Taranaki Bight (Statistical Area 040) and north of Cape Egmont (Statistical Areas 041 to 047) (Table 2 and Figure 5). These areas accounted for virtually all of the trevally catch from the sampled landings. In general, the sampled catch was distributed between these statistical areas in proportion to the total catch from the fishery, although catches from Statistical Areas 042 and 047 were over- and under-represented in the sample (Figure 5).

The fixed allocation otolith sample from the TRE 7 fishery required the collection of 18 otoliths per centimetre length class from the 31–48 cm F.L. length range, with an additional 8 otoliths collected from each length class beyond the extremes of this range. The target otolith sample was approached for each length class within the 33–48 cm length range, although only a few otoliths were collected from the peripheral length intervals (Figure 6). A total of 333 otoliths was collected (Table 3) and most of the otoliths were subsequently aged (see Appendix 7).

### **3.2.2 Length and age composition**

The length composition of the 2005–06 TRE 7 single trawl catch was dominated by a broad mode of fish in the 33–47 cm F.L. length range (Figure 7). The length composition was determined with a moderate level of precision, with c.v.s of 9–25% for the estimates of proportion at length for the main length classes and a MWCV of 16.1% (Figure 7). Insufficient samples were available to characterise the length composition of the catch from the separate subareas of the fishery (see Table 2).

Trevally recruit to the TRE 7 single trawl fishery from age 3 years and the 2005–06 catch was dominated by fish in the 4–11 year age classes (Figure 8). There was a high proportion of younger fish in the catch from the 5–8 year age classes, representing the 1998 to 2001 year classes. The age composition also reveals the presence of the strong 1988 and 1995 year classes, at age 18 and 11 years, and a relatively high proportion of old fish (20+ years). The c.v.s of the estimates of proportion at age are about 15–25% for most of the main age classes and the MWCV is 24.4% (Figure 8).

## **4. DISCUSSION**

This report summarises the results of the 2005–06 of length and age sampling of the peak-season single trawl fishery in TRE 7 and the purse-seine fishery in TRE 1, extending the time series of port sampling from these fisheries.

During 2005–06, almost all the significant landings from the TRE 1 purse-seine fishery were sampled. The sampling of the TRE 7 single trawl fishery was limited to a relatively small number (11) of landings, although the landings sampled comprised large catches of trevally. Overall, the sampled catch represented a significant (23.4%) proportion of the total catch of trevally from the bottom trawl



fishery and the samples were generally representative of the monthly and spatial distribution of the catch.

For both fisheries, the sampling programme approached the target level of precision for the estimated age compositions of the catch (a MWCV of 20%).

The length and age compositions are comparable to the results from sampling conducted in the late 1990s and early 2000s. The TRE 1 purse-seine fishery was sampled annually from 1997–98 to 2002–03, while sampling was conducted from the TRE 7 bottom trawl fishery from 1997–98 to 2000–01 (Walsh et al 1999, 2000, Langley 2001, 2002, 2003, 2004). The time series of sampling data was reviewed by Walsh & McKenzie (2009).

## 5. ACKNOWLEDGMENTS

The trevally catches were sampled by Fay Anderson and Geoff Plowman (Sanford Ltd, Tauranga) and Pouha Lotoahea (Sanford Ltd, Auckland). The project was managed by Andrew Bond (Sanford Ltd) and Dan McClary (Golder Associates NZ Ltd). Ageing of the otolith collections was undertaken by NIWA. Catch and effort data were provided by the Information Group, Ministry of Fisheries. Funding for the project (TRE2005/01) was provided by the Ministry of Fisheries.

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**Table 1: Comparison of the number of length frequency samples collected from the TRE 7 single trawl fishery and the monthly distribution of the total 2005–06 TRE 7 single trawl fishery, expressed as a percentage of the total annual number of landings and the total annual weight of the catch for landings exceeding 1 t of trevally.**

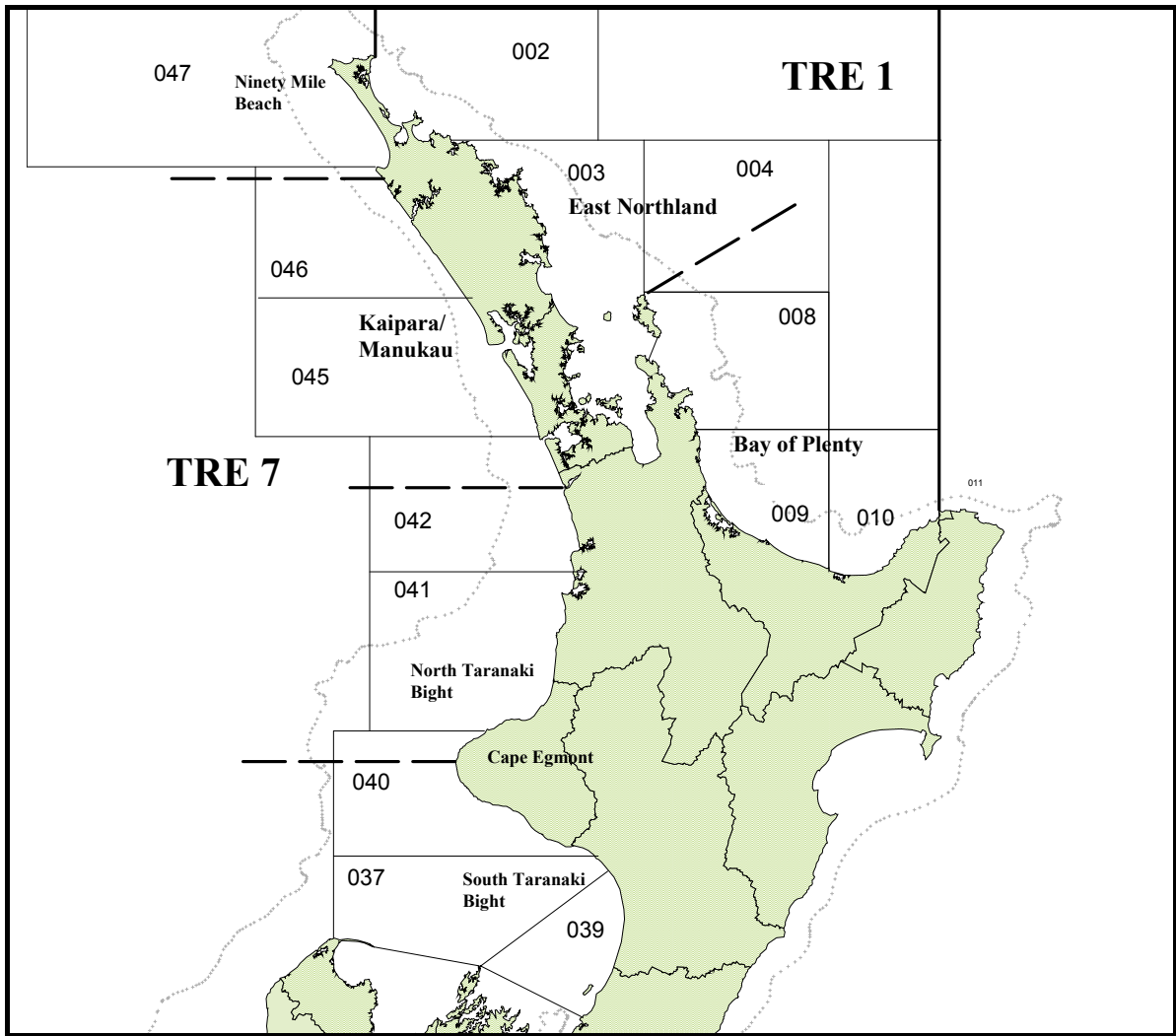
	Month												Total (t)
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	
Number landings	12	10	14	11	16	8	12	4	3	1	3	9	200
Landed weight	4	8	29	21	18	6	5	1	1	0	2	4	1 428
Samples	0	1	2	4	1	3	0	0	0	0	0	0	11

**Table 2: Spatial distribution of catch from sampled landings from the TRE 7 BT fishery from 2005–06.**

Fishery sub-area(s)	Number of samples
Kaipara/Manukau and Ninety Mile Beach	1
Kaipara/Manukau	3
Kaipara/Manukau and North Taranaki Bight	2
North Taranaki Bight	2
South Taranaki Bight	3
Total	11

**Table 3: Summary of 2005–06 TRE 7 collection of aged otoliths by fishery subarea.**

Fishery subarea	No. of otoliths	Length range (cm)	
		Min	Max
Ninety Mile Beach	0	-	-
Kaipara/Manukau	102	27	58
North Taranaki Bight	50	33	55
South Taranaki Bight	72	30	53
Other	109	27	59
Total	333	27	59



**Figure 1: Map of the TRE 1 and TRE 7 fishstock areas including the subareas of each fishery and the Ministry of Fisheries statistical areas. The grey dotted line represents the 200 m depth contour.**

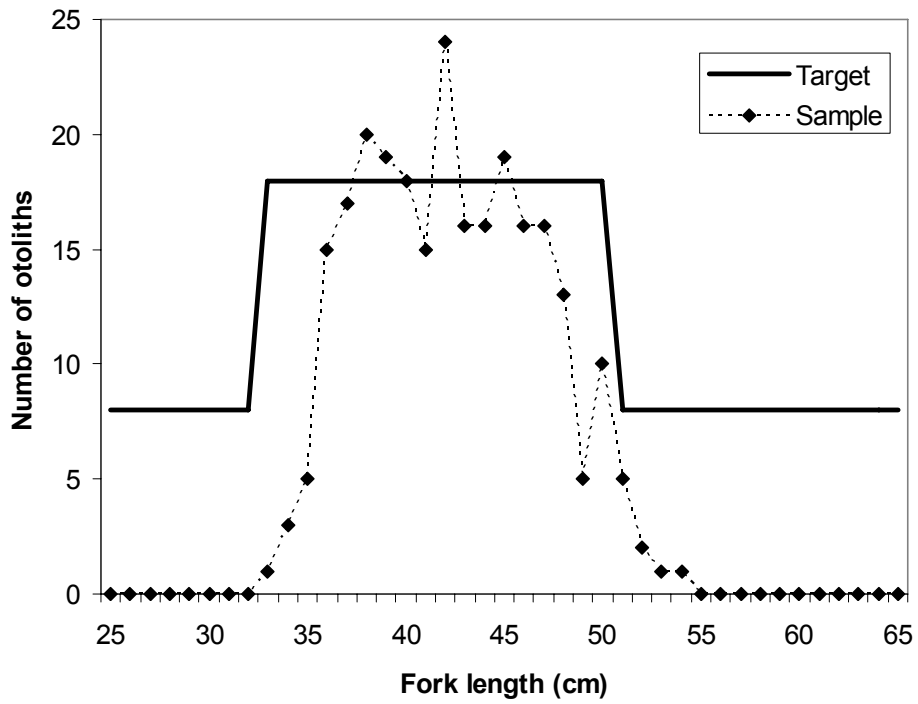
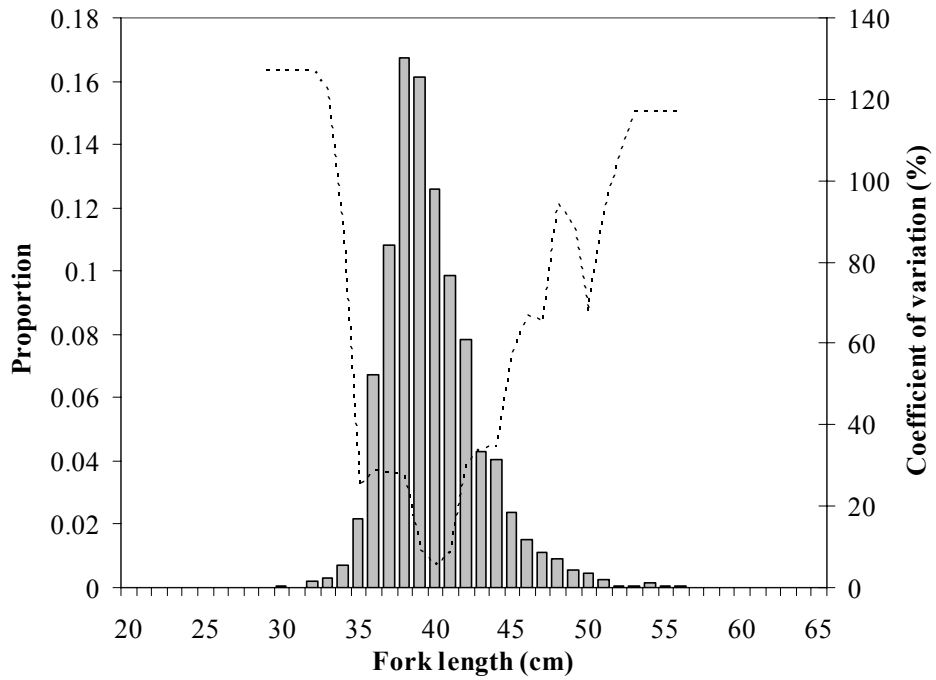


Figure 2: Length distribution of the target fixed allocation otolith sample (solid line) and the achieved otolith collection (points) for the 2005–06 TRE 1 purse-seine fishery.



**Figure 3: Length composition of the TRE 1 purse-seine catch from the 2005–06 fishing year. The dashed line represents the coefficient of variation associated with the estimates of proportion at length. Number of samples, 5; number of fish measured, 1962; MWCV, 25.1%.**

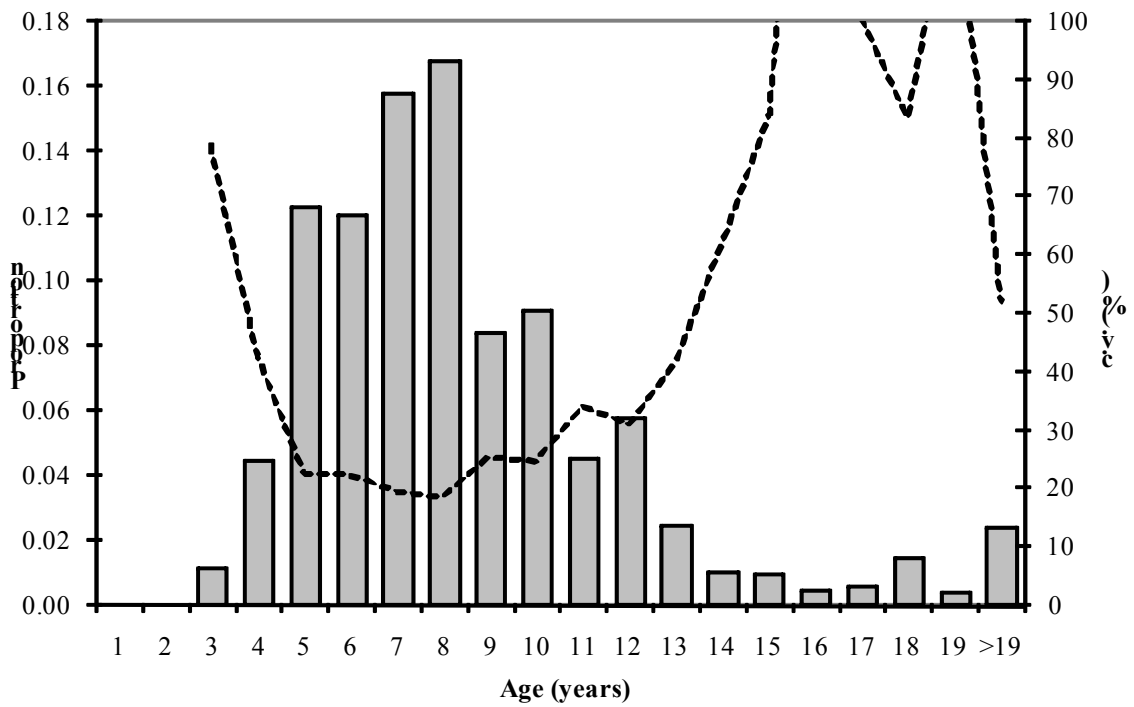


Figure 4: Age composition of the TRE 1 purse-seine catch for 2005–06. The dashed line represents the coefficient of variation associated with the estimates of proportion at age. Number of otoliths in the sample, 257; MWCV, 28.7%.

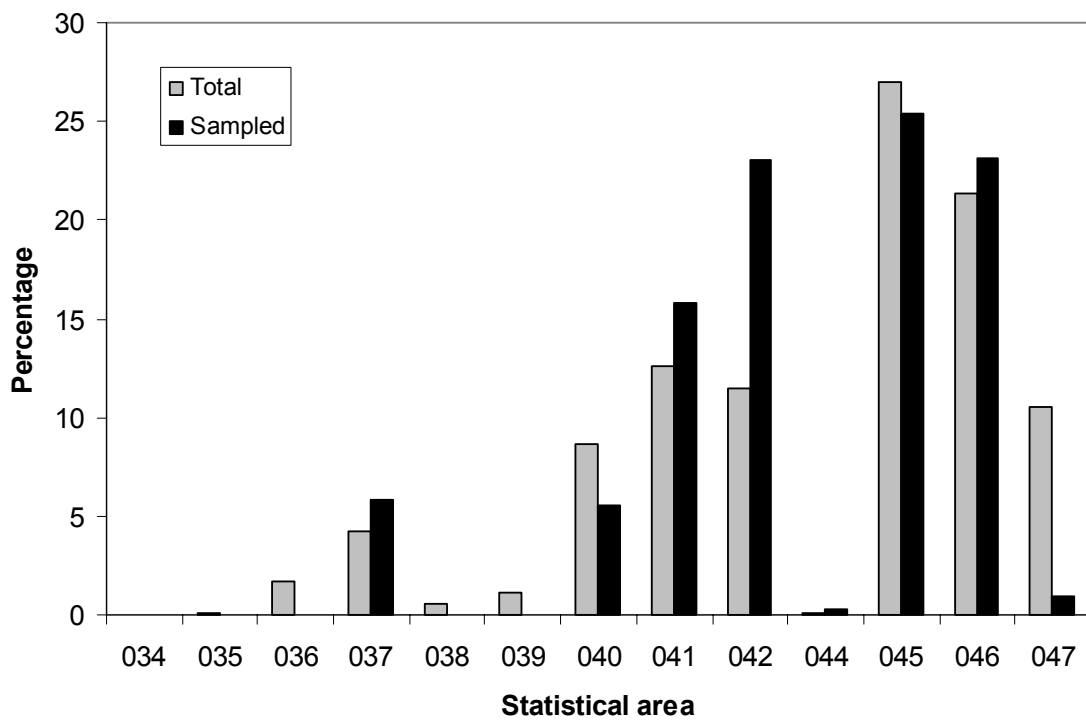


Figure 5: Comparison of the percentage distribution of the total TRE 7 bottom trawl catch and the sampled component by statistical area for the 2005–06 fishing year.

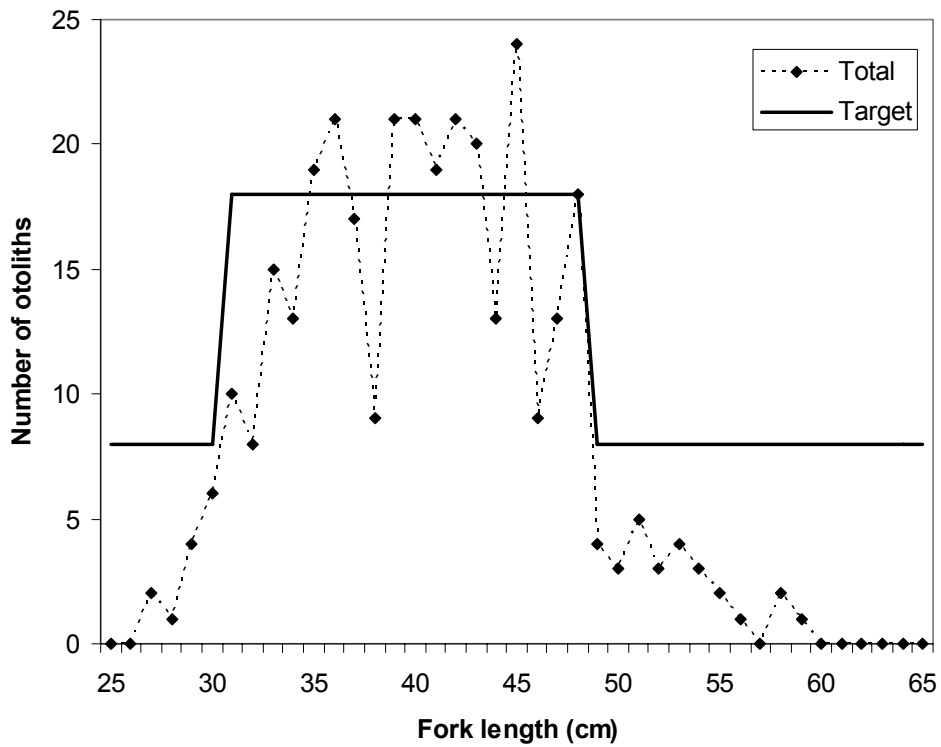


Figure 6: Length distribution of the target fixed allocation otolith sample (solid line) and the achieved otolith collection (points) for the 2005–06 TRE 7 single trawl fishery.

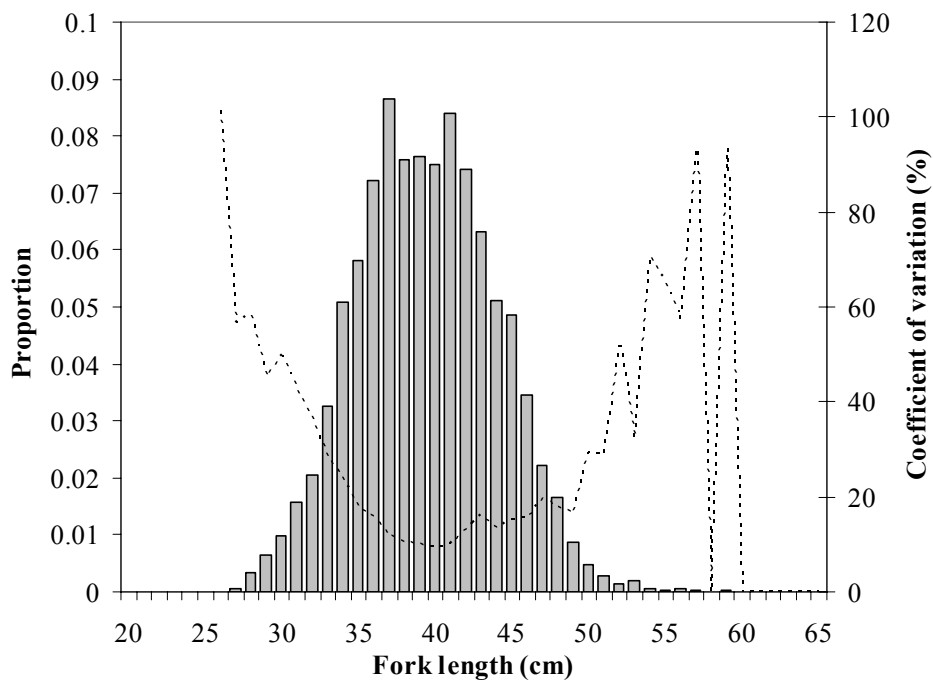
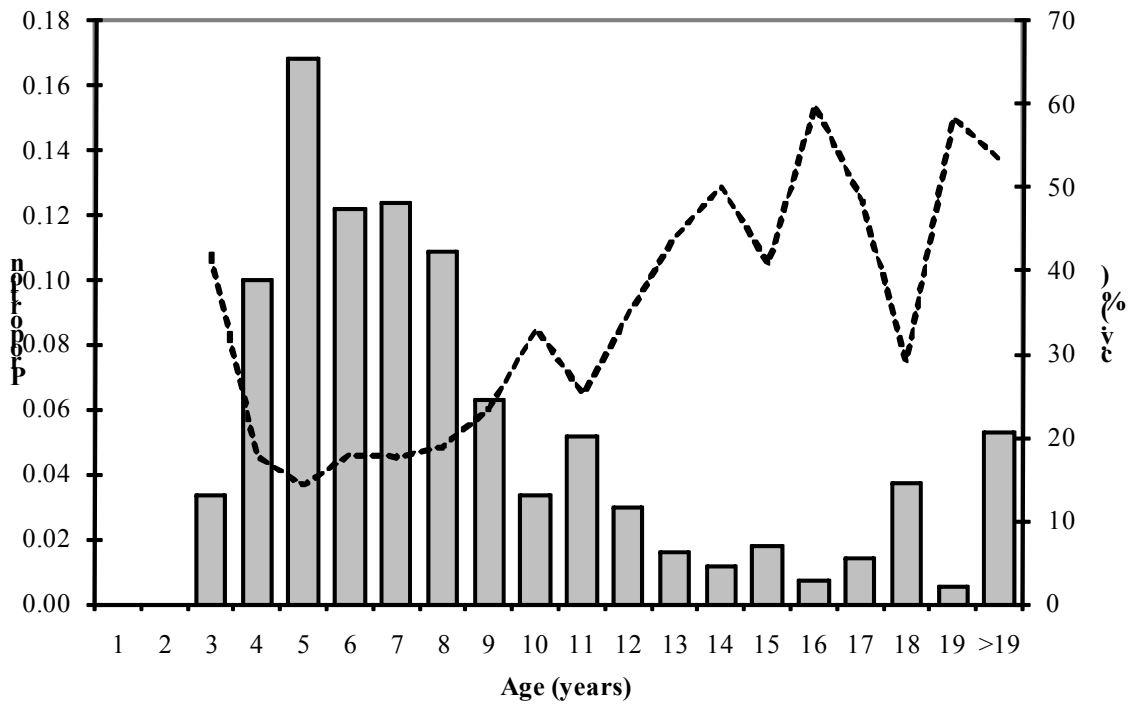


Figure 7: Length composition of the catch from the TRE 7 single trawl peak season fishery for 2005–06. Number of samples, 11; number of fish measured, 7 259; MWCV, 16.1%.





**Figure 8:** Age composition of the peak-season TRE 7 single trawl catch for 2005–06. The dashed line represents the coefficient of variation associated with the estimates of proportion at age. Number of otoliths in the sample, 505; MWCV, 24.4%.

**Appendix 1. Summary of individual landings sampled from F.V. *Lindberg* from the TRE 1 purse-seine fishery during 2005–06 fishing year.**

Landing number	Landing date	Landed weight (t)	Area(s) fished
1	02/11/2005	81.1	Bay of Plenty
2	22/11/2005	47.6	East Northland
3	02/12/2005	34.7	East Northland
4	23/03/2006	29.6	Bay of Plenty
5	13/09/2006	11.1	East Northland

**Appendix 2. Summary of individual landings sampled from the TRE 7 single trawl fishery during 2005–06 fishing year.**

Landing number	Vessel name	Landing date	Landed weight (t)	Area(s) fished
1	<i>San Rakaia</i>	27/11/2005	40.6	Kaipara/Manukau
2	<i>San Hauraki</i>	4/12/2005	20.2	Kaipara/Manukau
3	<i>Albert Sanford</i>	14/12/2005	58.0	Kaipara/Manukau
4	<i>San Rakaia</i>	10/01/2006	26.1	Kaipara/Manukau and North Taranaki Bight
5	<i>Albert Sanford</i>	12/01/2006	27.9	Kaipara/Manukau and Ninety Mile Beach
6	<i>San Rakaia</i>	16/01/2006	34.2	Kaipara/Manukau and North Taranaki Bight
7	<i>San Rakaia</i>	31/01/2006	56.6	North Taranaki Bight
8	<i>San Rakaia</i>	7/02/2006	50.6	North Taranaki Bight
9	<i>San Rakaia</i>	8/03/2006	22.4	South Taranaki Bight
10	<i>San Rakaia</i>	14/03/2006	13.7	South Taranaki Bight
11	<i>San Rakaia</i>	21/03/2006	11.9	South Taranaki Bight

**Appendix 3. Estimates of the proportion at length of trevally from the TRE 1 purse-seine fishery in 2005–06.**

Length (cm)	Prop.	c.v. (%)
20	0.0000	0.00
21	0.0000	0.00
22	0.0000	0.00
23	0.0000	0.00
24	0.0000	0.00
25	0.0000	0.00
26	0.0000	0.00
27	0.0000	0.00
28	0.0000	0.00
29	0.0002	126.87
30	0.0005	126.87
31	0.0002	126.87
32	0.0018	126.87
33	0.0031	122.16
34	0.0070	86.49
35	0.0215	24.66
36	0.0671	28.65
37	0.1083	28.21
38	0.1674	27.54
39	0.1613	8.96
40	0.1257	5.33
41	0.0985	8.71
42	0.0784	30.18
43	0.0431	34.37
44	0.0403	34.49
45	0.0237	56.34
46	0.0152	66.77
47	0.0110	65.25
48	0.0091	94.54
49	0.0057	88.92
50	0.0045	67.82
51	0.0023	92.56
52	0.0005	106.21
53	0.0007	116.83
54	0.0015	116.83
55	0.0007	116.83
56	0.0007	116.83
57	0.0000	0.00
58	0.0000	0.00
59	0.0000	0.00
60	0.0000	0.00
61	0.0000	0.00
62	0.0000	0.00
63	0.0000	0.00
64	0.0000	0.00
65	0.0000	0.00

**Appendix 4. Estimates of the proportion at length of trevally from the TRE 7 single trawl fishery in 2005–06.**

Length (cm)	Prop.	c.v. (%)
20	0.0000	0.00
21	0.0000	0.00
22	0.0000	0.00
23	0.0000	0.00
24	0.0000	0.00
25	0.0000	0.00
26	0.0001	101.49
27	0.0004	56.50
28	0.0033	58.59
29	0.0063	45.34
30	0.0099	49.87
31	0.0157	42.72
32	0.0204	36.03
33	0.0326	28.78
34	0.0508	23.62
35	0.0580	17.52
36	0.0721	15.98
37	0.0865	11.81
38	0.0759	10.39
39	0.0763	10.03
40	0.0751	9.12
41	0.0841	10.02
42	0.0743	13.01
43	0.0632	16.09
44	0.0512	13.40
45	0.0485	15.29
46	0.0346	15.58
47	0.0221	19.72
48	0.0167	17.73
49	0.0087	16.54
50	0.0049	29.24
51	0.0029	29.07
52	0.0015	51.79
53	0.0021	32.24
54	0.0004	70.95
55	0.0004	64.97
56	0.0004	57.58
57	0.0003	93.25
58	0.0000	0.00
59	0.0003	93.25
60	0.0000	0.00
61	0.0000	0.00
62	0.0000	0.00
63	0.0000	0.00
64	0.0000	0.00
65	0.0000	0.00

**Appendix 5. Estimates of proportion at age.**

**Estimates of proportion at age of trevally from the TRE 1 purse-seine fishery in 2005–06 and the associated coefficient of variations.**

Age (years)	Prop.	c.v
1	0.000	0.000
2	0.000	0.000
3	0.011	0.790
4	0.044	0.428
5	0.123	0.223
6	0.120	0.221
7	0.158	0.195
8	0.167	0.183
9	0.084	0.251
10	0.091	0.246
11	0.045	0.339
12	0.057	0.307
13	0.024	0.416
14	0.010	0.622
15	0.009	0.842
16	0.004	1.744
17	0.006	1.009
18	0.014	0.836
19	0.004	1.254
>19	0.024	0.520

**Estimates of proportion at age of trevally from the TRE 7 single trawl fishery in 2005–06 and the associated coefficient of variations.**

Age (years)	Prop.	c.v
1	0.000	0.000
2	0.000	0.000
3	0.034	0.418
4	0.100	0.176
5	0.168	0.142
6	0.122	0.179
7	0.124	0.177
8	0.109	0.188
9	0.063	0.234
10	0.034	0.329
11	0.052	0.251
12	0.030	0.348
13	0.016	0.438
14	0.012	0.500
15	0.018	0.408
16	0.008	0.597
17	0.014	0.482
18	0.037	0.290
19	0.006	0.583
>19	0.053	0.530

**Appendix 6. TRE 1 age-length key for the 2005–06 fishing year.**

Length (cm)	Age (years)																			No. Aged		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19		>19	
20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
33	0	0	0	1.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	
34	0	0	0.33	0.67	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	
35	0	0	0	0.20	0.40	0	0.20	0.20	0	0	0	0	0	0	0	0	0	0	0	0	5	
36	0	0	0.13	0.13	0.53	0.20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15	
37	0	0	0	0.06	0.29	0.24	0.35	0.06	0	0	0	0	0	0	0	0	0	0	0	0	17	
38	0	0	0	0	0.05	0.30	0.35	0.25	0	0.05	0	0	0	0	0	0	0	0	0	0	20	
39	0	0	0	0.11	0.16	0.11	0.16	0.16	0.16	0.05	0.05	0	0	0	0	0	0	0	0	0	19	
40	0	0	0	0	0	0	0.06	0.33	0.11	0.17	0.11	0.22	0	0	0	0	0	0	0	0	18	
41	0	0	0	0	0.07	0	0.20	0.13	0.07	0.27	0	0.07	0.07	0	0.07	0	0	0	0	0.07	15	
42	0	0	0	0	0.04	0.13	0.04	0.29	0.13	0.17	0.04	0.08	0.04	0.04	0	0	0	0	0	0	24	
43	0	0	0	0	0.06	0	0	0.19	0.19	0.13	0.13	0.13	0.13	0	0	0	0	0.06	0	0	16	
44	0	0	0	0	0	0.06	0	0.06	0.31	0.13	0.13	0.13	0.06	0	0	0	0.06	0	0	0.06	16	
45	0	0	0	0	0	0.06	0	0	0.11	0.06	0.22	0.11	0.11	0.11	0	0	0	0	0	0.22	18	
46	0	0	0	0	0	0	0	0.06	0.13	0.06	0.13	0.06	0.13	0.13	0	0	0.06	0.06	0.06	0.13	16	
47	0	0	0	0	0	0	0	0	0.19	0	0.06	0.06	0.13	0.13	0.13	0.06	0	0	0.13	0.13	16	
48	0	0	0	0	0	0	0	0	0	0.08	0.08	0.15	0	0	0.08	0.15	0.08	0.08	0.08	0.23	13	
49	0	0	0	0	0	0	0.20	0	0	0	0	0	0	0.20	0	0.40	0.20	0	0	0	5	
50	0	0	0	0	0	0	0	0	0	0	0	0	0.10	0	0.10	0	0	0.20	0.20	0.30	10	
51	0	0	0	0	0	0	0	0	0	0	0	0	0	0.17	0	0.17	0	0.17	0.17	0	0.33	6
52	0	0	0	0	0	0	0	0	0	0	0	0.50	0	0	0	0	0	0.50	0	0	2	
53	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00	1	
54	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00	1	
55	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
56	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
57	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
58	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
59	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
61	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
62	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
63	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
64	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
65	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Total	0	0	3	9	22	20	23	30	25	20	16	18	13	8	6	5	5	8	6	20	257	

**Appendix 7. TRE 7 age-length key for the 2005–06 fishing year.**

Length (cm)	Age (years)																			No. Aged	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19		>19
20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
27	0	0	0.50	0.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
28	0	0	0	1.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
29	0	0	1.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4
30	0	0	0.83	0.17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6
31	0	0	0.40	0.40	0.20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10
32	0	0	0.38	0.38	0.25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8
33	0	0	0.07	0.67	0.27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15
34	0	0	0	0.25	0.58	0.08	0	0.08	0	0	0	0	0	0	0	0	0	0	0	0	12
35	0	0	0.05	0.15	0.25	0.25	0.20	0.05	0.05	0	0	0	0	0	0	0	0	0	0	0	20
36	0	0	0	0.15	0.35	0.20	0.20	0.05	0	0.05	0	0	0	0	0	0	0	0	0	0	20
37	0	0	0	0.31	0.31	0.13	0.25	0	0	0	0	0	0	0	0	0	0	0	0	0	16
38	0	0	0	0	0	0.22	0.22	0.22	0	0	0	0	0	0	0	0	0	0	0	0	9
39	0	0	0	0	0.24	0.29	0.29	0.05	0.10	0	0	0	0	0	0	0	0	0	0	0	21
40	0	0	0	0	0.15	0.25	0.10	0.20	0.10	0	0.15	0.05	0	0	0	0	0	0	0	0	20
41	0	0	0	0	0	0.16	0.05	0.21	0.26	0.16	0.05	0	0	0	0.05	0	0.05	0	0	0	19
42	0	0	0	0	0	0.10	0.14	0.38	0.14	0.05	0.05	0	0.10	0	0	0.05	0	0	0	0	21
43	0	0	0	0	0	0	0.20	0.20	0.05	0.15	0.15	0.10	0	0.05	0	0	0	0.10	0	0	20
44	0	0	0	0	0	0	0	0.08	0.15	0	0.23	0.23	0.08	0.08	0.08	0	0	0	0	0	13
45	0	0	0	0	0	0	0.04	0	0	0	0.13	0	0.04	0.04	0.13	0.04	0	0.17	0	0	24
46	0	0	0	0	0	0	0	0	0	0	0.11	0.11	0.22	0	0	0	0	0.56	0	0	9
47	0	0	0	0	0	0	0	0	0.08	0	0.08	0	0.15	0.08	0.08	0	0	0	0.08	0	13
48	0	0	0	0	0	0	0	0	0	0	0	0	0	0.06	0.12	0.12	0	0.12	0.12	0	17
49	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00	4
50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.33	0	0.67	3
51	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0	0	0	0	0	0	0.80	5
52	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00	3
53	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00	4
54	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00	3
55	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00	2
56	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00	2
57	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00	1
58	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00	1
59	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
61	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
62	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
63	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
64	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
65	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	19	34	43	30	31	27	17	9	16	9	6	5	8	4	5	14	4	47	328