Length and age composition of commercial trevally landings in TRE 1 and TRE 7, 2007–08

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EXECUTIVE SUMMARY

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This report presents the results of Objective 1 and 2 of the Ministry of Fisheries project "Estimation of year class strength in TRE 1 and TRE 7" (TRE2007/01). The general objective was to determine the length frequency and age structure of commercial landings from TRE 1 and TRE 7 (by market sampling) for use in stock assessment models.

The length frequency and age-length key sampling approach was employed during the 2007–08 fishing year to estimate catch-at-age for trevally for the main fishing methods in TRE 1 and TRE 7. Length frequency samples were collected from the TRE 1 single trawl and purse-seine, and the TRE 7 single trawl fisheries, and age data were collected randomly in the form of fixed allocation age-length keys. For TRE 1, 15 and 2 landings were sampled for length frequency from the single trawl and purse-seine fisheries respectively, with an age-length key collection of 572 otoliths. For TRE 7, 21 landings were sampled for length frequency from the single trawl fishery with an age-length key collection of 848 otoliths.

A more rigorous ageing protocol was instigated in 2006–07 with the aim of improving reader accuracy and increasing the level of between reader agreements. Although the benefits of the improved protocol are evident in the current study, trevally otoliths are inherently difficult to age, and as such, some level of ageing error is always likely to be present in catch-at-age results.

The length and age distribution sampled from the TRE 1 purse-seine fishery in 2007–08 comprised on average the largest and oldest proportions of trevally sampled in recent years, the aggregate (over 19) age group proportion more than three times (33%) any collections in the past decade. Length and age compositions of the TRE 1 single trawl fishery contained a high proportion of small young fish, with those 10 years of age or younger making up over 85% of the landed catch by number, considerably lower proportions of older fish than the purse-seine fishery, or single trawl catches from the late 1990s. Spatial differences in length and age structure were examined for the first time in TRE 1, with independent sample collections from East Northland and Bay of Plenty subareas. Although length distributions for the respective subareas were not considerably different, even though the Bay of Plenty subarea comprised a higher proportion of small fish, the age compositions showed a level of spatial heterogeneity exists between the subareas in respect to year class strength variability, although some similarities were also present.

In 2007–08, the second consecutive year, length and age distributions from the TRE 7 fishery were sampled from a wider range of the stock than ever before. Combined length and age estimates for TRE 7 appeared the narrowest sampled from the fishery in over a decade, with high proportions of small young fish present, and mean age (7.4 years) the lowest recorded. The most obvious reason for these recent changes in both length and age is likely to be the strong recruitment of the 2003 year class (5-year-olds) accounting for almost one in four trevally landed in 2007–08, and combined with the adjacent 2002 and 2001 year classes (6- and 7-year-olds), make up over half of the single trawl landed catch by number. Age classes older than 10 years made up only 15% of the catch (4% from the aggregate (over 19) age group), i.e., less than half that seen in the late 1990s, and may in part reflect the expected fishing down phase of the older age classes over time.

Length and age collections in TRE 7 in 2007–08 further confirmed that spatial heterogeneity exists within the TRE 7 stock on a moderate spatial scale with noticeable differences between subarea strata, and the apparent increase in size and age of trevally down a latitudinal cline, consistent with findings the year before. Again, most obvious were those differences specific to the South Taranaki Bight subarea despite the relatively low size of sample collections. The most significant differences were; a high proportion of

large old fish in the aggregate (over 19 years) age group; very low proportions of small young fish (below 37 cm and 6 years); and the absence of fish in a number of age classes which may reflect periodic recruitment in the southern bounds of the stock. Similar to collections made in previous years, those from the combined Kaipara-Manukau and North Taranaki Bight subareas were largely made up of fish of moderate size and age. The Ninety Mile Beach subarea was dominated by a high proportion of small young fish, but still contained a broad range of sizes and ages, although not as obvious as the year before. As proportional catch-at-age data are not a direct index of absolute abundance, inferences to changes in stock size or state are not totally reliable and should be treated with some care. Despite changes in catch-at-age estimates over the past decade, with a general trend of decreasing relative abundance in the older age classes, it remains more than likely the current TRE 7 fishery is in a relatively healthy state and that exploitation rates in recent years have not impacted to any great extent on the stock.

Similar to trends seen the year before, trevally year class strength estimates often varied between subareas and methods in TRE 1 and subareas in TRE 7. In 2007–08, the 2003 year class (5-year-olds) was the most prominent year class in the East Northland, Ninety Mile Beach, and Kaipara-Manukau and North Taranaki Bight, single trawl landings making up between 19 and 29% of the numbers of trevally landed. There also appeared to be a relatively strong correlation in year class strengths in the most common year classes between the adjacent East Northland and Ninety Mile Beach subareas. Bay of Plenty single trawl landings were dominated by fish from 2004 and 1999 year classes (4- and 9-year-olds), while TRE 1 purse-seine landings (also from the Bay of Plenty) were largely made up of a wide range of age classes reflecting relatively low year class strength variation in this fishery. For the South Taranaki Bight subarea of TRE 7 few correlations with the adjacent combined Kaipara-Manukau and North Taranaki Bight subareas could be made, although among others, the 1999 and 1997 year classes (9- and 11-year-olds) may be considered relatively similar, and consistent with the sample collections of the year before. Although not consistent throughout the TRE 1 and TRE 7 stocks in 2007–08, a number of correlations could be made between relative year class strengths, especially for young aged fish, although some of these may just be coincidental. However, of interest was an apparent consistency in year class strengths for some age classes between trevally samples from the combined Kaipara-Manukau and North Taranaki Bight subareas in 2007–08 and those for snapper from SNA 8 in the same year. For both fisheries, the most noticeable consistencies are the dominance of the 2003 year class and the absence of fish from the 1997 year class, with the relative proportions of younger fish showing reasonable similarity overall, given selectivity differences between the species and the relative exploitation status of the respective populations.

Precision on sample estimates varied considerably between methods and subareas in TRE 1 and subareas in TRE 7, with mean weighted coefficient of variation (MWCV) estimates ranging from 0.14 to 0.30 for catch-at-age compositions. Low MWCV estimates for length compositions often related to the large size of the sampled landings compared to that landed in the fishery, the high number of samples obtained, and the low level of heterogeneity present. Low MWCV estimates in catch-at-age estimates were generally related to higher precision determined in the length composition and the size of and variability in age-at-length within the age–length key.

Mean weight-at-age estimates for most of the recruited age classes in the single trawl and purse-seine collections from the TRE 1 stock were generally well below the predicted values based on published parameters, with trevally from purse-seine samples most often of a greater weight-at-age than those captured by trawl. Mean weight-at-age estimates derived from the South Taranaki Bight subarea were often the highest in TRE 7 for younger age classes, largely similar to the predicted values, while those from the Ninety Mile Beach and the combined Kaipara-Manukau and North Taranaki Bight subareas were almost exclusively below the predicted values for many of the younger age classes. Mean weight-at-age estimates for some of the older trevally (18- and 19-year-olds) from East Northland (and Ninety Mile Beach) appear to attain a size above or close to the predicted values.

1. INTRODUCTION

Trevally (*Pseudocaranx dentex*) is one of New Zealand's most important commercial inshore fish species with over 90% of the national Total Allowable Commercial Catch (TACC) of 3932 t apportioned to the TRE 1 (1506 t) and TRE 7 (2153 t) fish stocks (Figure 1). The TRE 1 stock encompasses the northeast coast of the North Island, and the TRE 7 stock the entire west coast of the North Island and most of the north and west coasts of the South Island, with both stocks thought to be biologically distinct. In most recent years the greatest proportion of the TRE 1 catch has been taken by both single trawl and purse-seine, mainly from the Bay of Plenty and East Northland areas, while the catch in TRE 7 has been predominantly caught by single trawl and pair trawl largely off the northern half of the North Island's west coast. Most trevally is caught as the target species, but can also be a bycatch when targeting other species, usually snapper (*Pagrus auratus*), especially in the trawl fisheries.

Catch sampling of the TRE 1 and TRE 7 commercial landings for length and age compositions took place intermittently from 1972 to 1978 (James 1984, unpublished data) and was resumed in the 1997–98 fishing year (Walsh et al. 1999) as part of a new stock monitoring programme instigated by the Ministry of Fisheries. Annual sampling from the main fishing methods continued in the TRE 1 fisheries until 2002–03 and in TRE 7 until 2000–01 and the data are summarised in a series of subsequent reports (Walsh et al. 2000, Langley 2001, 2002, 2003, 2004) and in two reviews by Langley (unpublished results) and Walsh & McKenzie (2009). The programme was reinstated in 2005–06 with sampling conducted on the TRE 1 purse-seine fishery and the TRE 7 single trawl fishery (Langley 2009) and continued into 2006–07 (Walsh et al. 2010) with additional collections being directed to the TRE 1 single trawl fisheries, with a secondary aim to investigate patterns of spatial heterogeneity within the stocks. A summary of the various stock-method strata that have been sampled from TRE 1 and TRE 7 since 1997–98 is presented in Tables 1 and 2.

This report presents the results of market sampling from the TRE 1 and TRE 7 stocks between October 2007 and September 2008 and thus continues the time series. Funding for this project, TRE2007/01, was provided by the Ministry of Fisheries.

The specific objective of this project for 2007–08 was:

1. To conduct representative sampling and determine the length and age composition of commercial catches in TRE 1 (and TRE 7 (Obj. 2.)) during the 2007/2008 fishing year. The target coefficient of variation (c.v.) for the catch-at-age will be 20% (mean weighted c.v. across all age classes), including demonstrating that sampling was representative of the fishery.

2. METHODS

2.1 Sample collection

Landings from the trevally fisheries were stratified by stock, subarea, and fishing method and sample collections made from the main commercial methods that operate in the respective stocks: purse-seine and single trawl in TRE 1 and single trawl in TRE 7. There was no seasonal stratification imposed on the sampling other than it be conducted over the main "peak" period when trevally is landed by the respective methods. A rationalisation of the west coast trawl fleet in recent years has resulted in the pair trawl method in TRE 7 being excluded from the sampling programme because the relative pair trawl effort was deemed to be insignificant. The stratification of the single trawl landings by subarea was most often done by communication with the skipper during the fishing event and before sampling, whereby cooperative skippers would mark the bins (as stratification of ponds within the hold were not viable) indicating a catch relating to a particular subarea stratum. Other subarea sample

collections were confirmed some months after sampling based on data received from the Ministry of Fisheries catch and effort returns, some of these comprising samples from mixed subarea strata.

As part of the trevally catch sampling review, Walsh & McKenzie (2009) undertook an optimisation analysis for various catch sampling designs. The optimisation results for the length frequency and age-length key approach indicated that a mean weighted coefficient of variation (MWCV) of 0.20 for TRE 1 and TRE 7 single trawl catch at-age estimates could be achieved by sampling about 20 landings through the application of a 900 otolith age length-key. A MWCV of 0.20 could be achieved for TRE 1 purse-seine if a similar size age length-key was applied to length data from 10 sampled landings (note: as 10 purse-seine landings have never been sampled in any fishing year, it is likely the MWCV target would be unachievable).

For reasons of cost, it was not proposed to target a MWCV of 0.20 in each subarea–method–stratum. Instead the goal of the programme in 2007–08 would be to achieve a MWCV of at least 0.20 (for each method) in the TRE 1 and TRE 7 stocks after stratum amalgamation using the target sample sizes (length frequency samples and age-length key) outlined above.

Length frequency samples were collected sporadically from the TRE 1 fishery and are considered representative of the period October 2007–May 2008. The purse-seine fishery is typically concentrated around periods when more valuable species such as skipjack tuna are absent, with catches usually made around spring–summer and winter. In 2007–08 and similar to most recent years, there were few landings of trevally from the purse-seine fleet, compared to that some years before. Single trawl landings in TRE 1 are often a bycatch of other targeted species, although some targeting does occur during summer. In 2006–07, it was proposed that spatial differences in the length composition over the TRE 1 stock be investigated for the purse-seine and single trawl fisheries with subarea stratification based on the stock boundaries used for snapper, East Northland and the Bay of Plenty (see Walsh et al. (2010)). The sampling regime for TRE 1 specified that all purse-seine landings that targeted trevally were to be selected for sampling, and that single trawl landings were to be of a minimum catch weight of at least 1 t for the East Northland subarea and 2 t for the Bay of Plenty subarea.

All TRE 7 length frequency samples were collected during the "peak" season (November–May), which incorporates the period when schools of spawning trevally become more vulnerable to trawling. The peak of the season usually occurs during January–February, which is about one month after the peak of the snapper fishery. Although not consistent between years, Walsh et al. (1999) found significant spatial differences in the length composition of TRE 7 single trawl landings in 1997–98, as did Langley (2001) for samples collected from South Taranaki Bight in 1999–2000. Spatial differences in length composition were further investigated for samples collected from the single trawl fisheries in 2006–07 by Walsh et al. (2010), with specific collections targeted from the following three subareas: Ninety Mile Beach; Kaipara and Manukau coastline and North Taranaki Bight combined (as few differences were apparent in past years between these subareas); South Taranaki Bight (see Figure 1). The subarea stratification of the TRE 7 fishery was based on findings by James (1984). The sampling regime for TRE 7 specified that all single trawl landings were to have a minimum catch weight of trevally of at least 2 t for the northern two subareas and 1 t for the South Taranaki Bight subarea.

A two-stage sampling procedure was used to obtain length frequencies (West 1978). A random selection of landings and a random sample of bins within landings represent the first and second stages respectively. All fish in sampled bins were measured to the nearest centimetre below the fork length. As trevally show no differential growth between sexes (James 1984), sex was not determined. The sampling design used for snapper (Davies & Walsh 1995) was adopted for trevally. Sampling of purse-seine catches as described by Walsh et al. (1999) was slightly modified in that each hold (from a total of four) was treated as a separate stratum. A random sample of two bins of trevally was

collected from the top, middle, and bottom of each hold as the fish were unloaded. A breakdown of the proposed sampling for trevally in 2007–08 is given in Table 3.

2.2 Otolith collections and ageing

Otoliths were generally collected as a subsample of all landings sampled for length frequency to create age-length keys (refer Davies & Walsh 1995). Samples taken from TRE 1 single trawl and purse-seine landings encompassed the period October–May, and those from TRE 7 single trawl landings, November–May. The purpose of the keys was to convert catch length frequency information to age frequency for the respective stocks. It was assumed that age was distributed randomly within each sampled centimetre length class (Southward 1976). A fixed allocation sample for each length class was determined from the proportion of fish in each length class in single trawl length frequency samples in TRE 1 from 1999–2000 and in TRE 7 from 2000–01, with about 450 and 300 otolith samples collected from each subarea within the respective stocks. The overall target otolith allocation for TRE 1 (comprising two subarea strata) and TRE 7 (comprising three subarea strata) would therefore sum to about 900 otolith samples respectively, the optimised target sample outlined above. To ensure spatial and temporal representivity in the sample collections, a target of about 30–40 otoliths was collected from all landings sampled for length frequency within a subarea until the target sample sizes for each length class within the age-length key were achieved. Those size classes that were uncommon in landings (i.e., very small or large fish) were often targeted for otoliths when available to samplers in order to fulfil the age-length key requirements as best as possible.

All otoliths were prepared using the thin section technique as described by Stevens & Kalish (1998) and Tracey & Horn (1999) and a standardised procedure for reading otoliths was followed (Walsh et al. 1999). However, Walsh & McKenzie (2009) determined that inconsistencies seen in the relative year class strengths of trevally catch-at-age data from previous collections were most likely a result of ageing error caused by two main factors: the misinterpretation of growth zones in difficult otolith sections, and the inaccurate determination of the margin relative to the sample collection and birth dates. A revised trevally ageing protocol instigated in 2006–07 adopted a more rigorous approach than in past years to improve reader accuracy and increase the level of between-reader agreements, and this was followed for 2007–08. In summary, this modified protocol focused mainly on a few main facets: the interpretation and location of the first annulus; forcing an expected margin on the reader relative to the otolith collection date; and allowing the readers access to a variety of otolith images from previous collections in the hope of improving reader accuracy and precision, especially in preparations that are not easily interpretable. Three readers read the entire sets independently to determine an unbiased reading estimate. Where agreement was reached, it was deemed to be the final agreed reading. If no agreement was attained, then the otolith was reviewed again by all three readers together (via remote log-ons and teleconference technology) to reach agreement, or discarded from the set as unreadable, only if it was of an age less than 20 years, as samples over 19 years were combined into an aggregate age group for the analysis. It was envisaged that discarding a random uninterpretable otolith from the age-length key should have minimal effect on the sample collections and is likely to improve the precision in estimates of catch-at-age.

2.3 Data analysis

Trevally length and age data were stored on the Ministry of Fisheries *market* and *age* databases respectively, held by NIWA.

The calculation of proportions at length and age, and variances from length frequency samples and age-length keys, followed that of Davies & Walsh (1995). For sample collections from the TRE 1 single trawl fishery, estimates of proportion at length and age were calculated according to two possible designs: unstratified, or stratified. In the unstratified design, length and age data were pooled across both spatial strata (East Northland and Bay of Plenty subareas), thus treating the fishery as a single stratum. In the stratified design, estimates of proportion at age and length (and coefficient of variation, c.v.) were calculated for each stratum, and then combined to calculate weighted mean estimates. The stratum estimates were combined across strata and weighted according to the estimated number of fish landed in each stratum following Davies & Walsh (2003).

The calculation of mean weight-at-age and variances followed Quinn II et al. (1983), with a length-weight relationship: w (g) = $0.016 l^{3.064}$ (cm) (James 1984). Proportions at age, mean weight-at-age, and mean length-at-age (with analytical estimates of coefficient of variation) were calculated for the range of age classes recruited, with the maximum age being an aggregate of all age classes over 19 years. Weight-at-age estimates are compared with reference curves from the published length-weight relationship (James 1984) and von Bertalanffy growth parameters for TRE 1 and TRE 7 (Walsh et al. 1999) as follows:

$$w_j = 0.016(L_\infty(1 - e^{-K(j-j_0)}))^{3.064}$$

where w_j is the predicted weight (g) at age *j*.

3. RESULTS

3.1 Sample collections

Summaries of the length frequency sample sizes for each method subarea stratum taken within TRE 1 and TRE 7 in 2007–08 are given in Tables 4 and 5 respectively and summaries of the otolith sample collections in Tables 6 and 7.

The weight of the annual trevally catch and percentage catch by method for TRE 1 and TRE 7 stocks by subarea strata for 2007–08 is given in Figures 2 and 3 to display the spatial patterns in the fisheries. Most of the 2007–08 TRE 1 catch (about 847 t) was taken from the Bay of Plenty (72%) and East Northland (22%) subareas, while the Hauraki Gulf subarea accounted for only 6% (Figure 2). Almost half the 2007–08 TRE 7 catch (about 1797 t) came from the Kaipara-Manukau subarea (48%) while that from the other three subareas ranged between 8 and 25% (Figure 3). Single trawl was the dominant method for catching trevally in 2007–08, accounting for about 68% and 75% of the total landed weight respectively in the TRE 1 and TRE 7 stocks. Following the trend seen in 2006–07, there was a continued reduction in effort in the TRE 1 purse-seine fishery in 2007–08 compared to that seen in previous years, and as a result just under half (about 48%) of the TRE 1 stock TACC remained uncaught (Ministry of Fisheries 2010). In TRE 7, the pair trawl catch (about 334 t) for 2007–08 was more than a two-fold increase from the previous year, taken almost entirely from the Ninety Mile Beach and Kaipara-Manukau subareas, and the noticeably dominant 'other' method catch (about 43 t) in the South Taranaki Bight subarea was from a midwater trawl vessel targeting jack mackerel (*Trachurus* sp).

The average single trawl landing size and the numbers of landings in each stock subarea stratum, for all landings and for those greater than 1 t, is illustrated in Figures 4 and 5 to depict landing size and availability of single trawl landings (the main method catching trevally) for sampling in TRE 1 and TRE 7 respectively. The monthly catch of trevally and of that sampled (weight and number of landings) for the single trawl method (for all landings and for those greater than 1 t) is presented for TRE 1 (Figures 6 and 7) and TRE 7 (Figures 8 and 9) to display the seasonal patterns in the fisheries and the representivity of the sample collections.

Fifteen landings of a total target of 20 (see Tables 3 & 4) were sampled from the TRE 1 single trawl fishery in 2007–08: five landings from the East Northland subarea and 10 landings from Bay of Plenty subarea. The average weight of the sampled landings from TRE 1 single trawl fishery was 5.1 t, with trevally the target species in 11 landings and snapper the target in the other 4. As trevally was generally the main target in sampled landings, the average sampled landing size was quite large compared to that of the fishery, which summarises information for all single trawl landings containing trevally (target and bycatch) caught from TRE 1 (see Table 4). The largest landings of trevally sampled in 2007–08 were from vessels targeting trevally in the eastern Bay of Plenty, principally statistical areas 009 and 010. There were only two substantial purse-seine landings in the TRE 1 fishery in the summer of 2007–08, both of which were sampled, both coming from the Bay of Plenty subarea. Combined, these landings made up almost 100% of the total purse-seine catch, one landing alone accounting for 95% of the total.

The sampling target for the combined Kaipara-Manukau and North Taranaki Bight subareas of TRE 7 was achieved with 12 sample collections made (see Tables 3 & 5). Only 2 sampled landings of a target of 10 were achieved for the Ninety Mile Beach subarea and 3 of 10 for the South Taranaki Bight subarea. The average weight of the 21 sampled landings from TRE 7 single trawl fishery was 12.6 t, while that for that for the subareas was as follows: Ninety Mile Beach, 7.0 t; Kaipara-Manukau and North Taranaki Bight, 15.7 t; South Taranaki Bight, 2.3 t. For sampled landings from the northern three subareas of TRE 7 (Ninety Mile Beach, Kaipara and Manukau coastline, and North Taranaki Bight), the primary target species on all occasions was trevally, while the target in South Taranaki Bight subarea sampled landings (3 only) was barracouta (*Thyrsites atun*) and red gurnard (*Chelidonichthys kumu*). Considerable differences are apparent between the percentage of number of landings sampled and the percentage of weight of landings sampled in the TRE 7 single trawl fishery (see Table 5), because trevally was the target species on 86% of the fishing trips, and the average trevally catch chosen for sampling was comparatively large. The summarised information in Table 5 is for all single trawl landings containing trevally (target and bycatch) caught from TRE 7.

3.2 TRE 1 and TRE 7 length and age distributions

For the TRE 1 and TRE 7 fisheries in 2007–08, catch-at-age compositions (using the length frequency and age-length key approach) were derived from the combined length distributions of subarea or stock strata, and used to identify year class strengths. Otolith collections may not have been consistent across the entire sampling period, especially from landings sampled toward the end of the season when the age-length key collection was nearly complete or when specific subarea collections (e.g., Ninety Mile Beach) were difficult to obtain. This is unlikely to bias the age characterisations because the growth of recruited trevally (i.e., those over 25 cm long) would have been relatively low over the period when length frequency collections were made. This assumption has been accepted for other species with growth rates comparable to those of trevally (Westrheim & Ricker 1978, Davies & Walsh 1995).

Sample length and age distributions for the TRE 1 purse-seine and single trawl and TRE 7 single trawl fisheries in 2007–08 are presented as histograms and line graphs (Figures 10–29). Scatterplots of age-length data collected from TRE 1 and TRE 7 fisheries for 2007–08, and the subareas of TRE 7, are given in Figures 30–32. Mean weight-at-age estimates for the East Northland and Bay of

Plenty subarea-method strata of TRE 1 and single trawl subarea strata of TRE 7 are presented in Figures 33 and 34 respectively, and mean length-at-age estimates in Figures 35 and 36. The estimated proportions at length, age, mean weight-at-age, and mean length-at-age, are tabulated in Appendices 1–4. The age-length keys for TRE 1 and TRE 7 stocks and subarea strata are presented in Appendices 5 and 6 respectively. Length distributions of otolith sample collections as a comparison to that targeted for TRE 1 and TRE 7 subarea strata are presented in Appendix 7. A discontinuous time series of length and age compositions from the main trevally fisheries in TRE 1 and TRE 7 from 1997–98 to 2007–08 is given in Appendix 8.

The estimated total number of fish caught in each stock and subarea method stratum was calculated from the reported total weight landed and the mean fish weight derived from stratum length compositions (see Appendix 1).

3.3 TRE 1

3.3.1 TRE 1 single trawl catch-at-length and catch-at-age (unstratified and stratified)

The unstratified and stratified length distributions of the TRE 1 single trawl catch in 2007–08 were almost identical, being relatively narrow and characterised by one main mode at 38 cm and a tail of the distribution, although small, extending to 50 cm (Figure 10). The mean lengths of trevally sampled from the fishery were 36.8 and 36.9 cm for the unstratified and stratified approaches respecitvely, and the proportion-at-length MWCVs were 0.18 and 0.17. The low MWCV estimates probably a reflection of the satisfactory number of landings sampled from the fishery (15) and the level of homogeneity between them.

The age distributions (unstratified and stratified) for the TRE 1 single trawl fishery in 2007–08 were largely dominated by young fish below 11 years of age making up 87% and 86% of the number of trevally landed respectively (Figure 11). The most dominant age classes comprised fish from the 2004 to 2001 year classes (4- to 7-year-olds), and the 1999 and 1998 year classes (9- and 10-year-olds), and combined made up over two-thirds (69% and 71%) of the total catch by number. For the age classes in the fishery greater than 10 years, only those from the 1995 to 1993 year classes (13- to 15-year-olds) and the aggregate (over 19) age group showed any notable presence, albeit with relatively low representation, none of which individually exceeded more than 3% of the catch. In the age-length key collection for TRE 1, a high proportion of samples (20%) made up the aggregate (over 19) age group, with good representation in all age classes older than this up to and over 30 years of age (see Appendix 5, Figure 30). Only those age classes over 3 years of age are likely to be fully recruited to the fishery as they no longer contain a noticeable proportion of fish in the 27–30 cm length intervals (see age-length key, Appendix 5). The mean ages of trevally sampled from the fishery were 7.3 and 7.5 years for the unstratified and stratified approaches respectively, and the proportion-at-age MWCVs were 0.18 and 0.20.

3.3.2 TRE 1 subarea catch-at-length and catch-at-age

The length distributions for the TRE 1 subarea method collections were relatively dissimilar, with single trawl comprising proportionally smaller fish to that sampled from the purse-seine fishery, and Bay of Plenty single trawl landings comprising proportionally more small fish (i.e., below 35 cm) compared to samples from East Northland (Figures 12–14, 18). All distributions were generally uni-modal and made up of fish most often of a narrow size range. The East Northland single trawl distribution largely comprised fish between 34 and 42 cm with a peak at 38 cm, the Bay of Plenty single trawl distribution slightly broader with a size range between 30 and 42 cm and a peak at 38 cm (see Figures 12 & 13). The purse-seine estimates were largely comprised of fish between 40 and 47 cm with few fish in the left and right hand tails of the distribution, and a peak at 44 cm (see Figure

14). The mean length of trevally sampled from the East Northland and Bay of Plenty single trawl fisheries was 37.9 and 36.7 cm respectively and the proportion-at-length MWCVs were 0.19 and 0.20. The mean length of trevally sampled from the Bay of Plenty purse-seine fishery was 43.8 cm, and the proportion-at-length MWCV was low at 0.01 because the combined sampled landings weight was substantial, making up over 99% of the total Bay of Plenty purse-seine (and TRE 1) landed catch (see Table 4).

The age distributions for the East Northland and Bay of Plenty single trawl fisheries were largely made up of young fish below 11 years of age, and differed considerably from that of the Bay of Plenty purse-seine estimates which were generally broader, contained a reasonable proportion of middle-aged fish, but very low numbers below 9 years of age (Figures 15–17, 19). The 2003 and 1998 year classes (5- and 10-year-olds) were dominant in the East Northland single trawl fishery and the 2004 and 1999 year classes (4- and 9-year-olds) dominant in the Bay of Plenty single trawl fishery, both subareas having low proportions in the aggregate (over 19) age groups (see Figures 15 & 16). As a result, estimates of mean age were 8.1 and 7.4 years respectively, reasonable estimates for trawl-based fisheries. The Bay of Plenty purse-seine catch-at-age estimate had moderate proportions of fish present in the 1999, 1995, and 1990 age classes (9-, 13- and 18-year-olds), but by far the most dominant was the aggregate (over 19) age group which made up one-third (33%) of the total number of fish landed by purse-seine (Figure 17). Consequently, the mean age of trevally from the purse-seine fishery was very high at 15.4 years, and the proportion-at-age MWCV was 0.28.

3.4 TRE 7

3.4.1 TRE 7 single trawl catch-at-length and catch-at-age

Characterised by one main mode at 36.0 cm, the length distribution of the TRE 7 single trawl catch in 2007–08 contained a relatively high proportion of small to medium sized fish in the 33 to 40 cm size range, with a reasonably broad tail extending to 55 cm (Figure 20). The mean length of trevally sampled from the fishery was 37.8 cm, and the proportion-at-length MWCV was 0.13.

The age distribution for the single trawl fishery in 2007–08, although relatively broad, was dominated by young trevally from the 2003–2001 year classes (5- to 7-year-olds) making up over half (51%) of the landed catch by number, the 2003 contributing almost half this number alone (Figure 21). Those year classes less than 11 years of age made up 85% of the TRE 7 catch, with most of the remaining old age classes having only modest levels of relative abundance, the exception being 12- and 13-year-olds (1996 and 1995 year classes). The aggregate (over 19) age group made up about 4% of the landed single trawl catch by number in TRE 7, reflecting the reasonable number of fish of this age range available in the fishery. Sixteen percent of samples made up the aggregate (over 19) age group in the age-length key collection for TRE 7, with good representation up to the mid-30 age classes (see Appendix 6, Figures 31 & 32). Only those age classes over 4 years of age are likely to be fully recruited to the fishery as they no longer contain a noticeable proportion of fish in the 25–30 cm length intervals (see age-length key, Appendix 6). The mean age of trevally sampled from the fishery was 7.4 years and the proportion-at-age MWCV was 0.14.

3.4.2 TRE 7 subarea catch-at-length and catch-at-age

The length and age distributions determined from each of the three TRE 7 subarea sample collections in 2007–08 showed subtle similarities and differences (Figures 22–29).

The Ninety Mile Beach subarea, had a high proportion of small fish characterised by one narrow mode at 36.0 cm with a long tail extending to over 60 cm (Figure 22). The mean length of trevally sampled from the fishery was the lowest of the TRE 7 subareas at 37.2 cm, and the proportion-at-length MWCV was 0.13. The Ninety Mile Beach subarea catches were largely made up of very

young fish, with those of 3 to 7 years (2005 to 2001 year classes) dominating the fishery and making up three-quarters (76%) of the numbers of trevally landed. The 2003 year class (5-year-olds) was by far the most dominant of these making up just under one-third of the total trawl catch (29%). The 1998 year class (10-year-olds) was the most dominant in the mid-age range, and there was a moderate percentage (4%) of fish in the aggregate (over 19) age group (Figure 25). The mean age of trevally sampled from the fishery was 6.7 years, and the proportion-at-age MWCV was 0.26.

The sample length distribution from the combined Kaipara-Manukau and North Taranaki Bight subareas was relatively broad with a predominance of small to moderate sized fish, characterised by one mode centred at 36 cm, and a tail extending to over 50 cm (Figure 23). The mean length of trevally sampled from the fishery was 38.2 cm, and the proportion-at-length MWCV was 0.17. The age distribution from the Kaipara-Manukau and North Taranaki Bight subareas was dominated by the 2003 year class (5-year-olds) making up over one-fifth of the number of trevally landed in 2007–08 (Figure 26). There was an appreciable number of fish in the age classes 4–13 years, the exception being 11-year-olds (1997 year class) with no fish present, and a moderate number (4%) of fish continue to occupy the aggregate (over 19) age group. The mean age of trevally sampled from the combined Kaipara-Manukau and North Taranaki Bight subareas fishery was relatively high at 7.9 years, and the proportion-at-age MWCV was 0.20.

The South Taranaki Bight subarea contained the highest proportions of large fish for sampling undertaken in TRE 7 in 2007–08 and was characterised by one main mode centred at about 41 cm, and a tail extending to over 55 cm (Figure 24). The length distribution was relatively narrow, comprising fish from 36–49 cm, and the mean length was the highest of the TRE 7 subareas at 42.2 cm, and the proportion-at-length MWCV was 0.22. The South Taranaki Bight subarea age distribution, was largely made up of young fish between 6 and 9 years of age, with intermittent numbers of fish in the older age classes, many of these having no fish at all (Figure 27). The aggregate (over 19) age group, made up of many age classes, accounted for almost 1 in 10 fish (9%) landed from the South Taranaki Bight fishery, the highest estimate for the TRE 7 subareas. As a result, the mean age of trevally sampled was the highest at 9.4 years, and the proportion-at-age MWCV was 0.30.

3.4.3 TRE 1 and TRE 7 mean weight-at-age and mean length-at-age estimates

Observed and predicted mean weight-at-age estimates are given for the main methods in the TRE 1 and TRE 7 subarea fisheries, with predicted values based on published parameters (Figures 33 and 34). The mean weight-at-age estimates for some of the young age classes (2- to 5-year-olds) lie on or above the predicted weight-at-age curve because of the minimum legal size (MLS) restriction of 25 cm in commercial catches, and also because fish of this age range may not yet be fully recruited to the fishery. The absence of smaller fish of a partially recruited age class would positively bias the observed mean for that age class (Davies et al. 2003).

The observed mean weight-at-age estimates from the East Northland and Bay of Plenty subarea trawl fisheries were relatively similar over the most common age classes and generally well below the predicted estimates for TRE 1 (Figure 33). Estimates from the purse-seine fishery were different from trawl, being generally highest for the most common age classes in the fishery. The observed mean weight-at-age estimates for the subareas of TRE 7 more closely resembled the predicted estimates, those from the South Taranaki Bight subarea slightly above, and those from the Ninety Mile Beach and the combined Kaipara-Manukau and North Taranaki Bight subareas generally below (Figure 34). Those estimates for age classes 18 years and older for these northern TRE 7 subareas (and East Northland) did not fit well with the predicted values, sitting well above the line.

Observed mean length-at-age estimates for the main methods in the TRE 1 and TRE 7 subarea fisheries closely resemble those patterns seen in mean weight-at-age estimates (Figures 35 and 36).

4. DISCUSSION

This is the ninth report to summarise the length and age compositions of trevally landings from the main fishing methods operating in TRE 1 and/or TRE 7 since 1997–98. In a review of the trevally catch sampling data collected between 1997–98 and 2002–03 from both stocks, Walsh & McKenzie (2009) found that due to inconsistencies in year class strengths, trends in the progression of weak and strong year classes in TRE 1 and TRE 7 catches were difficult to determine. This conclusion is borne out by recent TRE 1 and TRE 7 stock assessments, in which the models also found it difficult to fit to the time series of catch-at-age observations (McKenzie 2007, 2008). Walsh & McKenzie (2009) determined that the 'smoothing' in trevally catch-at-age estimates was a direct result of ageing error, where the misinterpretation of growth zones in difficult otolith sections, and the inaccurate determination of the margin relative to the sample collection and birth dates, were the main contributing factors. A new ageing protocol was implemented in 2006–07 which adopted a more rigorous approach with the aim of improving reader accuracy and increasing the level of between-reader agreements. However, trevally otoliths can be inherently difficult to age, and as such, some level of ageing error is always likely to be present in catch-at-age results.

In 2007–08, and similar to previous years, there continued to be difficulty in obtaining length and age sample collections from the East Northland, Ninety Mile Beach, and South Taranaki Bight subarea single trawl fisheries with a total of 5, 2, and 3 landings sampled from targets of 10. Walsh et al. (2009a) documented a downsizing and rationalisation of the inshore trawl fleet in northern New Zealand in recent years, largely for financial and economic reasons, resulting in fewer trawl vessels available to obtain samples from. The few that do operate, regularly fish between the TRE 1 and TRE 7 stocks on the same fishing trip, thereby rendering the catch useless for sample selection. In 2006–07, liaison with cooperative fishers enabled samples to be collected from within a stock (when the vessel fished in both TRE 1 and TRE 7) only when the fisher agreed to mark the sample bins directly after capture. However, this proved unworkable as later inspection of the catch length distributions revealed the two samples comprised trevally of the same length structure, obviously reflecting no separation by the fisher as requested (Walsh et al. 2010). Similarly, a major TRE 1 and TRE 7 processor refused to undertake sample collections from its single trawl vessels that operated in the East Northland and Ninety Mile Beach subareas and denied the researcher access to its processing operation in order to conduct sampling themselves. Despite this, it should be noted that all required Bay of Plenty subarea single trawl and purse-seine sample collections were successfully undertaken by this processor under contract in 2007–08. It is not known why sample collections were not achieved for the South Taranaki Bight subarea despite an estimated 92 t of trevally being landed, but the reasons may be the same as some of those reasons outlined above.

The results determined for length and age collections in TRE 1 in 2007–08 show variability in trevally catch-at-length and catch-at-age estimates exists between the method fisheries, similar to findings in previous years (Walsh et al. 1999, 2000, Langley 2001, Walsh & McKenzie 2009, Walsh et al. 2010). The unstratified and stratified length compositions of the single trawl catch were almost identical, spread over a relatively narrow length range and generally dominated by small trevally, markedly different from that of purse-seine catch, reflecting method–specific differences in selectivity. Although similar to that seen in 2006–07, the single trawl length distributions for 2007–08 were not as broad as those from sample collections made in the late 1990s (Walsh et al. 1999, 2000, Langley 2001), the current collections being largely made up of fish less than 43 cm (1.6 kg), the average size in the TRE 1 fishery about 37 cm (about 1.0 kg). The Bay of Plenty purse-seine catch was characterised by a strong unimodal distribution based on moderate sized individuals, reflecting this method catching surface schools of similar sized fish with little variation, analogous to findings

by James (1984), and generally similar to that seen in past years. Walsh & McKenzie (2009) found the length compositions of purse-seine landings generally varied little between years, although current sample estimates from the Bay of Plenty subarea had a higher proportion of large trevally (average size 43.8 cm, about 1.7 kg) than seen in purse-seine collections since sampling was resumed in 1997–98, but were more similar to that of purse-seine collections from the late 1970s (James 1984).

The differences seen in TRE 1 length compositions between the single trawl and purse-seine methods for 2006–07 were also apparent in the catch-at-age compositions for 2007–08, with single trawl catches predominantly made up of young trevally, 10 years of age or less, few fish present in the right hand limb, and a low relative abundance in the aggregate (over 19) age group compared to collections from past years. Purse-seine catch-at-age estimates were relatively broad, comprising few young fish, a moderate number in the mid-age range, and a very high proportion (33%) in the aggregate (over 19) age group, over three times that of any collections from the past decade. Similarly, high proportions of fish in the aggregate (over 19) age group have been seen only in purse-seine sample collections from the late 1970s (James 1984), when the TRE 1 biomass was large and in the fishing down phase. As the purse-seine method is highly selective, sampling from the single trawl fishery is likely to be more representative of the recruited population, capturing a wider range of sizes and ages, and therefore having better stock monitoring utility (Walsh & McKenzie 2009). Walsh et al. (2010) speculated that the recent differences seen in the TRE 1 single trawl length and age distributions compared to previous years may actually reflect a change in the trevally population length and age structure within the stock, now predominantly comprised of small and young fish.

Noticeable differences were observed between the unstratified and stratified age compositions for the TRE 1 single trawl fishery. The unstratified design is a reflection of where data are pooled across spatial strata, thus treating the fishery as a single stratum, whereas the stratified design calculates proportions of length and age for each stratum and the strata are then weighted according to the estimated number of fish landed. As the total tonnage (and the estimated number of trevally) landed by single trawl in the respective subarea strata in 2007–08 was far greater for the Bay of Plenty subarea (almost 7 times by number) than for East Northland, results for both the stratified length and age compositions for the TRE 1 single trawl fishery more closely resemble the single stratum estimates derived for the Bay of Plenty subarea. That the unstratified and stratified length distributions for the TRE 1 single trawl fishery were almost identical, and similar to the length composition of the Bay of Plenty subarea catch, directly reflects the larger landings (both weight and number of fish) sampled from this subarea, compared to those samples taken from East Northland.

In 2007–08, adequate sample collections for length and age were made from the single trawl fishery from the two subareas that make up TRE 1, East Northland and Bay of Plenty, and for the first time spatial heterogeneity comparisons were able to be investigated. The length distributions from the East Northland and Bay of Plenty subareas were not overly dissimilar, although the Bay of Plenty fishery had a higher proportion of small fish. Catch-at-age estimates for the respective subarea single trawl fisheries showed some similarity over the general age range, with both fisheries largely based on young fish of 10 years or less, the Bay of Plenty with a slightly higher proportion of very young fish than East Northland. In general, there appeared to be some level of spatial heterogeneity in catch-at-age between the subarea fisheries reflected by the variability in relative year class strength, where more dominance in particular age classes occurs for a particular subarea than the other. For the older age classes, estimates of year class strength were generally poor and no visual comparisons could be made, although the East Northland subarea contained a higher proportion of fish in the aggregate (over 19) age group than the Bay of Plenty. The continuation of a trawl-based sampling programme with some regularity should continue to provide better information on the mortality and recruitment variation of the TRE 1 stock, as long as spatial sample collections can be made and industry participation and cooperation is forthcoming. No spatial comparisons in length and age could be made from the purse-seine fishery in 2007–08 as samples were entirely based on two landings, both

Bay of Plenty subarea collections. A few speculative correlations could be made between relative year class strengths for young fish in catch-at-age estimates for the TRE 1 and SNA 1 stocks for 2007–08, but these may just be coincidental.

The level of precision in the TRE 1 and subarea single trawl length distributions was relatively high with MWCVs ranging from 0.17 to 0.20, indicative of a reasonable level of homogeneity in length sample collections in 2007–08. Similar to 2006–07, the purse-seine trevally fishery did not operate to the same level as it had done in past years, with samples taken from only two large landings (accounting for 99.9% of the total purse-seine catch) of a total of five, all from the Bay of Plenty subarea, only three targeting trevally. As a result, the associated MWCV estimate for the purse-seine length distribution was very low (0.01) and is largely attributed to a high sampled landing weight relative to that of the whole purse-seine fishery, and to a lesser degree a low between-landing variance, implying the purse-seine length composition in 2007–08 to be an adequate representation. Catch-at-age MWCV estimates for the TRE 1 single trawl fishery in 2007–08 were relatively low at 0.18 and 0.20 for the unstratified and stratified designs, and for the subarea fisheries, moderate at 0.29 (East Northland) and 0.23 (Bay of Plenty) respectively, likely to reflect a combination of length and age sample sizes and the range of age classes present in the fisheries. The MWCV for the purse-seine fishery was high (0.28) and probably reflects the broad age composition with few very dominant age classes present in catches, most of similar relative strength to adjacent cohorts. Precision may be further reduced by the paucity of defined strong and weak year classes in the distributions, reflective of ageing error (N. Davies, pers. comm.).

Similar to that seen in 2006–07, the length and age distributions for the TRE 7 subarea fisheries in 2007–08 showed heterogeneity exists within the stock on a moderate spatial scale along a latitudinal cline from the north to the south. Unlike sampling conducted in years before 2006–07, length and age samples were independent collections within each subarea, and it can therefore be hypothesised that the summaries presented here are spatially discrete, and that real differences in age and length structure exist within the TRE 7 stock.

In 2007–08 only two sampled single trawl landings (and 186 otoliths) were obtained from the Ninety Mile Beach subarea. The length and age distributions were largely dominated by small young trevally, by far the greatest proportion of these associated with fish from the 2003 year class, making up almost one in three fish landed in 2007–08. Although the right hand limbs of these distributions in 2007–08 comprised considerably fewer fish than in 2006–07, there was still representation throughout all size (to over 60 cm) and all age classes (up to 19 years) including the aggregate (over 19) age group. Walsh et al. (2010) postulated that as the sample size was low it may adversely affect results, warning that in order to fully determine if spatial variability in length and age exists within the Ninety Mile Beach subarea, a more comprehensive sampling strategy is required in the future. This view remains the same for sample collections made in 2007–08, albeit some consistency in the relative year class strengths was observed between the consecutive year age samples, future sampling will require full industry cooperation to improve on these results. Although sample sizes were low in 2007–08, MWCV estimates for the length (0.13) and age (0.26) distributions were also relatively low and may indicate moderate precision in sample estimates, probably reflecting a high level of homogeneity between sampled landings.

Although slightly fewer large and old fish were present in 2007–08, length and age distributions from the combined Kaipara-Manukau and North Taranaki Bight subarea stratum were generally similar to collections made in 2006–07, with only slight reductions in mean length and age estimates. The length range for the subarea was moderately broad, similar to that described by Walsh & McKenzie (2009) as being mainly made up of small to moderate sized fish, with few large fish over 50 cm. The distribution was smooth and largely unimodal with a peak at 36 cm, although some prominence of a smaller mode is apparent around 44 cm. A moderate MWCV estimate (0.17) would suggest a moderate level of heterogeneity in length occurs between landings within this part of TRE 7, but may

also be influenced by large numbers of samples obtained. Similar to the previous year, the age composition in 2007–08 largely comprised younger fish (5 to 12 years old, but not including 11-year-olds), the 2003 year class the most dominant making up almost one in four fish landed, and of similar relative strength to that seen in the adjacent Ninety Mile Beach subarea. There is also a visible progression of weak and strong year classes in this fishery over the past two years, especially for many of the younger fish up to 12 years and is probably a reflection of the more rigorous ageing process instigated in 2006–07. The reduced numbers of older fish present in the combined Kaipara-Manukau and North Taranaki Bight single trawl catch (including the aggregate (over 19) age group) in 2007–08 may reflect a combination of the recent strong recruitment of young age classes into this subarea and the fishing down of older age classes over time, the latter related to this subarea receiving by far the greatest fishing pressure in TRE 7 estimated to be around 75% of the annual catch. The catch-at-age MWCV estimate was moderate at 0.20 and probably reflects the broadness of the age distribution.

In 2006–07, Walsh et al. (2010) showed comprehensive sampling for length and age data from South Taranaki Bight confirmed the suggestion by Walsh & McKenzie (2009) that previous length (and most likely age) sample collections from this subarea were considerably different from those from all other areas of TRE 7. James (1984) found trevally length and age compositions collected by trawl survey in the 1970s along the west coast stock to vary considerably, larger and older fish being more common in the south. Walsh et al. (2010) found the length distribution for trevally in 2006–07, like previous sample collections (1997–98 and 1999–2000) to be based on fish of a size range not strongly evident in the other TRE 7 samples, and that age composition data from the South Taranaki Bight subarea showed clear differences from the other spatial areas too. They reasoned that a paucity of age data for specific age ranges may reflect periodic recruitment to the subarea because of its southernmost geographic range, secondly, that low numbers of small and young trevally (few individuals below 36 cm and 5 years of age) may be an artefact of delayed recruitment, and that the overwhelming dominance of old fish (20% in the aggregate (over 19) age group) which gave rise to a very high estimate of mean age (12.0 years[•]) was significantly different from other subareas in TRE 7. Although current sample collections for the 2007–08 fishing year were based on low sample sizes (3 landings; 133 otoliths), and although not ideal, similarities in the length and age distributions can easily be drawn between the consecutive year collections for South Taranaki Bight. The length distribution was typical of that seen previously in the subarea and contained few fish below 38 cm. The age distribution was consistent with the progression of strong and weak year classes in the fishery the year before (especially younger fish), considering the low number of otoliths collected, although the aggregate (over 19) age group appears to be of only moderate strength in comparison (10%). And similar to the last year, there were few individuals less than 5 years of age in the fishery (see Appendices 6 & 7), reflecting delayed recruitment. However, as the number of collections in 2007–08 was low and made from vessels that fished in either or both subarea strata (South Taranaki Bight and Tasman & Golden Bays) on a single fishing trip, it is difficult to determine whether any differences in the length and age structure of trevally within the South Taranaki Bight stratum exists as they do for snapper from SNA 7 and SNA 8. Similar to the Ninety Mile Beach subarea, a comprehensive sampling strategy that is adhered to is required for the South Taranaki Bight in order to successfully meet the required sample sizes for this fishery.

Similar to previous years, the TRE 7 combined single trawl sample collections in 2007–08 were based on comprehensive length (14 500 measurements) and age (850 otoliths) samples with relatively high levels of precision, MWCV estimates of 0.13 and 0.14 respectively. Since sampling first began in 1997–98, length distributions have changed considerably as strong and weak year classes recruit into the fishery affecting the relative abundance of the size of fish captured by single trawl. The current length composition is slightly narrower than the distributions from the late 1990s and contains a reasonable proportion of small to medium sized trevally between 33 and 40 cm. Similarly, and

[•] Note this estimate is biased low because of the aggregate age class.

reflecting the increase in the left hand limb of length distribution, mean age in the fishery is now the lowest recorded (7.4 years) since sampling first began more than a decade ago. The most obvious reason for these recent changes in both length and age is probably the strong recruitment of the 2003 year class, accounting for almost one in four trevally landed in 2007–08, and its dominance along with the two most other prominent (and adjacent) year classes (2001 and 2002) which when combined make up over half of the single trawl landed catch by number. Age classes over 10 years of age account for only 15% of the landed catch by number (4% making up the aggregate (over 19) age group), less than half that seen in the late 1990s. It should also be noted that TRE 7 is the largest inshore demersal finfish fishery on the west coast of the North Island with a 2153 t TACC, most of which is caught annually (although less so nowadays) and the aforementioned changes in length and age may also in part reflect the expected fishing down phase of the older age classes over time. However, as proportional catch-at-age data are not a direct index of absolute abundance, inferences from these data in respect to changes in stock size are not totally reliable and should be treated with some care. A stock assessment of TRE 7 (Langley & Maunder 2009), using two higher values of natural mortality (0.087 and 0.10), concluded with a moderate–high probability that the 2008 biomass was above the B_{MSY} level (61% and 100%, respectively) and that the stock size was predicted to remain at about the current level over the next five years, albeit increasing slightly, at or above B_{MSY}.

However, as comprehensive length and age samples from the South Taranaki Bight subarea were included in TRE 7 sample collections for the first time in 2006–07, and now in 2007–08, the overall combined length and age distribution representing the TRE 7 stock may not be as analogous with collections in past years because of the level of spatial heterogeneity that appears to be present within the stock. The potential for differences in the length composition between subareas highlights the importance of ensuring the sampling coverage is representative of the areal distribution of the entire fishery to ensure the collection of an unbiased sample of the length composition of the (overall stock) catch (Langley 2002). As differences in the underlying age compositions of the subareas also appear to be present in TRE 7, it would seem fundamental that future sampling would also ensure that age data are also representative of the areal distribution of the entire fishery as well.

In 2006–07 Walsh et al. (2010) found that although inconsistencies in year class strengths appear to exist between the subareas of TRE 7, there were also a number of similarities, with a reasonably high proportion of young fish present in all catch-at-age summaries, although the overall age range of young fish decreased from north to south. In 2007–08, many of the year class strength similarities and differences between the TRE 7 subareas of the year before showed through, confirming the spatial consistency in the sampling and the rigorous approach directed toward ageing trevally, despite inherent difficulties. In 2007–08, similarities in the relative year class strength could be seen for the 2001 to 2003 year classes, and to a certain extent, the 1998 year class for the adjacent Ninety Mile Beach, and the combined Kaipara-Manukau and North Taranaki Bight subareas. Similarly, the 1997 (no fish), 1999, 2000, and 2002 year classes in the Kaipara-Manukau and North Taranaki Bight, and South Taranaki Bight subareas showed a clear level of consistency. Like 2006–07, there was also a considerable proportion of fish in the aggregate (over 19) age group in all TRE 7 subareas in 2007–08. Any variability in relative year class proportions between the TRE 7 subareas may also be due to the variable recruitment specific to a stock (a reflection of unique environmental conditions), growth differences, and fishing mortality differences. Some relative year class strengths for trevally from the combined Kaipara-Manukau and North Taranaki Bight subareas in 2007–08 appear to correlate well with those for snapper from SNA 8 (Walsh et al. 2009b) for the same year. For both fisheries, the most noticeable consistencies are the dominance of the 2003 year class and the absence of fish from the 1997 year class, with the relative proportions of a number of young fish showing reasonable similarity overall, given selectivity differences between the species and the relative exploitation status of the respective populations. The same level of consistency was not able to be drawn between the relative year class strength estimates for trevally from the South Taranaki Bight subarea stratum, which encompasses both South Taranaki Bight and Tasman Bay/Golden Bay areas, and those from SNA 7 (Blackwell & Gilbert 2008), a discrete stock with localised spawning and recruitment.

Because very small and young trevally are largely absent in catch-at-age estimates for the South Taranaki Bight subarea, and periodic recruitment appears inherent within the older age classes of the population, Walsh et al. (2010) speculated that delays in recruitment for trevally to the southernmost areas may not be implausible, and may be similar to that seen in SNA 8, whereby 98% of the west coast stock recruitment was found to be natal to the largest (Kaipara) harbour. It is therefore likely that recruited trevally and snapper, particularly from the southernmost bounds of the stocks, may not be subject to the same environmental conditions during their ontogeny, and therefore correlations in year class strengths between the species for this area should not be expected. As reported by Walsh et al. (2010), in 2006–07 only minor similarities in relative year class strengths in single trawl catches from the TRE 1 and TRE 7 stocks have been apparent when sampling was conducted concurrently in both fisheries in the late 1990s (Walsh et al. 1999, 2000). However, like sample collections for 2006–07, those from 2007–08 also showed some similarities may be drawn for year class strengths between East Northland and Ninety Mile Beach single trawl summaries, the two adjacent subareas of the TRE 1 and TRE 7 stocks. Overall, the level of consistency seen in relative year class strength in catch-at-age estimates within the TRE 7 (and East Northland) subareas for consecutive year collections further emphasises what is known from tagging studies, that trevally movement between areas is limited with most fish (88%) captured within 30 nautical miles of release sites (James 1980). Similarly, although some similarities in year class strength may be apparent between the subareas that make up the TRE 1 and TRE 7 stocks, a moderate level of spatial heterogeneity in year class strength also exists, with most trevally probably residing within the same spatial strata from year to year with low levels of stock and subarea mixing.

The oldest trevally sampled from the TRE 1 and TRE 7 fisheries in 2007–08 were 39 and 42 years old respectively, and samples aged by James (1984) from collections undertaken in the 1970s determined maximum age estimates of 46 and 47 years.

Overall mean weight-at-age estimates for most of the recruited age classes in the single trawl and purse-seine collections from the TRE 1 East Northland and Bay of Plenty fisheries were generally well below the predicted values based on published parameters, those trevally from purse-seine being most often of a greater mean weight-at-age than those captured by trawl. Visually, there were no noticeable growth rate differences overall between the East Northland and Bay of Plenty single trawl estimates, although some older trevally (18- and 19-year-olds) from East Northland (and Ninety Mile Beach) appear to attain a size above or close to the predicted values. This may reflect faster growth rates experienced at a younger age, similar to that seen in young snapper (1989 and 1991 cohorts) from the Hauraki Gulf during the early 1990s where consecutive warm sea-surface temperatures correlated with high mean length-at-age estimates (Davies et al. 2003). Mean weight-at-age estimates derived from the South Taranaki Bight subarea were generally the highest in TRE 7 and largely similar to the predicted values, while estimates for the Ninety Mile Beach, and the combined Kaipara-Manukau and North Taranaki Bight subareas, for the most common age classes were generally below the these values. The predicted values are based on the published length-weight relationship (James 1984) and von Bertalanffy growth parameters (Walsh et al. 1999) for TRE 1 and TRE 7. Spatial and temporal variability between observed and predicted mean weight-at-age estimates have also been found in snapper and are thought to be due to difference in regional exploitation levels, recruitment rates, and annual variation in water temperature (Davies et al. 2003, Walsh et al. 2006a, 2006b, 2006c). Should spatial and/or temporal variation in growth exist within the TRE 1 and TRE 7 stocks or subarea strata, then it is probable that the predicted estimates presented here are unlikely to be suitable descriptions of the respective stocks. Observed mean length-at-age estimates for the main methods in the TRE 1 and TRE 7 subarea fisheries closely resemble those patterns seen in mean weight-at-age estimates.

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6. REFERENCES

Blackwell, R.G.; Gilbert, D.J. (2008). Age composition of commercial snapper landings in Tasman Bay/Golden Bay (SNA 7), 2006–07. *New Zealand Fisheries Assessment Report 2008/67.* 21 p.

Davies, N.M.; Hartill, B.; Walsh, C. (2003). A review of methods used to estimate snapper catch-at-age and growth in SNA 1 and SNA 8. *New Zealand Fisheries Assessment Report 2003/10.* 63 p.

Davies, N.M.; Walsh, C. (1995). Length and age composition of commercial snapper landings in the Auckland Fishery Management Area 1988–94. *New Zealand Fisheries Data Report No. 58.* 85 p.

Davies, N.M.; Walsh, C. (2003). Snapper catch-at-length and catch-at-age heterogeneity between strata in East Northland longline landings. *New Zealand Fisheries Assessment Report 2003/11.* 26 p.

James, G.D. (1980). Tagging experiments on trawl-caught trevally, *Caranx georgianus*, off north-east New Zealand, 1973–79. *New Zealand Journal of Marine and Freshwater Research 14 (3)*: 249–254.

James, G.D. (1984). Trevally, *Caranx georgianus* Cuvier: age determination, population biology, and the fishery. *Fisheries Research Bulletin 25.* 52 p.

Langley, A.D. (2001). Length and age composition of trevally in commercial landings from TRE 1 and TRE 7, 1999–2000. *New Zealand Fisheries Assessment Report 2001/42.* 32 p.

Langley, A.D. (2002). Length and age composition of trevally in commercial landings from TRE 1 and TRE 7, 2000–01. *New Zealand Fisheries Assessment Report 2002/19.* 34 p.

Langley, A.D. (2003). Length and age composition of trevally (*Pseudocaranx georgianus*) in commercial landings from the TRE 1 purse-seine fishery, 2001–02. *New Zealand Fisheries Assessment Report 2003/48.* 18 p.

Langley, A.D. (2004). Length and age composition of trevally (*Pseudocaranx dentex*) in commercial landings from the TRE 1 purse-seine fishery, 2002–03. *New Zealand Fisheries Assessment Report 2004/39.* 17 p.

Langley, A.D. (2009). Length and age composition of trevally in commercial landings from TRE 1 and TRE 7, 2005–06. *New Zealand Fisheries Assessment Report 2009/31.* 23 p.

Langley, A.D.; Maunder, M. (2009). Stock assessment of TRE 7. *New Zealand Fisheries Assessment Report 2009/49.* 42 p.

McKenzie, A. (2007). Assessment of the TRE 1 stock in the 2005–06 fishing year. Final Research Report for Ministry of Fisheries Research Project TRE2004-01 (*Unpublished report held by MFish, Wellington.*)

McKenzie, A. (2008). Standardised CPUE analysis and stock assessment of the west coast trevally fishery (TRE 7). *New Zealand Fisheries Assessment Report 2008/44*. 74 p.

Ministry of Fisheries (2010): Report for the Fisheries Assessment Plenary, May 2010: stock assessments and yield estimates. Ministry of Fisheries. 1158 p.

Quinn II, T.J.; Best, E.A.; Bijsterveld, L.; McGregor, I.R. (1983). Sampling Pacific halibut (*Hippoglossus stenolepis*) landings for age composition: history, evaluation and estimation. *Scientific Report 68, International Pacific Halibut Commission.* 56 p.

Southward, G.M. (1976). Sampling landings of halibut for age composition. *Scientific Report 58, International Pacific Halibut Commission.* 31 p.

Stevens, D.W. ; Kalish, J.M. (1998). Validated age and growth of kahawai (*Arripis trutta*) in the Bay of Plenty and Tasman Bay. *NIWA Technical Report 11*. 33 p.

Tracey, D.M.; Horn, P.L. (1999). Background and review of ageing orange roughy (*Hoplostethus atlanticus*, Trachichthyidae) from New Zealand and elsewhere. *New Zealand Journal of Marine and Freshwater Research 33*: 67–86.

Walsh, C.; Davies, N.M.; Buckthought, D. (2009a). Length and age composition of commercial snapper landings in SNA 8, 2006–07. *New Zealand Fisheries Assessment Report 2009/3.* 19 p.

Walsh, C.; Davies, N.M.; Buckthought, D. (2009b). Length and age composition of commercial snapper landings in SNA 8, 2007–08. *New Zealand Fisheries Assessment Report 2009/13.* 23 p.

Walsh, C.; Davies, N.M.; Rush, N.; Buckthought, D.; Smith, M. (2006a). Age composition of commercial snapper landings in SNA 1, 2004–05. *New Zealand Fisheries Assessment Report 2006/39.* 34 p.

Walsh, C.; Davies, N.M.; Rush, N.; Middleton, C.; Smith, M.; Newmarch, G. (2006b). Length and age composition of commercial snapper landings in SNA 1, 2003–04. *New Zealand Fisheries Assessment Report 2006/7.* 46 p.

Walsh, C.; McKenzie, J. (2009). Review of length and age sampling for trevally in TRE 1 and TRE 7 from 1997–98 to 2002–03. *New Zealand Fisheries Assessment Report 2009/.* 56 p.

Walsh, C.; McKenzie, J.; Armiger, H. (2006c). Spatial and temporal patterns in snapper length and age composition and movement; west coast North Island, New Zealand. *New Zealand Fisheries Assessment Report 2006/6.* 57 p.

Walsh, C.; McKenzie, J.; Ó Maolagáin, C.; Blackwell, R.; James, G.D.; Rush, N. (2010). Length and age composition of commercial trevally landings in TRE 1 and TRE 7, 2006–07. *New Zealand Fisheries Assessment Report 2010/9.* 62 p.

Walsh, C.; McKenzie, J.; Ó Maolagáin, C.; Stevens, D.; Tracey, D. (1999). Length and age composition of trevally in commercial landings from TRE 1 and TRE 7, 1997–98. *NIWA Technical Report 66*. 39 p.

Walsh, C.; McKenzie, J.; O Maolagain., C.; Stevens, D. (2000). Length and age composition of commercial trevally landings in TRE 1 and TRE 7, 1998–99. Final Research Report for MFish Research Project TRE9801 Objective 1. 24 p.

West, I.F. (1978). The use in New Zealand of multilevel clustered sampling designs for the sampling of fish at market for year-class. *C.M. 1978/D:5, Statistics Committee, Conseil International pour 1'Exploration de la Mer.*

Westrheim, S. J. & Ricker, W. E. (1978). Bias in using an age-length key to estimate age-frequency distributions. *Journal of the Fisheries Research Board of Canada 35*: 184–189.

Table 1: TRE 1 catch sampling summary from 1997–98 to 2007–08 (Note: all collections made using the length frequency and age-length key sampling approach, and all ageing undertaken by NIWA).

TRE 1

Catch sampling report	Research Provider	Fishing year	Fishing method	No. of landings sampled for LF	Season††	Comments*	Otolith sample size	Otolith prep†	Season††
Walsh et al. (1999)	NIWA	1997–98	Purse-seine	7	Spr–Sum, Win	5 BPLE, 2 ENLD			
			Single trawl	12	Sum–Aut	3 BPLE, 4 HAGU, 4 ENLD, 1 Mixed	357	B&E	Sum–Aut
Walsh et al. (2000)	NIWA	1998–99	Purse-seine	9	Spr–Sum, Win	5 BPLE, 4 ENLD	30	TS	Win
			Single trawl	12	Sum–Win	8 BPLE, 3 ENLD, 1 Mixed	280	TS	Sum–Win
Langley (2001)	Sanford Ltd	1999–2000	Purse-seine	7	Spr–Sum	4 BPLE, 3 ENLD			
			Single trawl	22	Spr–Win	18 BPLE, 4 Mixed	572	TS	Aut–Win
Langley (2002)	Sanford Ltd	2000–01	Purse-seine	7	Spr–Sum, Win	5 BPLE, 2 ENLD	745	TS	Spr–Sum, Win
Langley (2003)	Sanford Ltd	2001–02	Purse-seine	8	Spr–Sum, Win	7 BPLE, 1 ENLD	360	TS	Sum,Win
Langley (2004)	Sanford Ltd	2002–03	Purse-seine	8	Spr–Sum	2 BPLE, 6 ENLD	554	TS	Spr–Sum
Langley (2009)	GANZL	2005–06	Purse-seine	5	Spr, Aut, Win	2 BPLE, 3 ENLD	257	TS	Spr, Aut, Win
Walsh et al. (2010)	NIWA	2006–07	Purse-seine	2	Spr, Sum	2 ENLD			
			Single trawl	5	Aut, Win	4 ENLD, 1 Mixed	338	TS	Aut, Win
Walsh et al. (2010)	NIWA	2007–08	Purse-seine	2	Sum	2 BPLE	73	TS	Sum
			Single trawl	15	Spr–Aut	10 BPLE, 5 ENLD	499	TS	Spr–Aut

* BPLE = Bay of Plenty; ENLD = East Northland; HAGU = Hauraki Gulf.
† B&E = Bake and embed; TS = Thin section.
†† Spr (Oct–Nov), Sum (Dec–Feb), Aut (Mar–May), Win (Jun–Sep).
NIWA, National Institute of Water and Atmospheric Research; GANZL, Golder Associates (NZ) Ltd.

Table 2: TRE 7 catch sampling summary from 1997–98 to 2007–08 (Note: all collections made using the length frequency and age-length key sampling approach, and all ageing undertaken by NIWA).

TRE 7

Catch sampling report	Research Provider	Fishing year	Fishing method	No. of landings sampled for LF	Season††	Comments*	Otolith sample size	Otolith prep†	Season††
Walsh et al. (1999)	NIWA	1997–98	Single trawl	55	Spr–Aut, Win	9 NMB, 15 K-M, 10 NTB, 1 STB, 20 Mixed (47 Peak, 8 Off-peak)	375	B&E	Sum
			Pair trawl	7	Spr–Sum	Unknown			
Walsh et al. (2000)	NIWA	1998–99	Single trawl	26	Spr–Aut	3 NMB, 10 K-M, 2 NTB, 11 Mixed	225	TS	Sum–Aut
			Pair trawl	14	Sum–Aut	6 NMB, 2 K-M, 2 NTB, 4 Mixed	156	TS	Sum–Aut
Langley (2001)	Sanford Ltd	1999–2000	Single trawl	39	Sum–Aut	6 NMB, 7 K-M, 5 NTB, 2 STB, 19 Mixed	505	TS	Sum–Aut
Langley (2002)	Sanford Ltd	2000–01	Single trawl	49	Spr–Aut	5 NMB, 16 K-M, 3 NTB, 25 Mixed	496	TS	Spr–Sum
			Pair trawl	13	Spr–Sum	2 NMB, 7 K-M, 4 Mixed			
Langley (2009)	GANZL	2005–06	Single trawl	11	Spr–Aut	3 K-M, 2 NTB, 3 STB, 3 Mixed	328	TS	Spr–Sum
Walsh et al. (2010)	NIWA	2006–07	Single trawl	33	Spr–Win	2 NMB, 14 K-M/NTB, 11 STB, 6 Mixed	920	TS	Spr–Win
Walsh et al. (2010)	NIWA	2007–08	Single trawl	21	Spr–Aut	2 NMB, 12 K-M/NTB, 3 STB, 4 Mixed	848	TS	Spr–Aut

* NMB = Ninety Mile Beach; K-M = Kaipara-Manukau; NTB = North Taranaki Bight; STB = South Taranaki Bight.
† B&E = Bake and embed; TS = Thin section.
†† Spr (Oct–Nov), Sum (Dec–Feb), Aut (Mar–May), Win (Jun–Sep).
NIWA, National Institute of Water and Atmospheric Research; GANZL, Golder Associates (NZ) Ltd.

Table 3: Level of sampling proposed to describe the TRE 1 and TRE 7 subarea method fisheries in 2007–08.

	Subarea	Method	Number of landings sampled	Number of otoliths in age-length-key
TRE 1	East Northland	Single trawl	10	450
		Purse-seine	*1-10	
	Bay of Plenty	Single trawl	10	450
		Purse-seine	*1-10	
TRE 7	Ninety Mile Beach	Single trawl	10	300
	Kaipara-Manukau and North Taranaki Bight	Single trawl	10	300
	South Taranaki Bight	Single trawl	10	300

* Allthough the total number of TRE 1 purse-seine landings is 10, the number to be sampled in each stratum cannot not be specified *a priori.*

Table 4: Summary of the catch (total number and weight of landings) and samples (number of landings and weight sampled, and number of fish measured) in method–subarea strata for the TRE 1 purse-seine and single trawl fisheries for the 2007–08 fishing year.[*]

		Number of landings			No. of fish	Weight of landings (t)		
Method*	Area**	Total	Sampled	% of total	measured	Total	Sampled	% of total
PS	ENLD	0	0	0	0	0	0	0
	BPLE	5	2	40.0	833	120	119	99.2
	TRE 1	5	2	40.0	833	120	119	99.2
BT	ENLD	192	5	2.6	1 553	88	7	8.0
	HAGU	195	0	0.0	0	45	0	0.0
	BPLE	337	10	3.0	5 175	420	69	16.4
	TRE 1[†]	604	15	2.5	6 728	553	76	13.7

[*] PS, purse-seine; BT, single trawl.

[†] The TRE 1 single trawl total number of landings does not equal combined subareas total as a vessel may fish over more than one subarea per trip.

[**] ENLD, East Northland; HAGU, Hauraki Gulf; BPLE, Bay of Plenty.

Table 5: Summary of the catch (total number and weight of landings) and samples (number of landings and weight sampled, and number of fish measured) in method–subarea strata for the TRE 7 single trawl and pair trawl fisheries for the 2007–08 fishing year.[*]

		Number of landings			No. of fish	Weight of landings (t)		
Method*	Area**	Total	Sampled	% of total	measured	Total	Sampled	% of total
BT	NMB	62	2	3.2	1 223	158	14	8.9
	K-M/NTB	292	12	4.1	8 922	1 076	188	17.5
	STB	228	3	1.3	1 086	92	7	7.6
	TRE 7[†]	459	21	4.6	14 658	1 325	265	20.0

[*] BT, single trawl.

[†] The TRE 7 total number of landings does not equal combined subareas total as a vessel may fish over more than one subarea per trip.

[**] NMB, Ninety Mile Beach; K-M/NTB, Kaipara-Manukau & North Taranaki Bight; STB, South Taranaki Bight.

Table 6: Details of trevally otolith samples collected in 2007–08 from TRE 1 subareas for age-length key collections.

Method*	Area**	Sampling period	Sample method †	Length range (cm)	No. aged
BT	ENLD	29 Oct 07–16 May 08	SR	28–50	203
PS/BT	BPLE	16 Nov 07–11 Mar 08	SR	25–55	369
PS/BT	TRE 1	29 Oct 07–16 May 08	SR	25–55	572

* PS, purse-seine; BT, single trawl.

** ENLD, East Northland; BPLE, Bay of Plenty.

† Stratified random sample.

Table 7: Details of trevally otolith samples collected in 2007–08 from TRE 7 subareas for age-length key collections.

Method*	Area**	Sampling period	Sample method †	Length range (cm)	No. aged††
BT/BPT	NMB	14 Nov 07–26 Mar 08	SR	27–66	186
BT/BPT	K-M/NTB	22 Nov 07–18 Mar 08	SR	25–65	391
BT	STB	15 Nov 07–17 May 08	SR	30–55	133
BT/BPT	TRE 7	14 Nov 07–17 May 08	SR	25–66	848

* BT, single trawl; BPT, pair trawl.

** NMB, Ninety Mile Beach; K-M/NTB, Kaipara-Manukau & North Taranaki Bight; STB, South Taranaki Bight.

† Stratified random sample.

†† The TRE 7 total number of otoliths do not equal the combined subareas total as some sample collections were from vessels that fished over more than one subarea per trip.

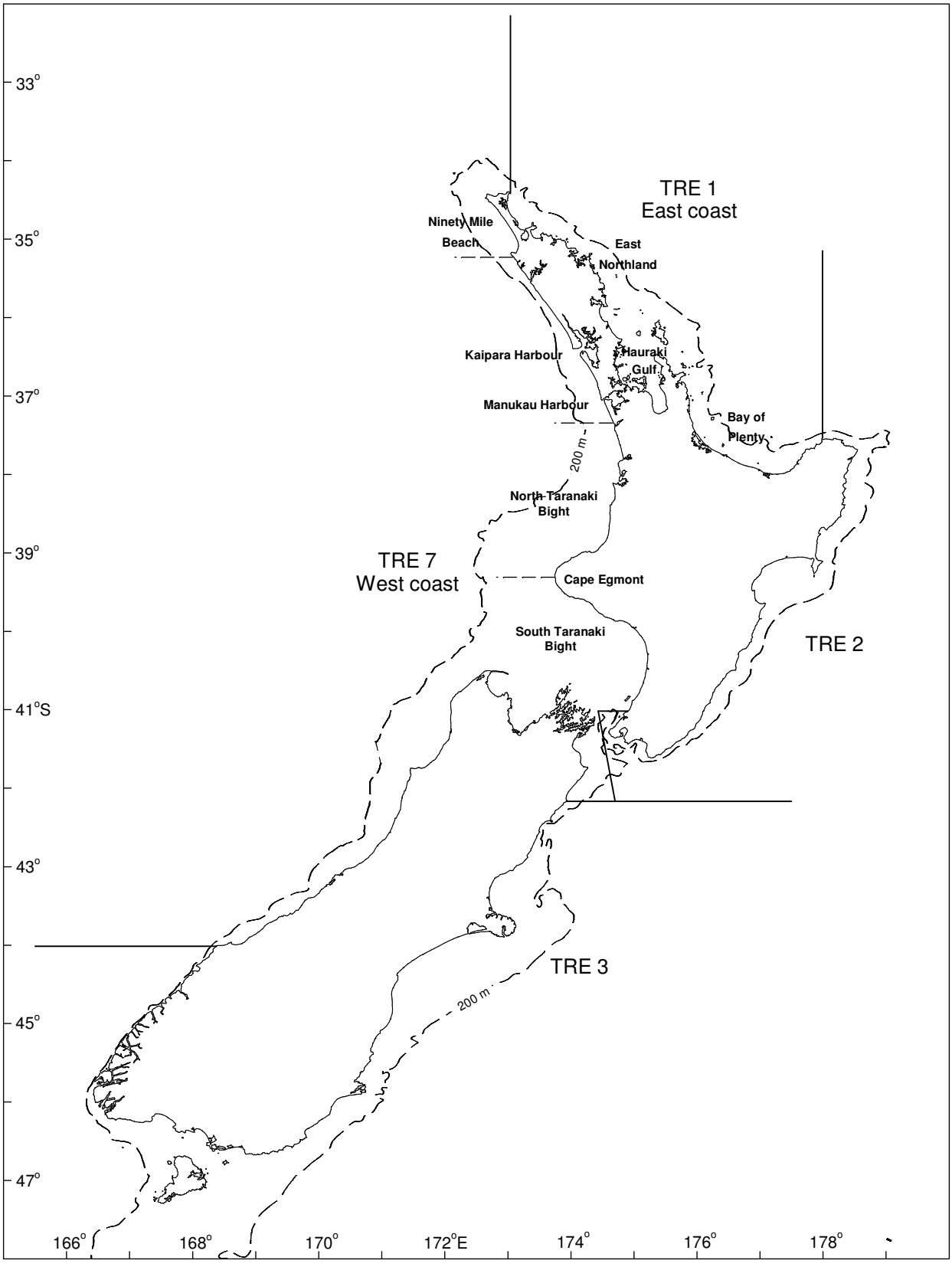


Figure 1: Trevally quota management areas and locations referred to in the text.

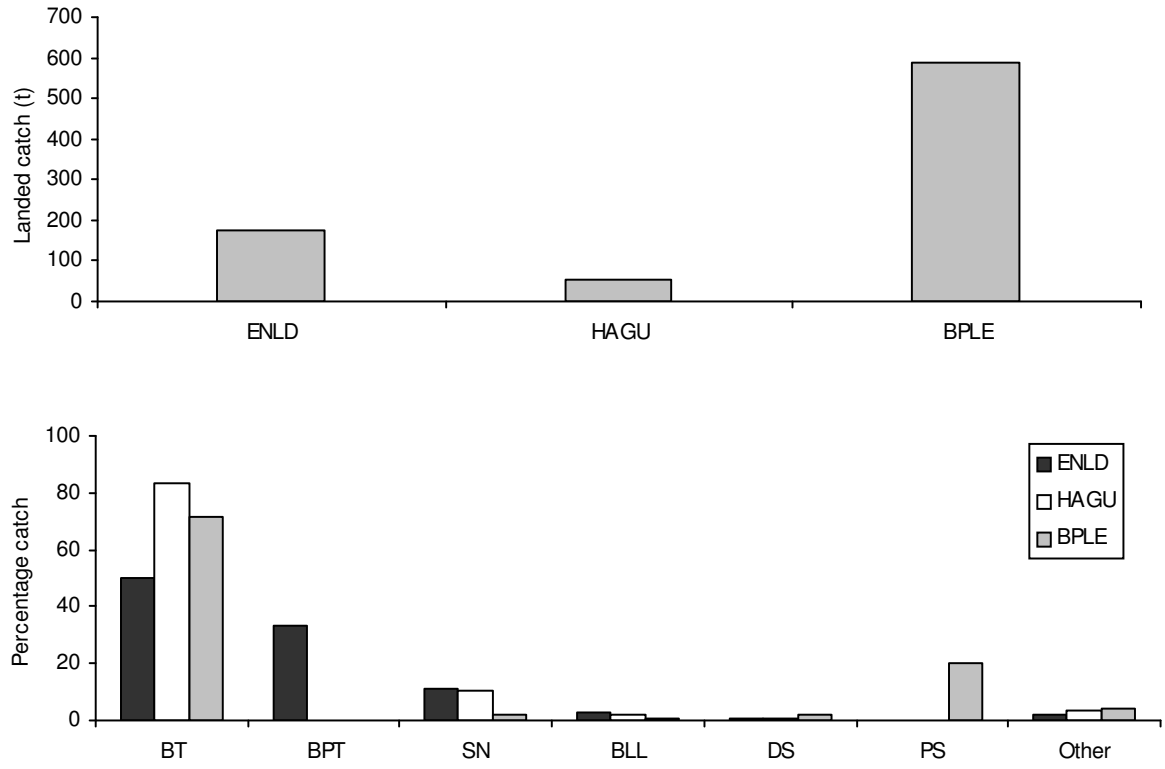


Figure 2: The landed catch (t) and percentage catch by method of trevally for the subareas of TRE 1 in 2007–08 (ENLD, East Northland; HAGU, Hauraki Gulf; BPLE, Bay of Plenty; BT, single trawl; BPT, pair trawl; SN, set net; BLL, bottom longline; DS, Danish seine; PS, purse-seine).

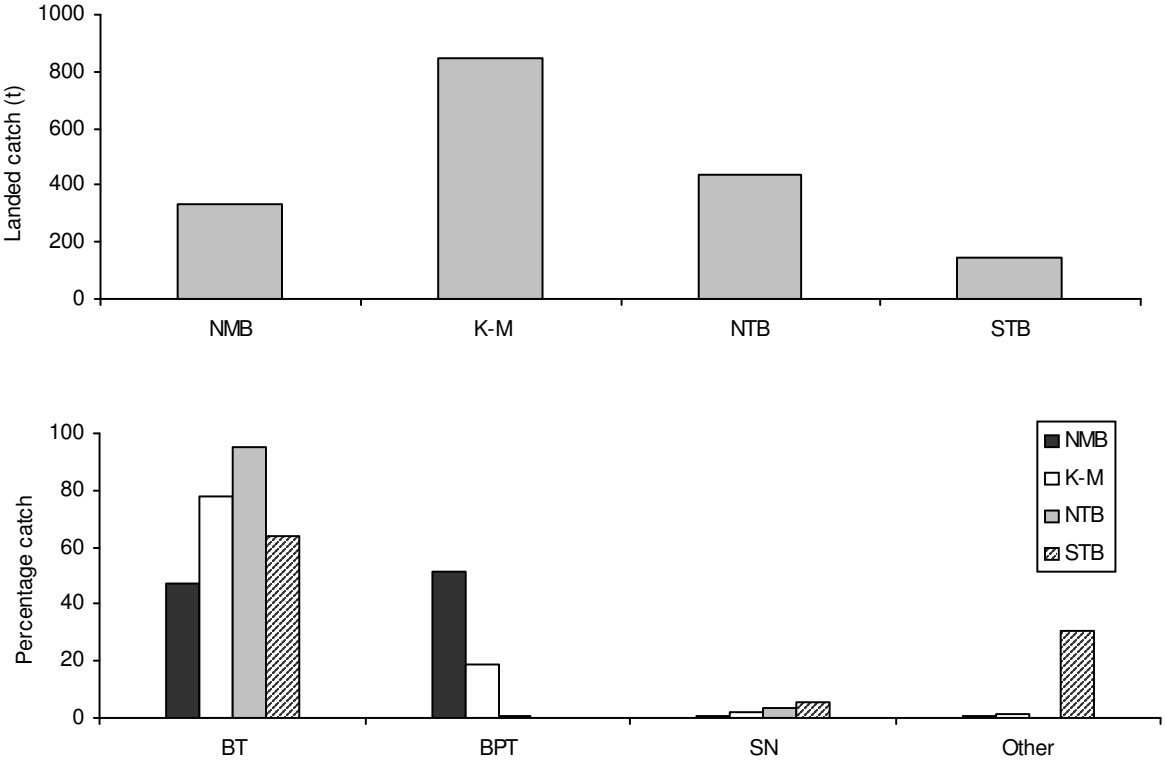


Figure 3: The landed catch (t) and percentage catch by method of trevally for the subareas of TRE 7 in 2007–08 (NMB, Ninety Mile Beach; K-M, Kaipara-Manukau; NTB, North Taranaki Bight; STB, South Taranaki Bight; BT, single trawl; BPT, pair trawl; SN, set net).

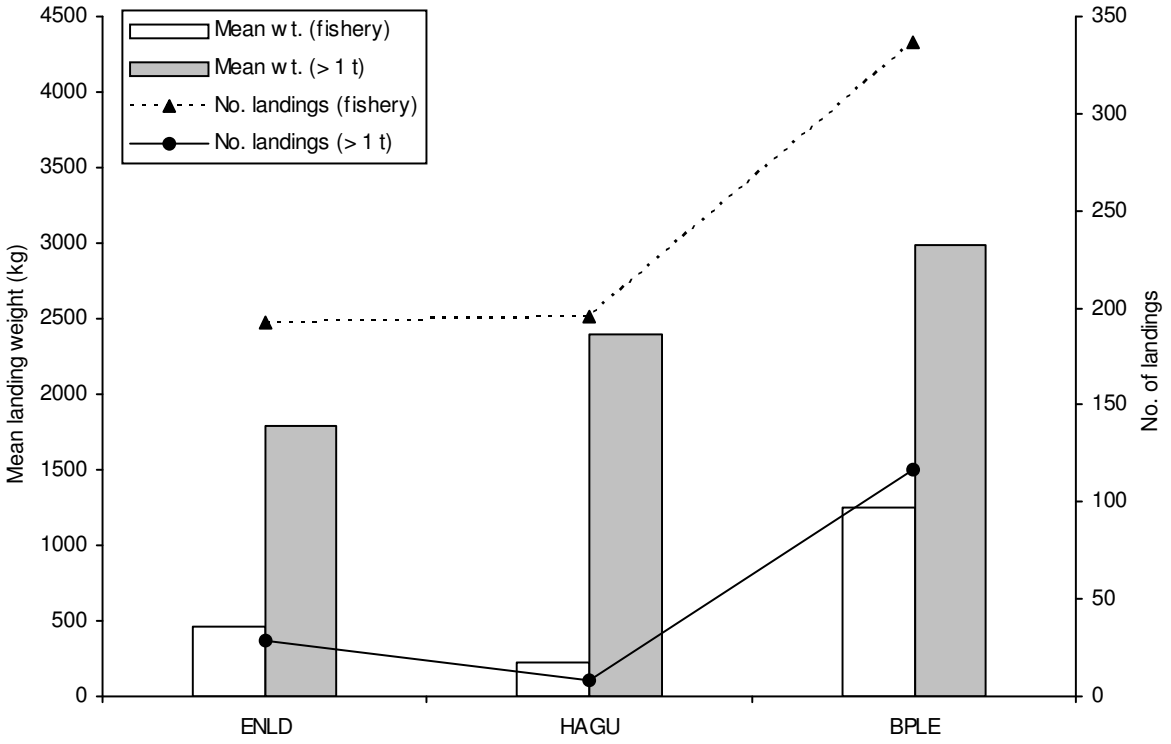


Figure 4: Mean single trawl landing size and number of landings of trevally for all landings in the fishery and for those landings > 1 tonne in 2007–08 (ENLD, East Northland; HAGU, Hauraki Gulf; BPLE, Bay of Plenty).

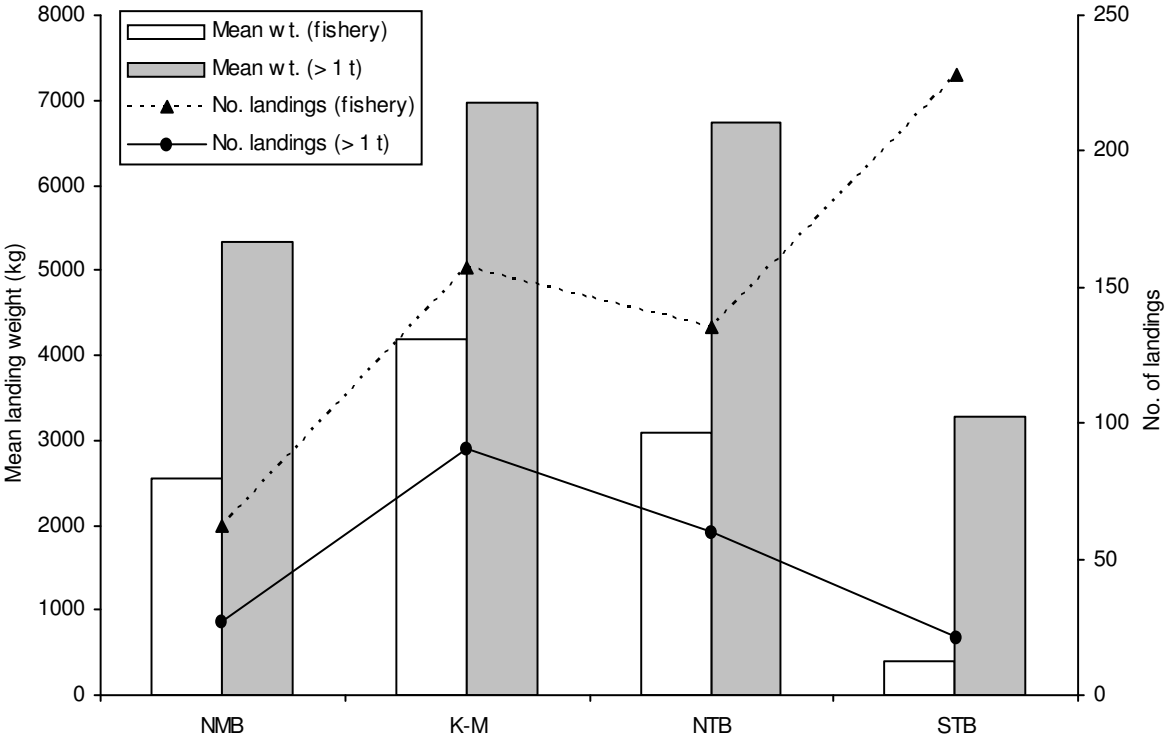


Figure 5: Mean single trawl landing size and number of landings of trevally for all landings in the fishery and for those landings > 1 tonne in 2007–08 (NMB, Ninety Mile Beach; K-M, Kaipara-Manukau; NTB, North Taranaki Bight; STB, South Taranaki Bight).

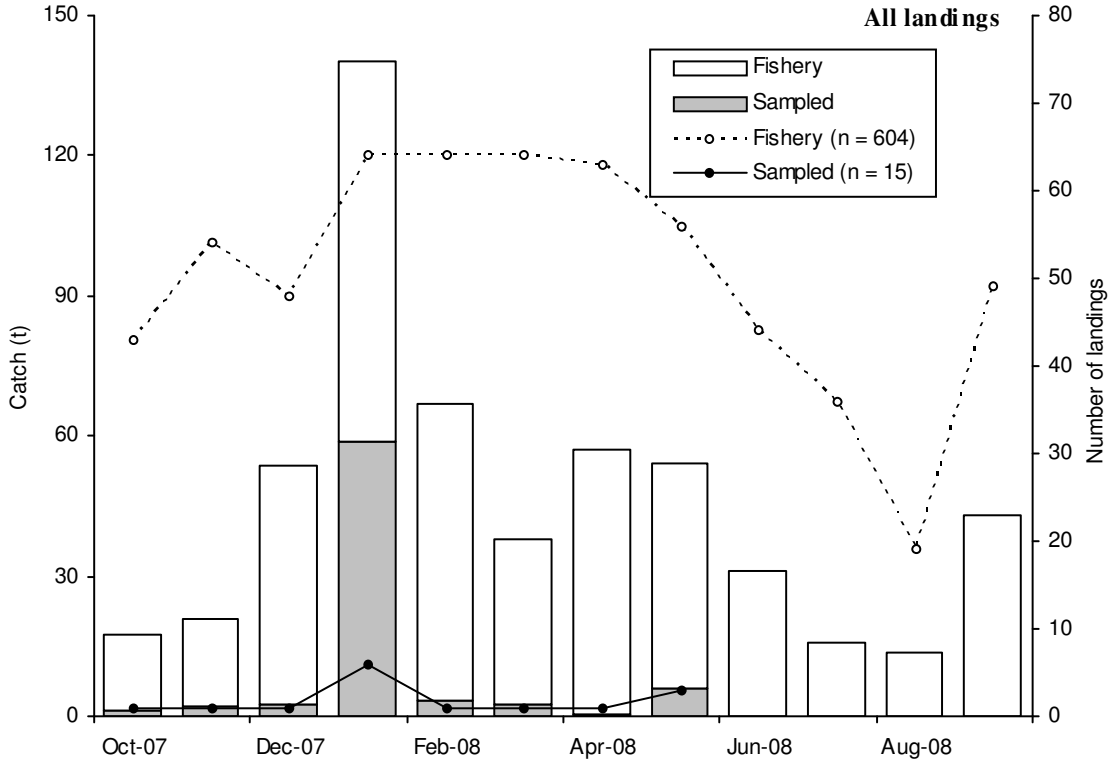


Figure 6: Comparison of the monthly distribution of landed weight (white bars) and numbers of landings (dashed line) of trevally in the TRE 1 single trawl fishery for all landings where trevally was caught. Included are corresponding estimates for all sampled landings (grey bars and solid line) to show representivity of collections. Note: bars and lines are overlaid.

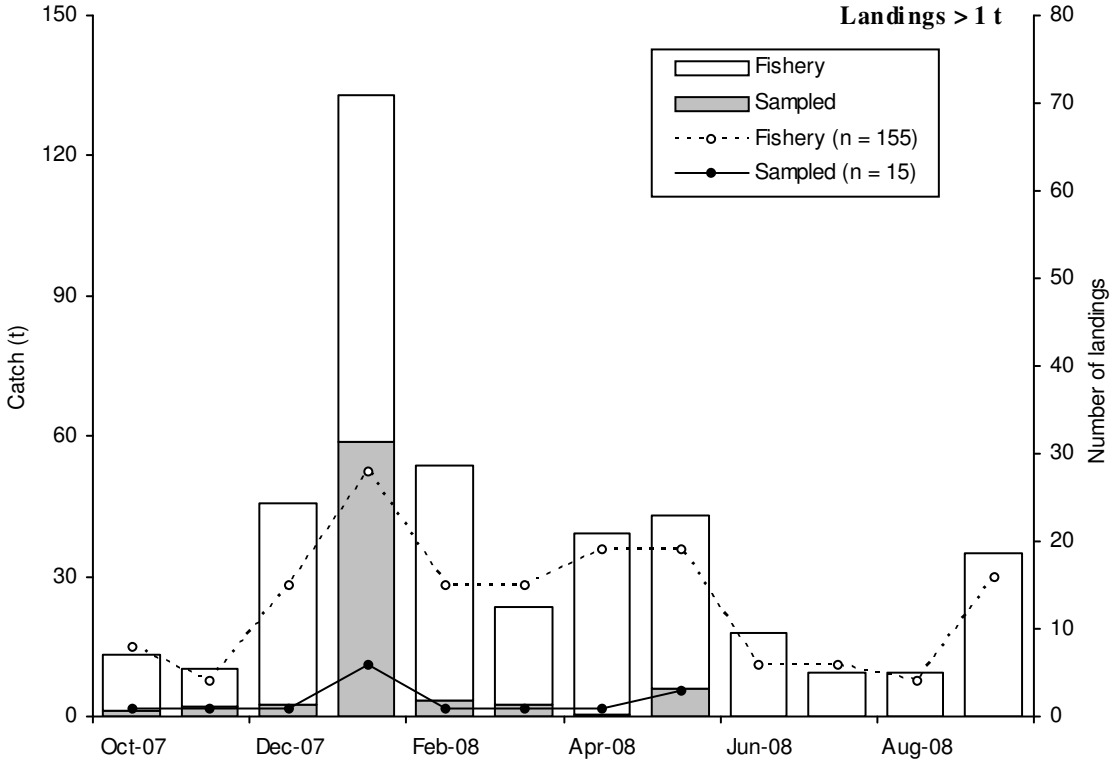


Figure 7: Comparison of the monthly distribution of landed weight (white bars) and numbers of landings (dashed line) of trevally in the TRE 1 single trawl fishery for all landings > 1 tonne. Included are corresponding estimates for all sampled landings (grey bars and solid line) to show representivity of collections. Note: bars and lines are overlaid.

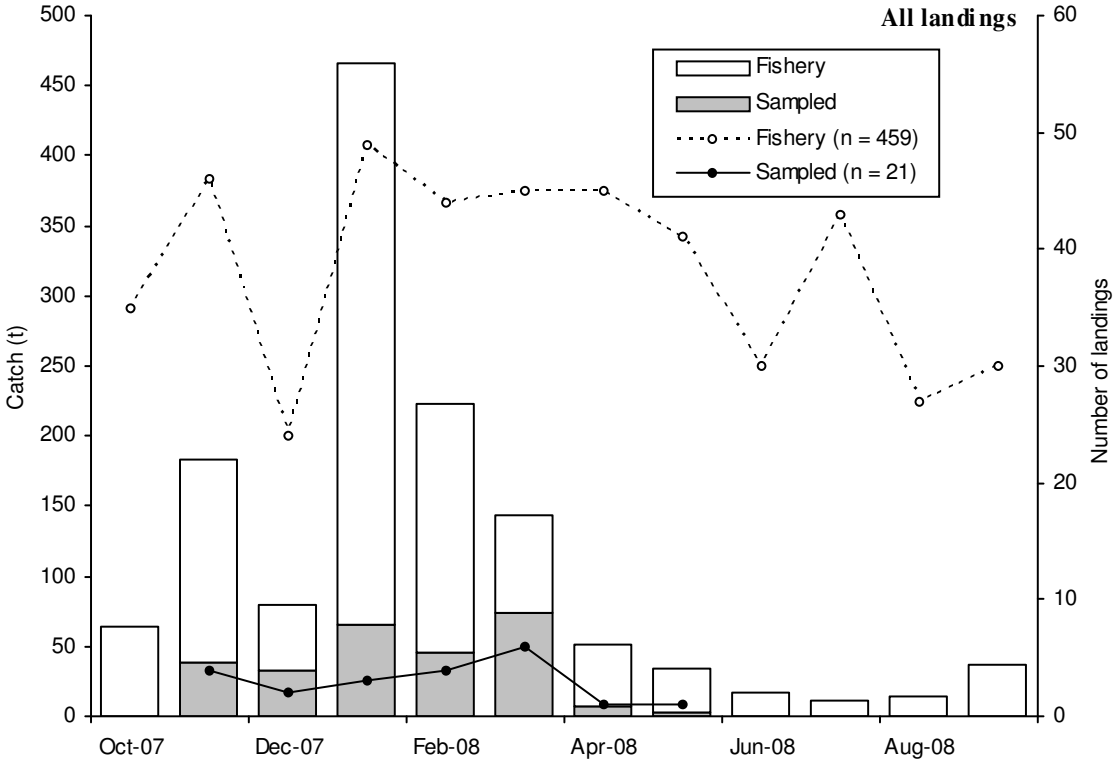


Figure 8: Comparison of the monthly distribution of landed weight (white bars) and numbers of landings (dashed line) of trevally in the TRE 7 single trawl fishery for all landings where trevally was caught. Included are corresponding estimates for all sampled landings (grey bars and solid line) to show representivity of collections. Note: bars and lines are overlaid.

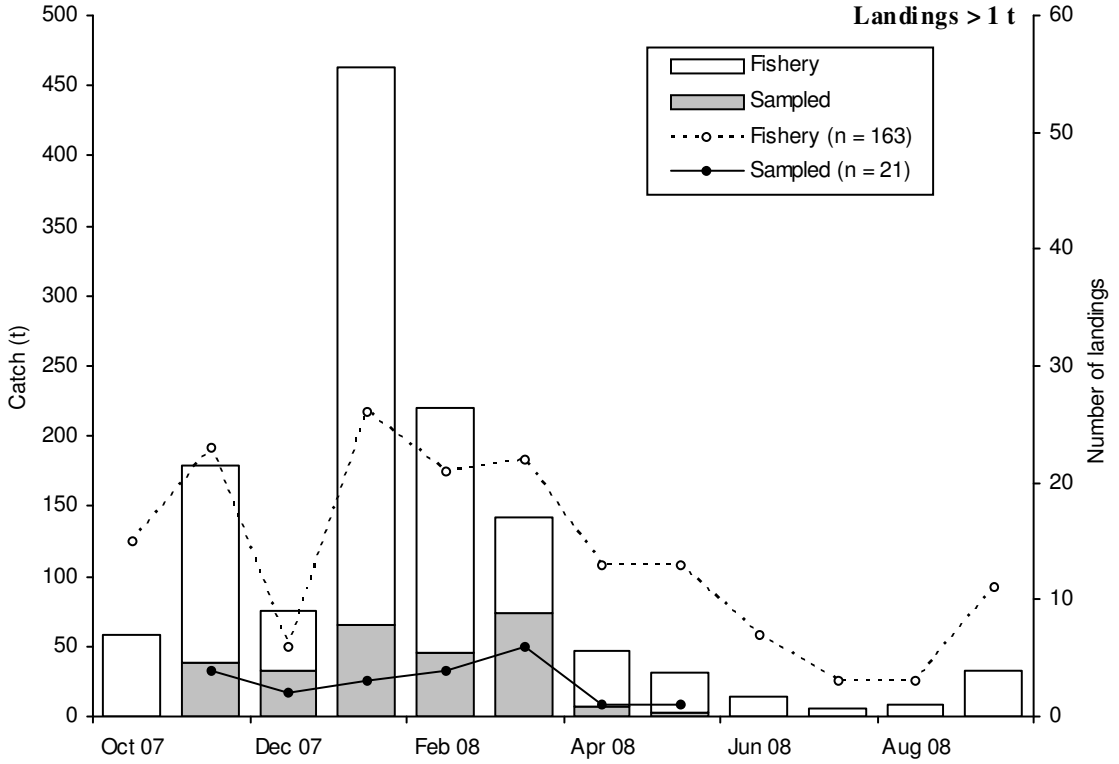


Figure 9: Comparison of the monthly distribution of landed weight (white bars) and numbers of landings (dashed line) of trevally in the TRE 7 single trawl fishery for all landings > 1 tonne. Included are corresponding estimates for all sampled landings (grey bars and solid line) to show representivity of collections. Note: bars and lines are overlaid.

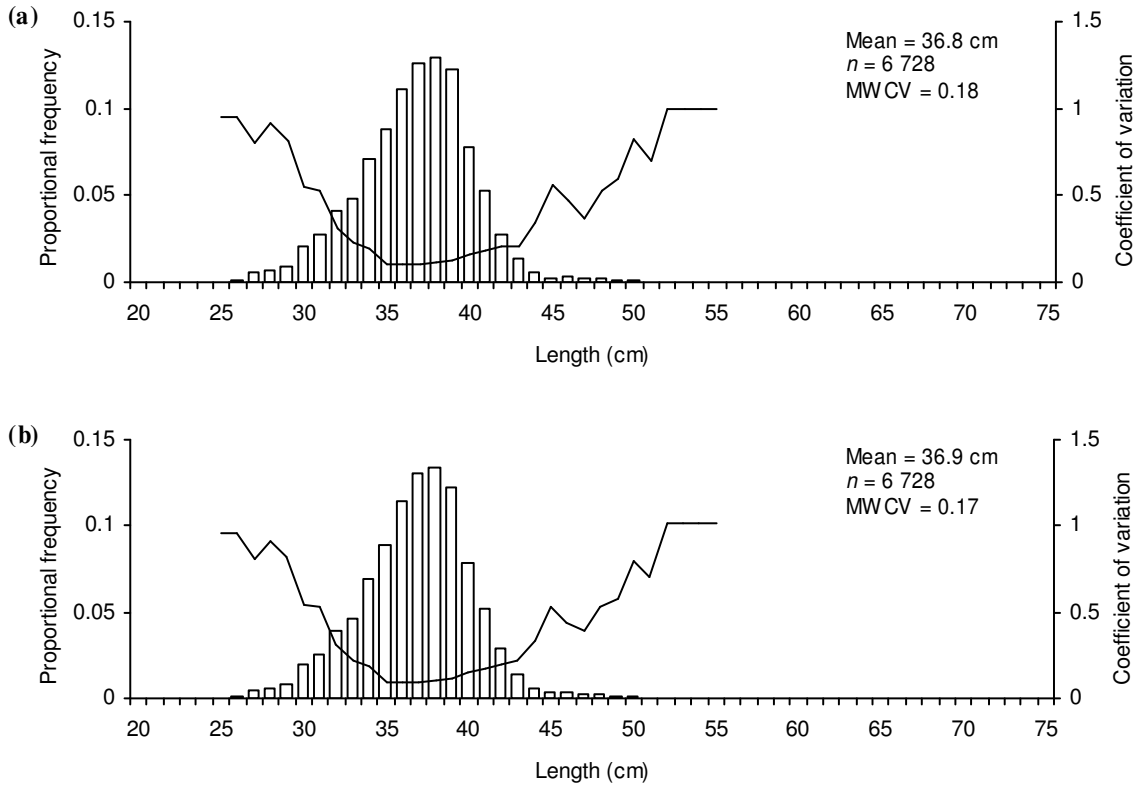


Figure 10: Unstratified (a) and stratified (b) proportion at length distributions (histogram) and analytical (solid line) c.v.s determined from trevally landings sampled from the TRE 1 single trawl fishery in 2007–08 (*n*, length sample size; MWCV, mean weighted c.v.).

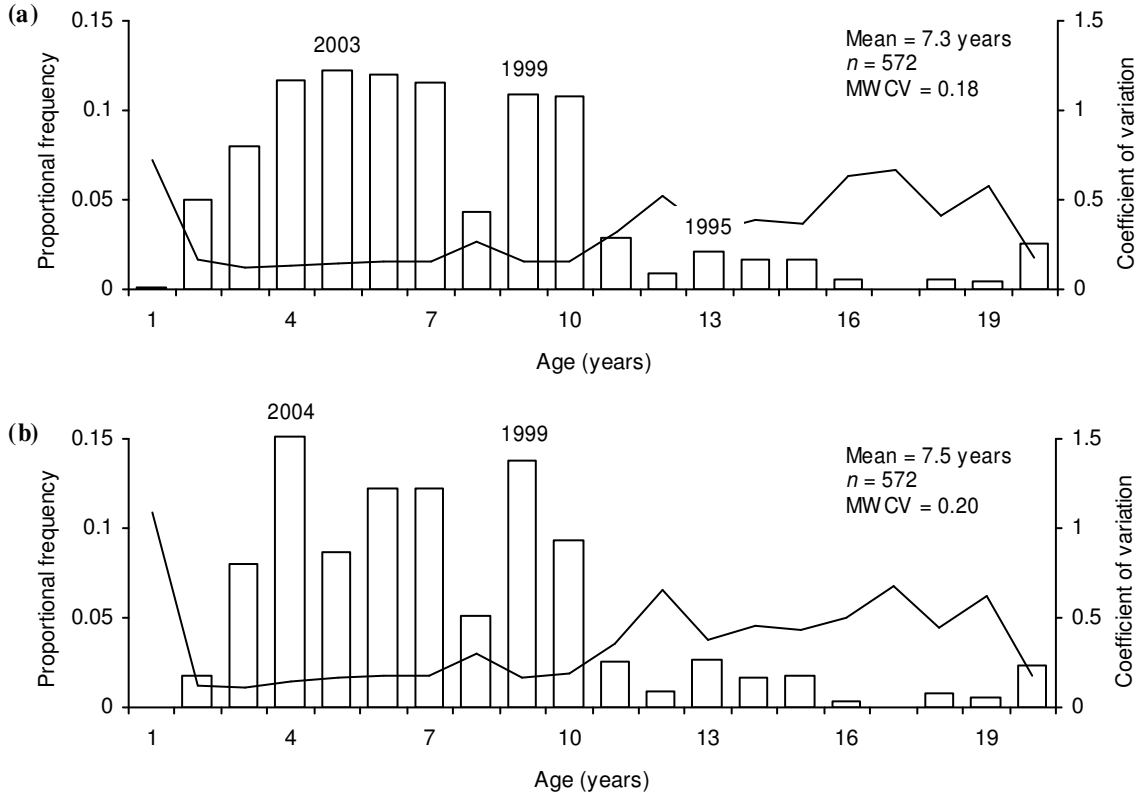


Figure 11: Unstratified (a) and stratified (b) proportion at age distributions (histogram) and analytical (solid line) c.v.s determined from trevally landings sampled from the TRE 1 single trawl fishery in 2007–08 (*n*, otolith sample size; MWCV, mean weighted c.v.).

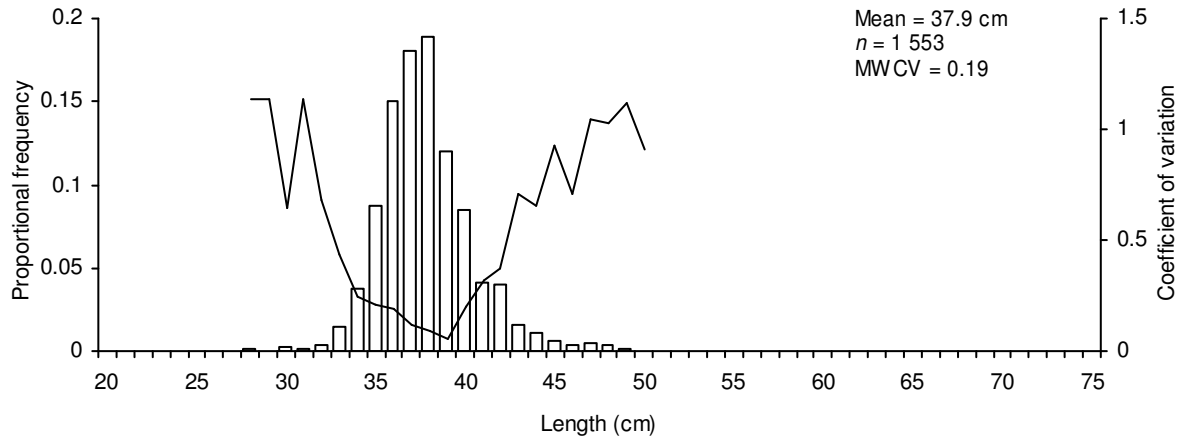


Figure 12: Proportion at length distribution (histogram) and analytical (solid line) c.v.s determined from trevally landings sampled from the East Northland sub-area single trawl fishery in 2007–08 (n, length sample size; MWCV, mean weighted c.v.).

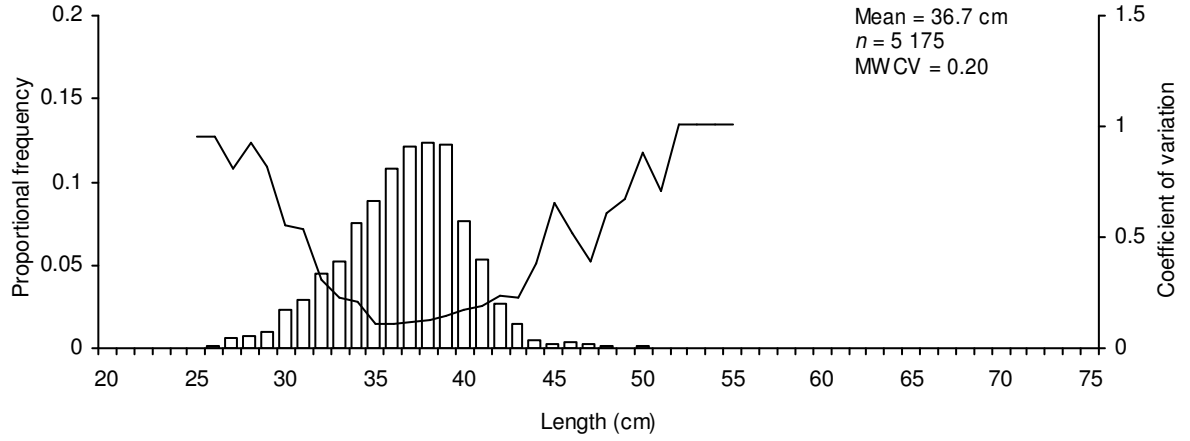


Figure 13: Proportion at length distribution (histogram) and analytical (solid line) c.v.s determined from trevally landings sampled from the Bay of Plenty sub-area single trawl fishery in 2007–08 (*n*, length sample size; MWCV, mean weighted c.v.).

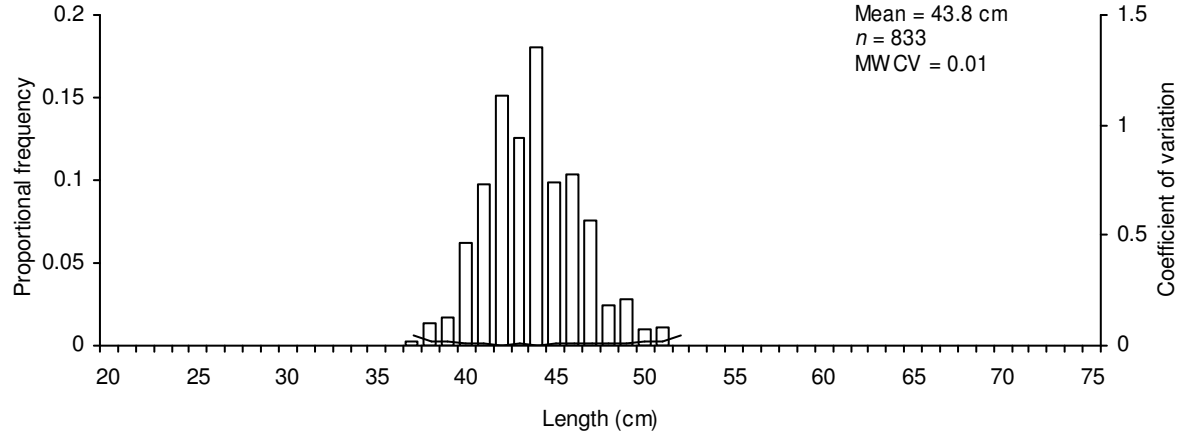


Figure 14: Proportion at length distribution (histogram) and analytical (solid line) c.v.s determined from trevally landings sampled from the Bay of Plenty sub-area purse-seine fishery in 2007–08 (*n*, length sample size; MWCV, mean weighted c.v.).

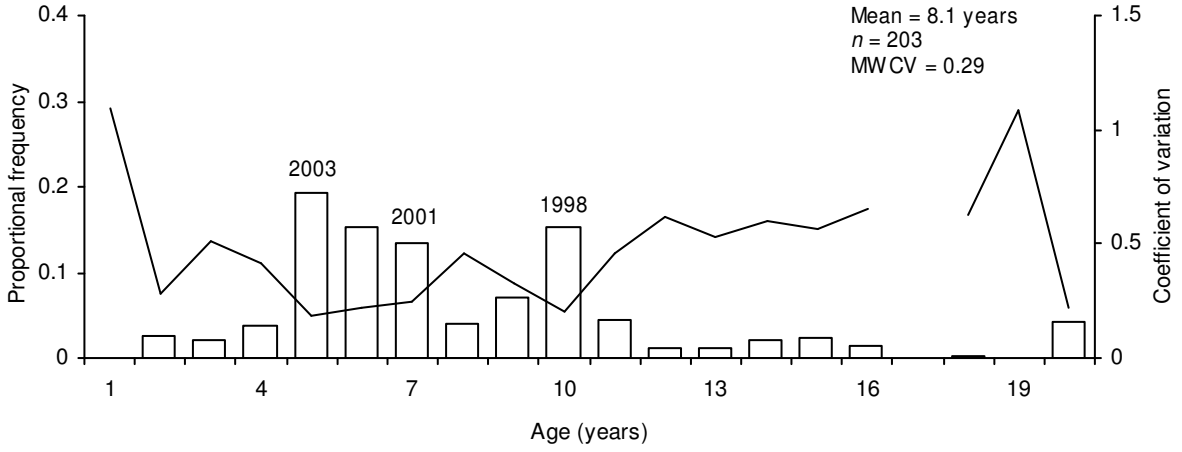


Figure 15: Proportion at age distribution (histogram) and analytical (solid line) c.v.s determined from trevally landings sampled from the East Northland sub-area single trawl fishery in 2007–08 (*n*, otolith sample size; MWCV, mean weighted c.v.).

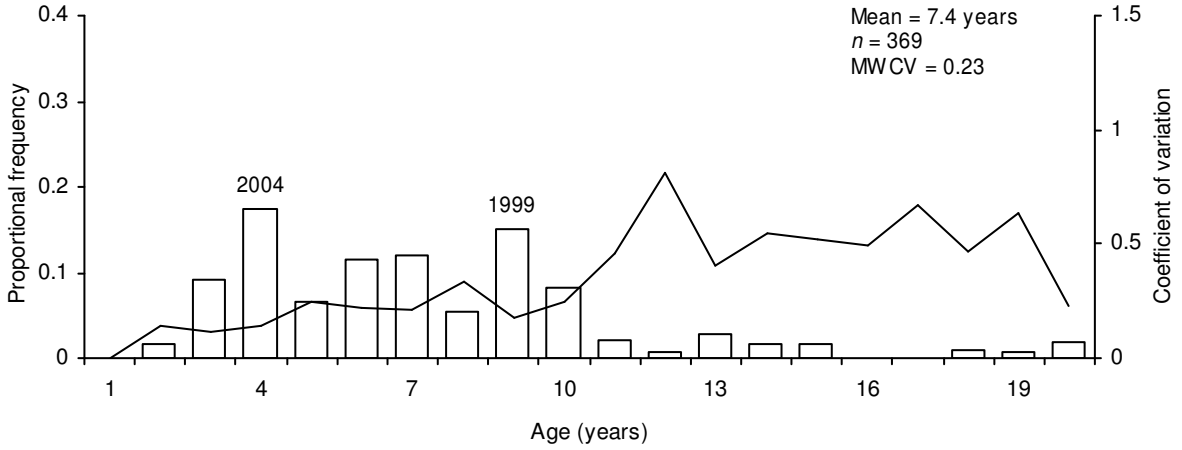


Figure 16: Proportion at age distribution (histogram) and analytical (solid line) c.v.s determined from trevally landings sampled from the Bay of Plenty sub-area single trawl fishery in 2007–08 (*n*, otolith sample size; MWCV, mean weighted c.v.).

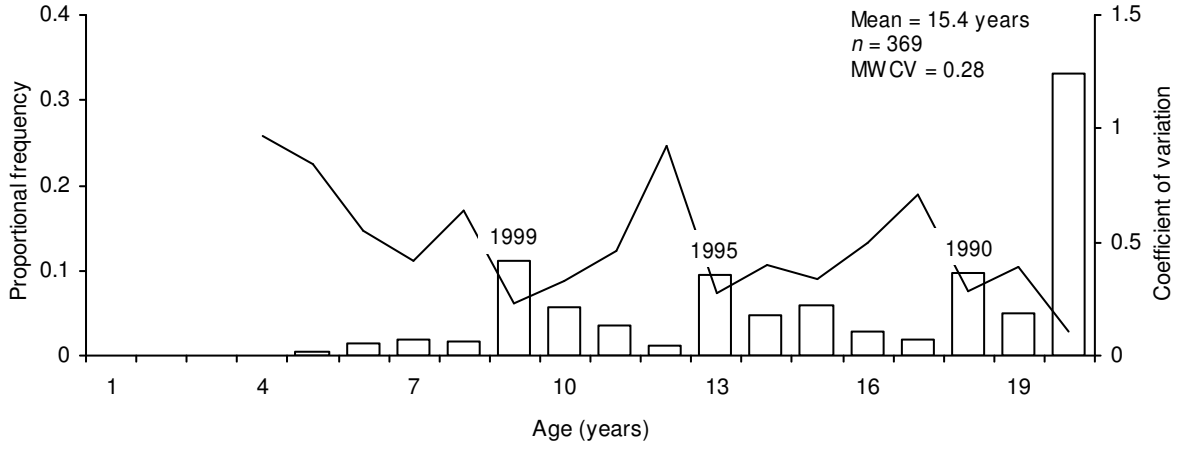


Figure 17: Proportion at age distribution (histogram) and analytical (solid line) c.v.s determined from trevally landings sampled from the Bay of Plenty sub-area purse-seine fishery in 2007–08 (*n*, otolith sample size; MWCV, mean weighted c.v.).

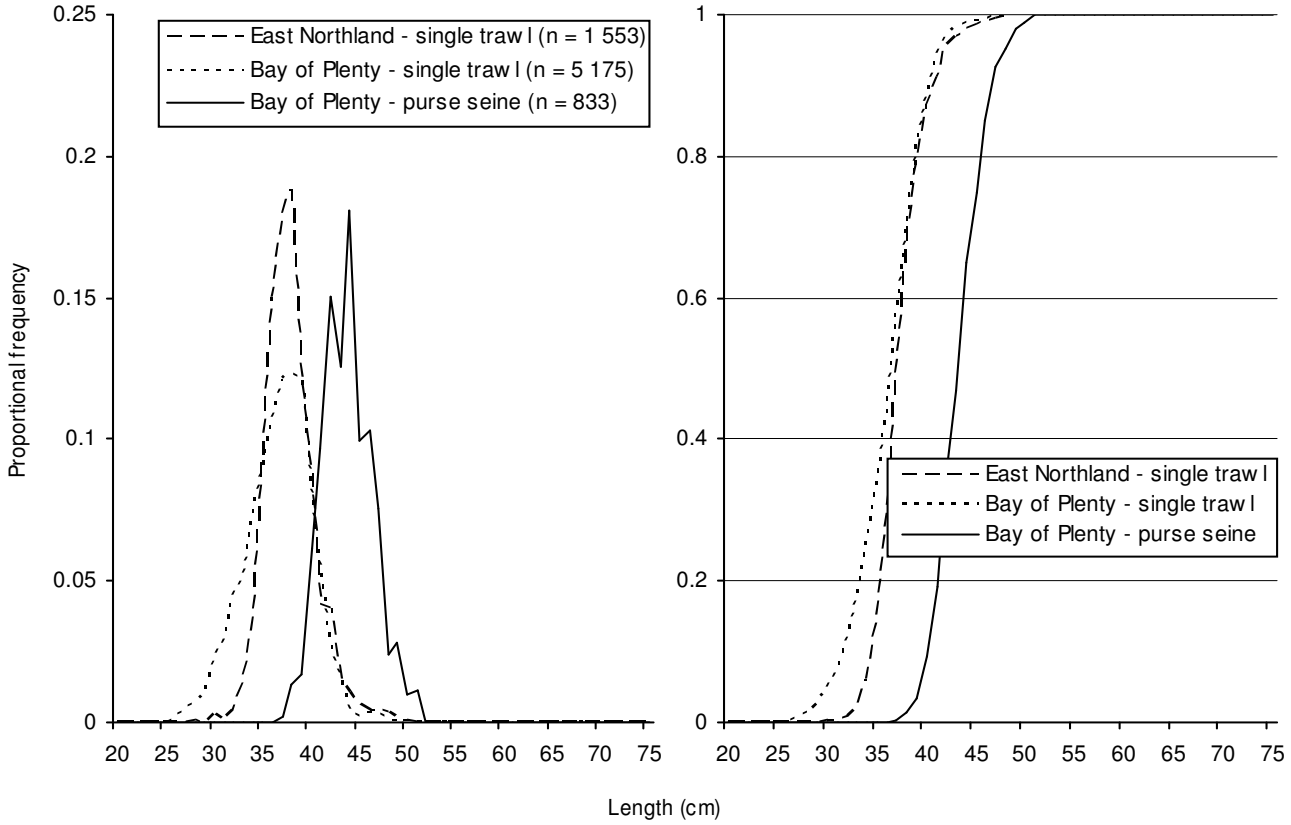


Figure 18: Comparison of the proportion and cumulative proportion at length distributions determined from trevally landings sampled from the East Northland and Bay of Plenty sub-area method fisheries of TRE 1 in 2007–08 (*n*, length sample size).

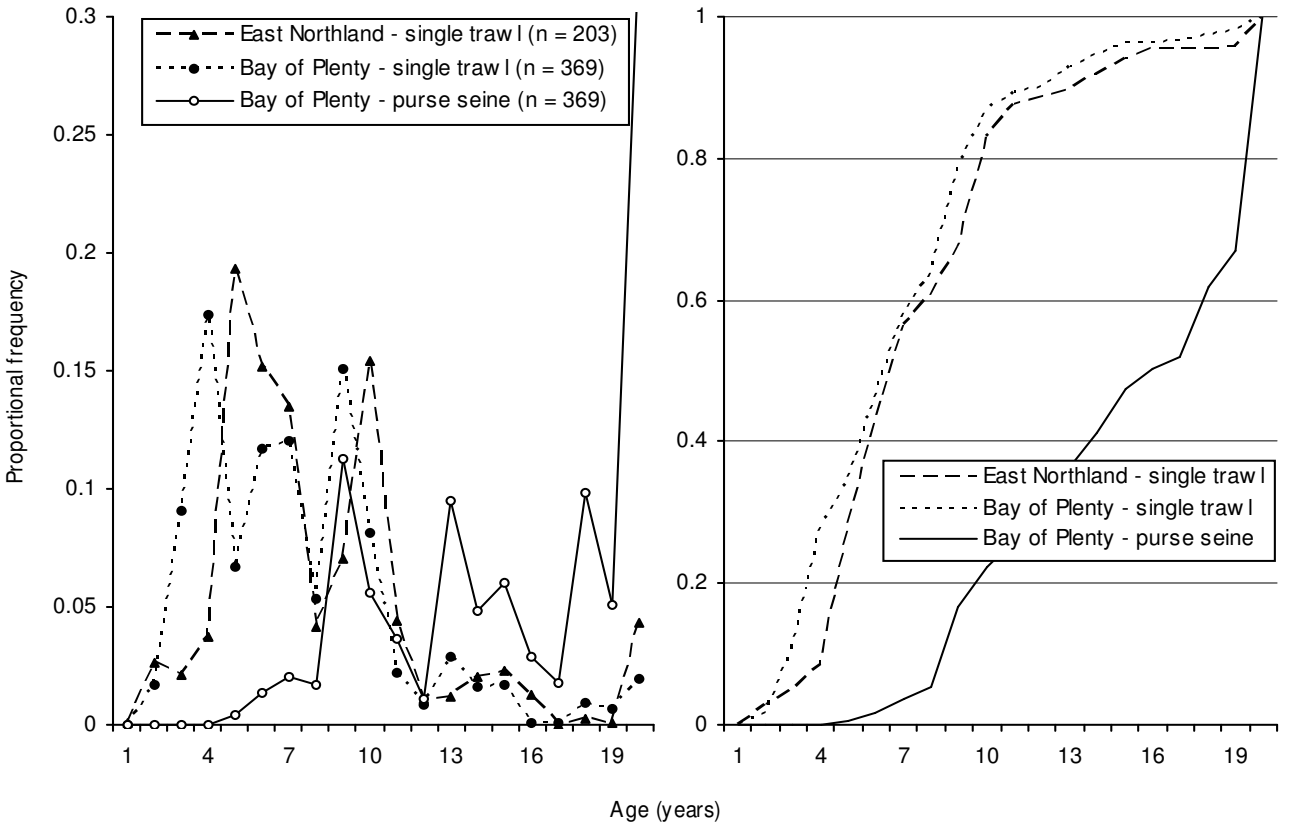


Figure 19: Comparison of the proportion and cumulative proportion at age distributions determined from trevally landings sampled from the East Northland and Bay of Plenty sub-area method fisheries of TRE 1 in 2007–08 (*n*, otolith sample size).

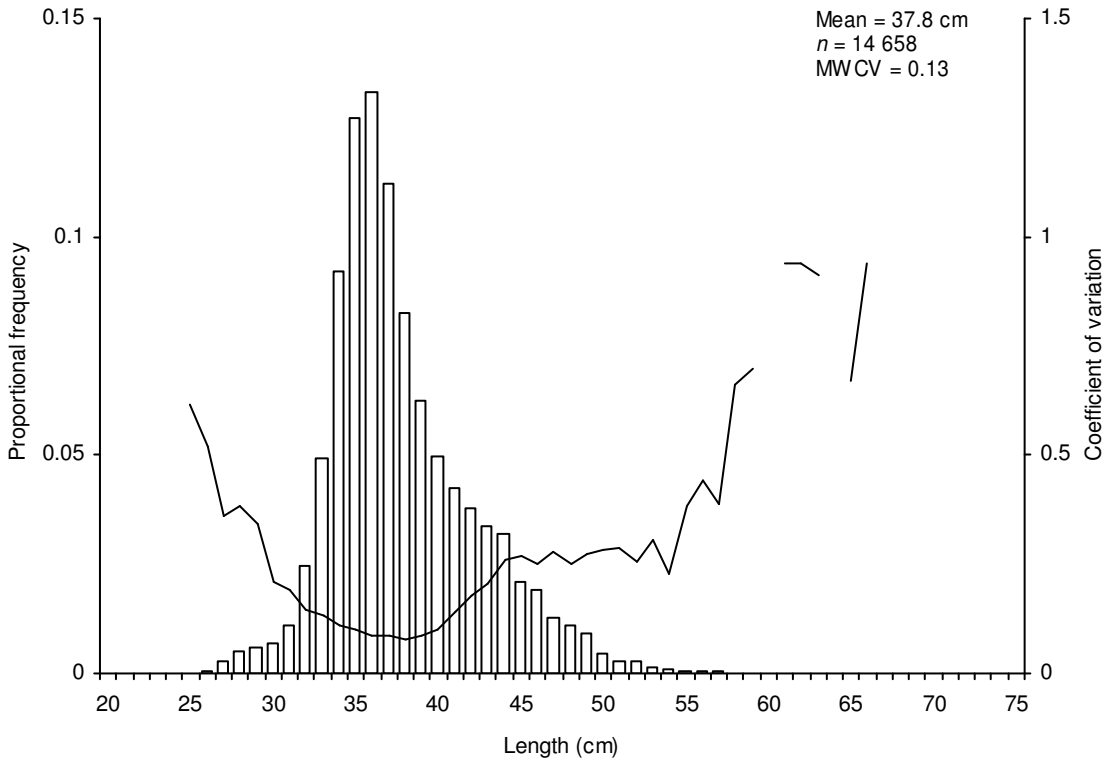


Figure 20: Proportion at length distribution (histogram) and analytical (solid line) c.v.s determined from trevally landings sampled from the TRE 7 single trawl fishery in 2007–08 (*n*, length sample size; MWCV, mean weighted c.v.).

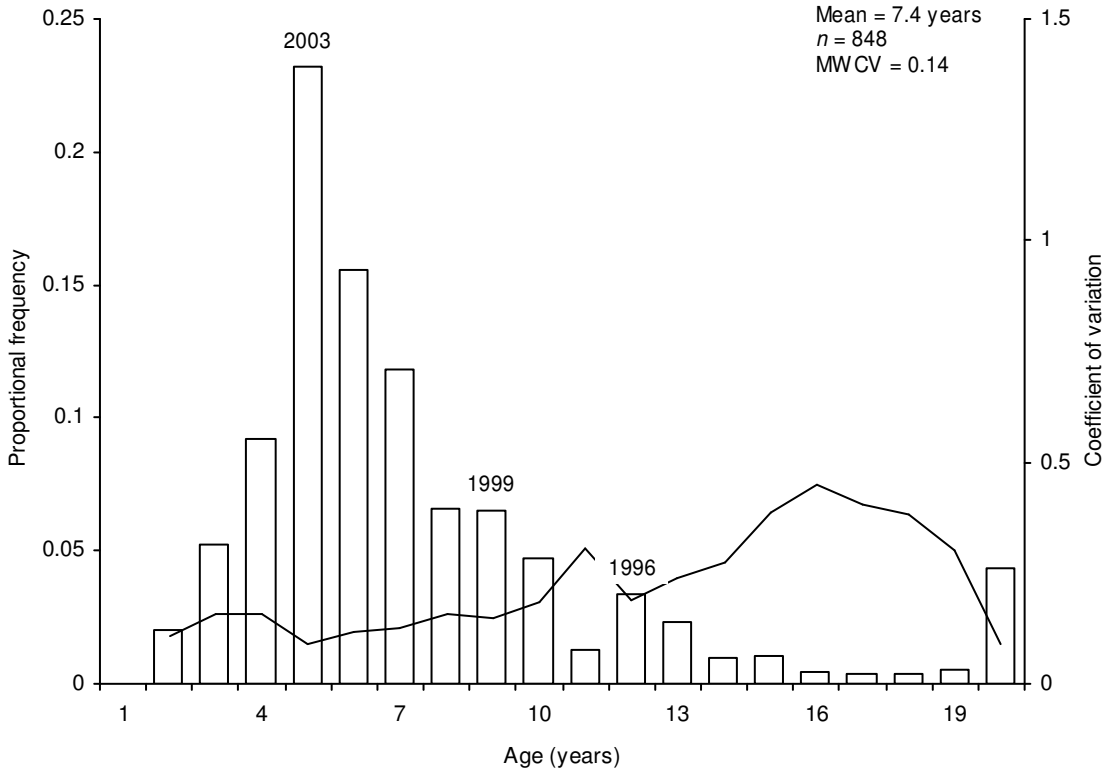


Figure 21: Proportion at age distribution (histogram) and analytical (solid line) c.v.s determined from trevally landings sampled from the TRE 7 single trawl fishery in 2007–08 (*n*, otolith sample size; MWCV, mean weighted c.v.).

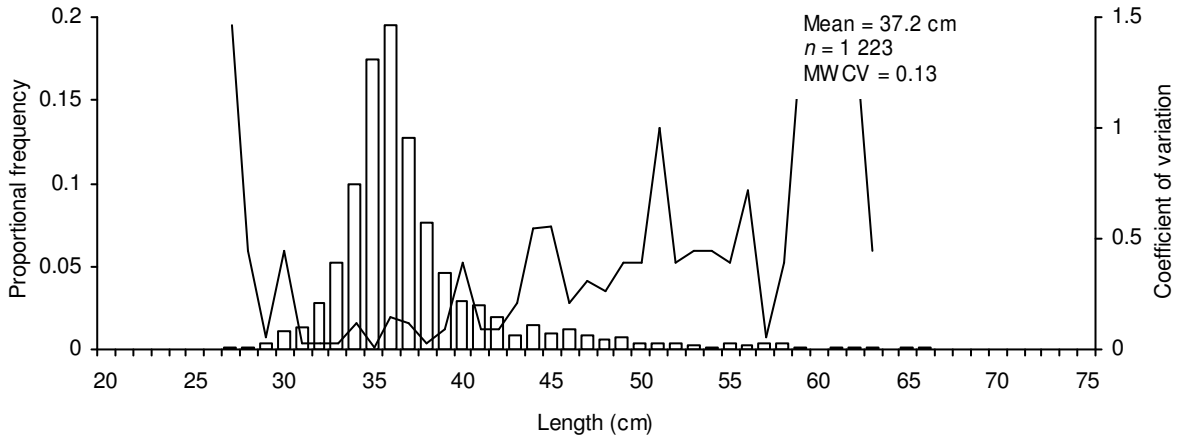


Figure 22: Proportion at length distribution (histogram) and analytical (solid line) c.v.s determined from trevally landings sampled from the Ninety Mile Beach sub-area single trawl fishery in 2007–08 (*n*, length sample size; MWCV, mean weighted c.v.).

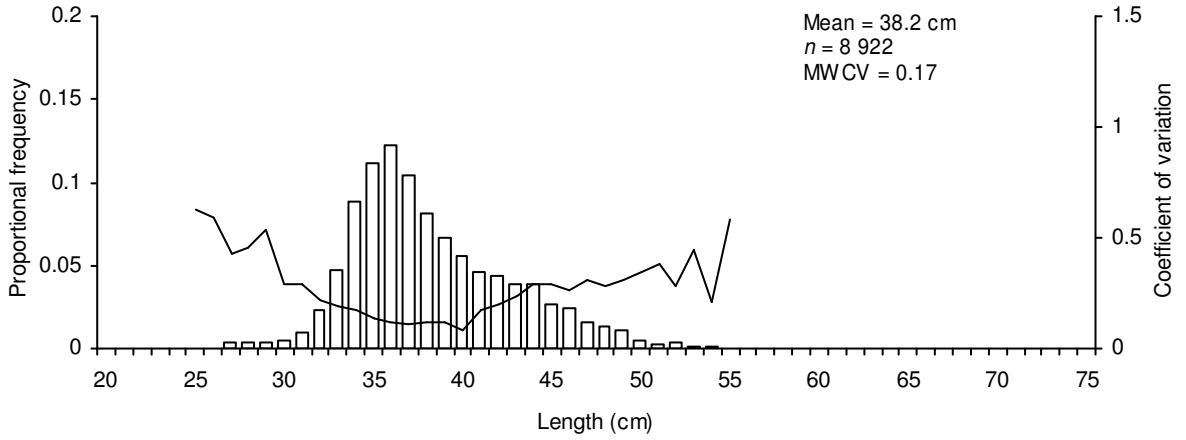


Figure 23: Proportion at length distribution (histogram) and analytical (solid line) c.v.s determined from trevally landings sampled from the combined Kaipara-Manukau and North Taranaki Bight sub-area single trawl fishery in 2007–08 (*n*, length sample size; MWCV, mean weighted c.v.).

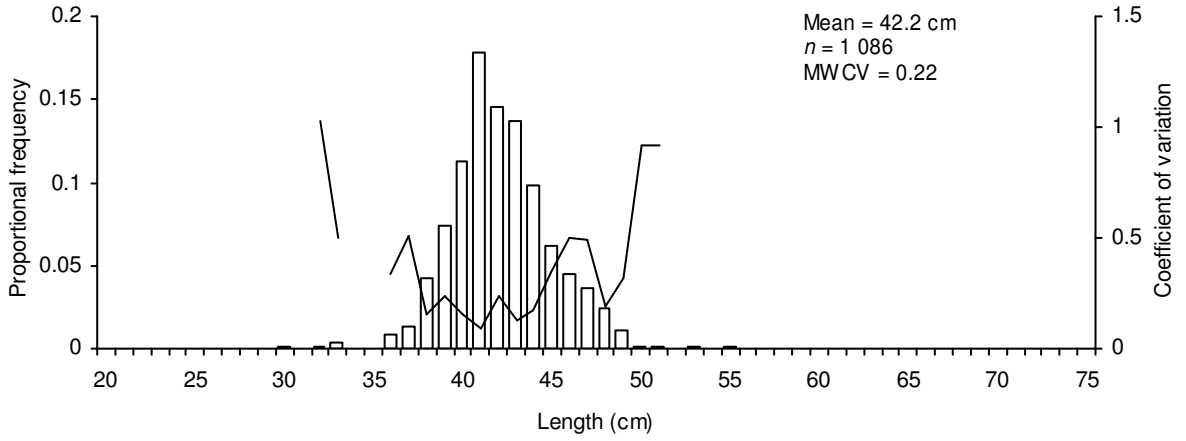


Figure 24: Proportion at length distribution (histogram) and analytical (solid line) c.v.s determined from trevally landings sampled from the South Taranaki Bight sub-area single trawl fishery in 2007–08 (*n*, length sample size; MWCV, mean weighted c.v.).

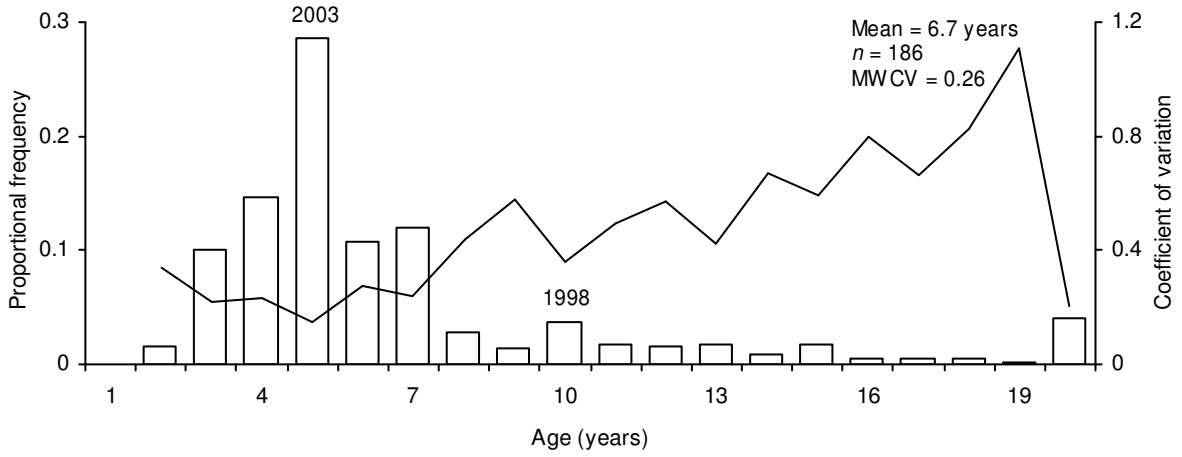


Figure 25: Proportion at age distribution (histogram) and analytical (solid line) c.v.s determined from trevally landings sampled from the Ninety Mile Beach sub-area single trawl fishery in 2007–08 (*n*, otolith sample size; MWCV, mean weighted c.v.).

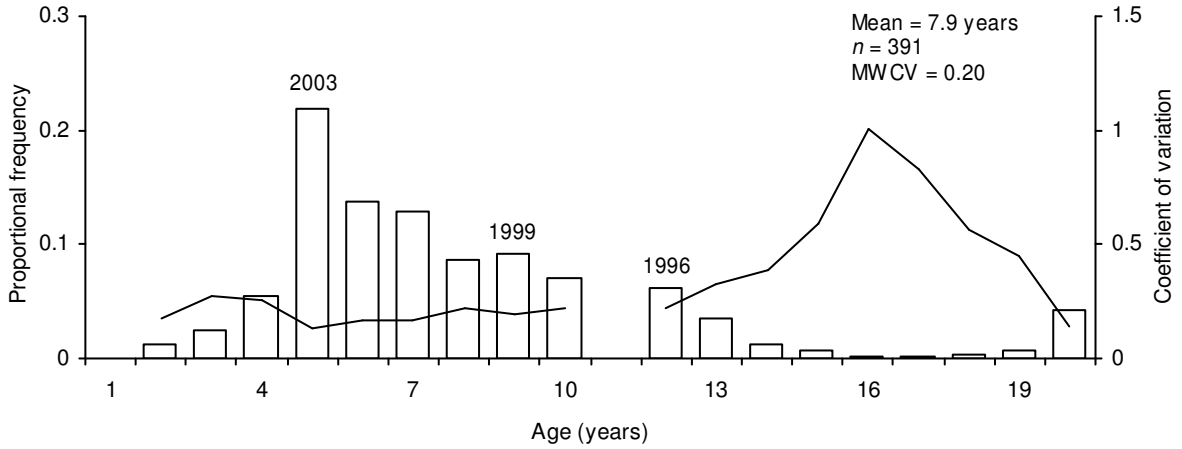


Figure 26: Proportion at age distribution (histogram) and analytical (solid line) c.v.s determined from trevally landings sampled from the combined Kaipara-Manukau and North Taranaki Bight sub-areas single trawl fishery in 2007–08 (*n*, otolith sample size; MWCV, mean weighted c.v.).

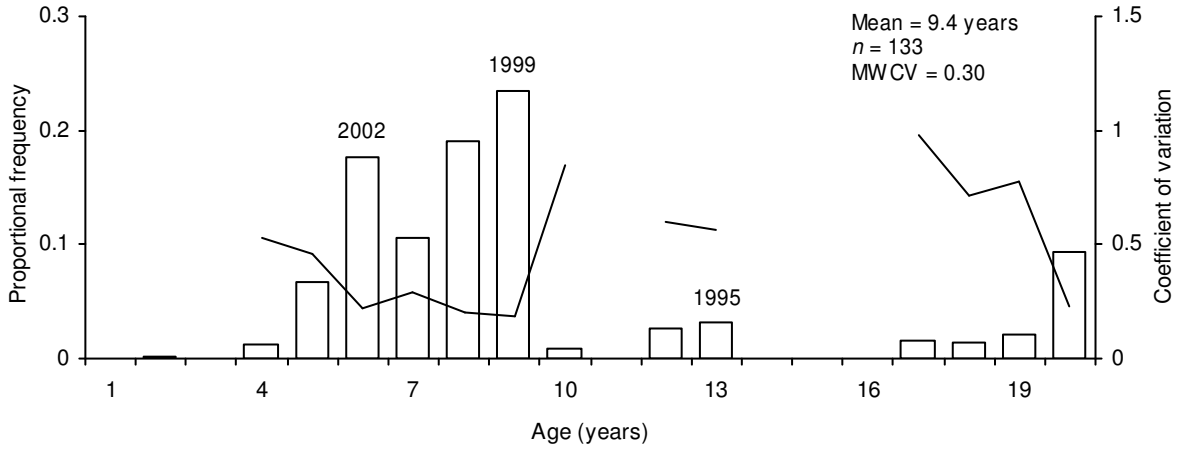


Figure 27: Proportion at age distribution (histogram) and analytical (solid line) c.v.s determined from trevally landings sampled from the South Taranaki Bight sub-area single trawl fishery in 2007–08 (*n*, otolith sample size; MWCV, mean weighted c.v.).

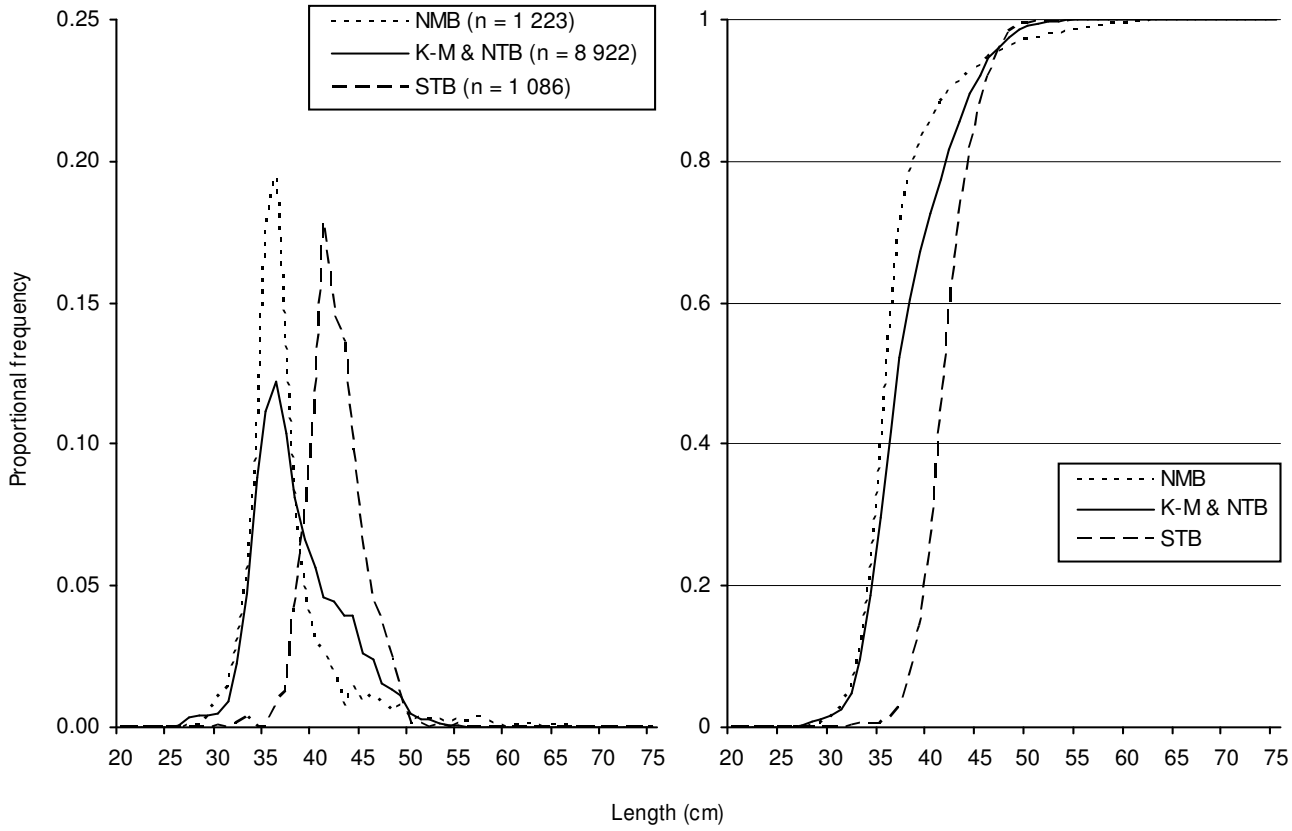


Figure 28: Comparison of the proportion and cumulative proportion at length distributions determined from trevally landings sampled from the three TRE 7 sub-area single trawl fisheries in 2007–08 (*n*, length sample size).

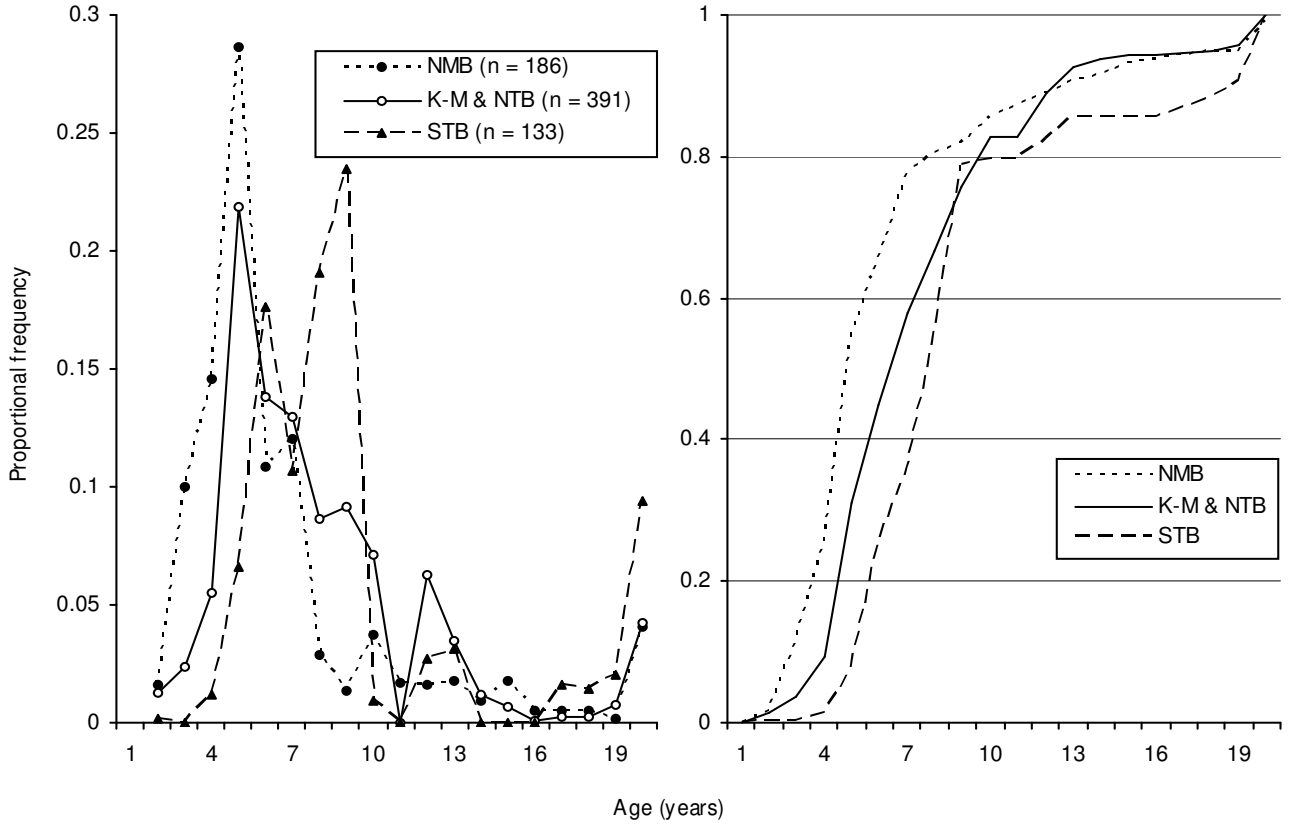


Figure 29: Comparison of the proportion and cumulative proportion at age distributions determined from trevally landings sampled from the three TRE 7 sub-area single trawl fisheries in 2007–08 (*n*, otolith sample size).

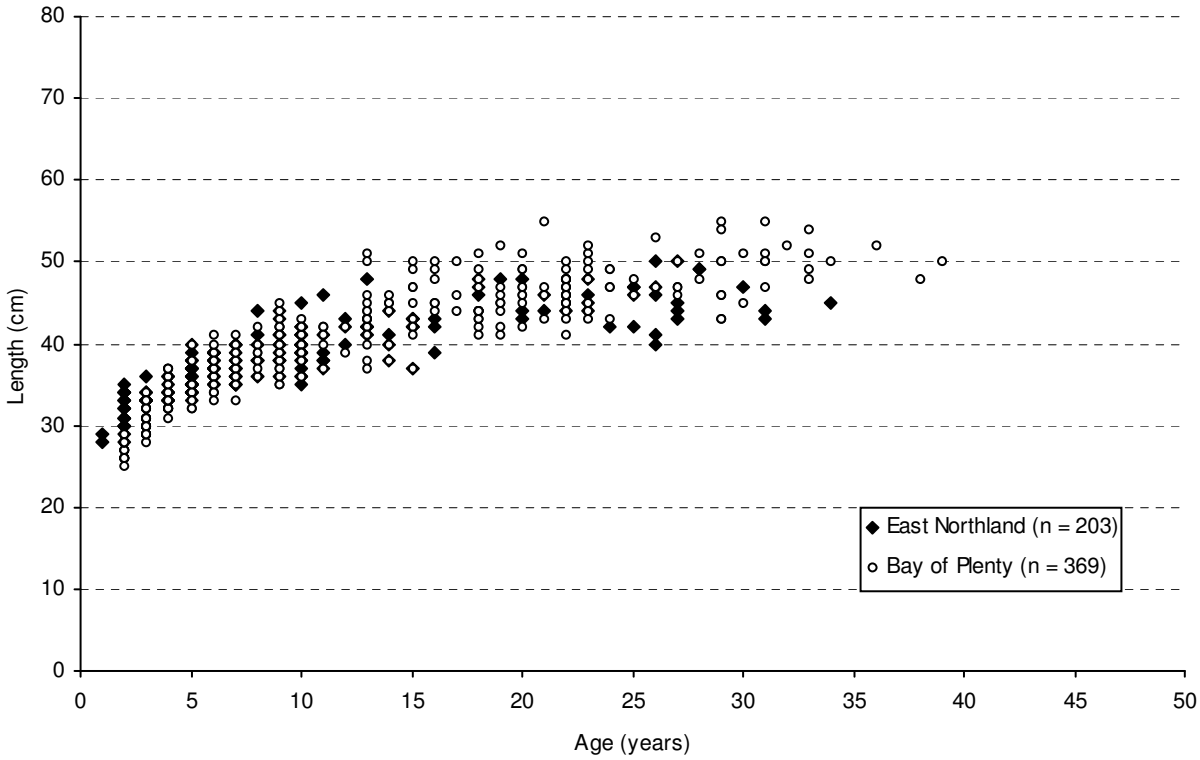


Figure 30: Age-length scatterplot for trevally sampled from the TRE 1 stock in 2007–08 (Note: sub-area of collection displayed; *n*, sample size).

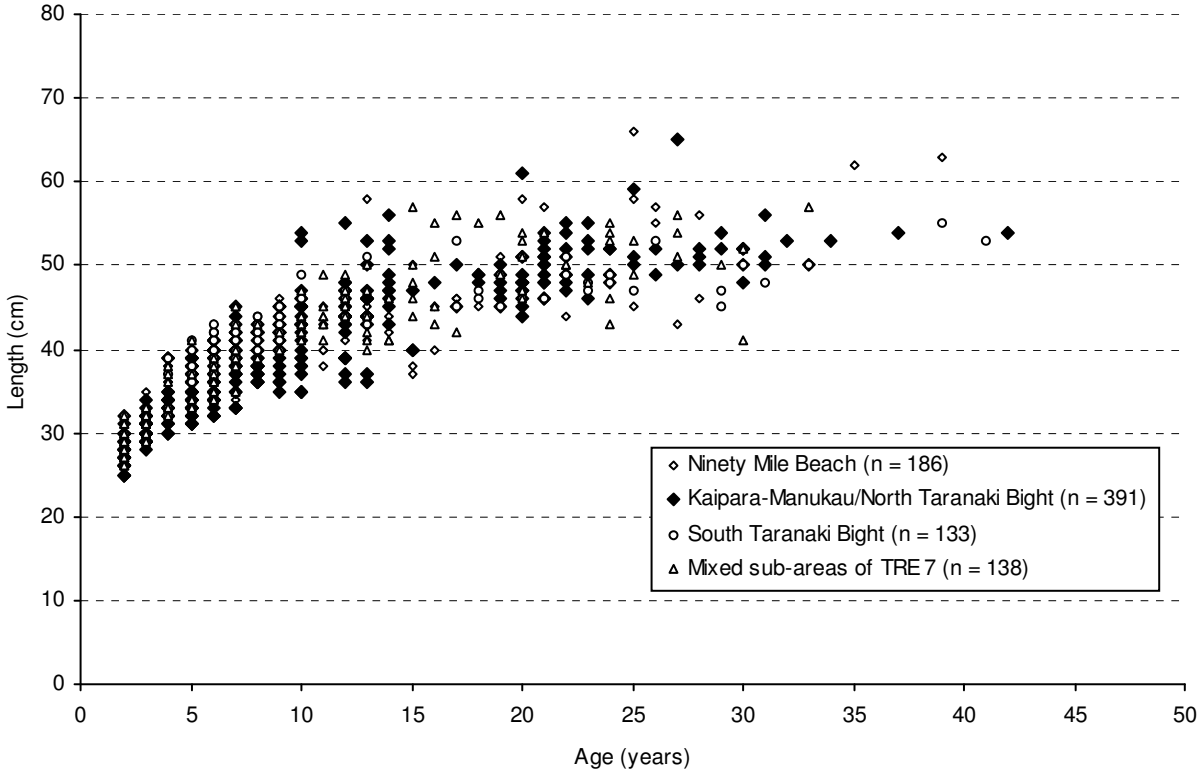


Figure 31: Age-length scatterplot for trevally sampled from the TRE 7 stock in 2007–08 (Note: sub-area of collection displayed; *n*, sample size).

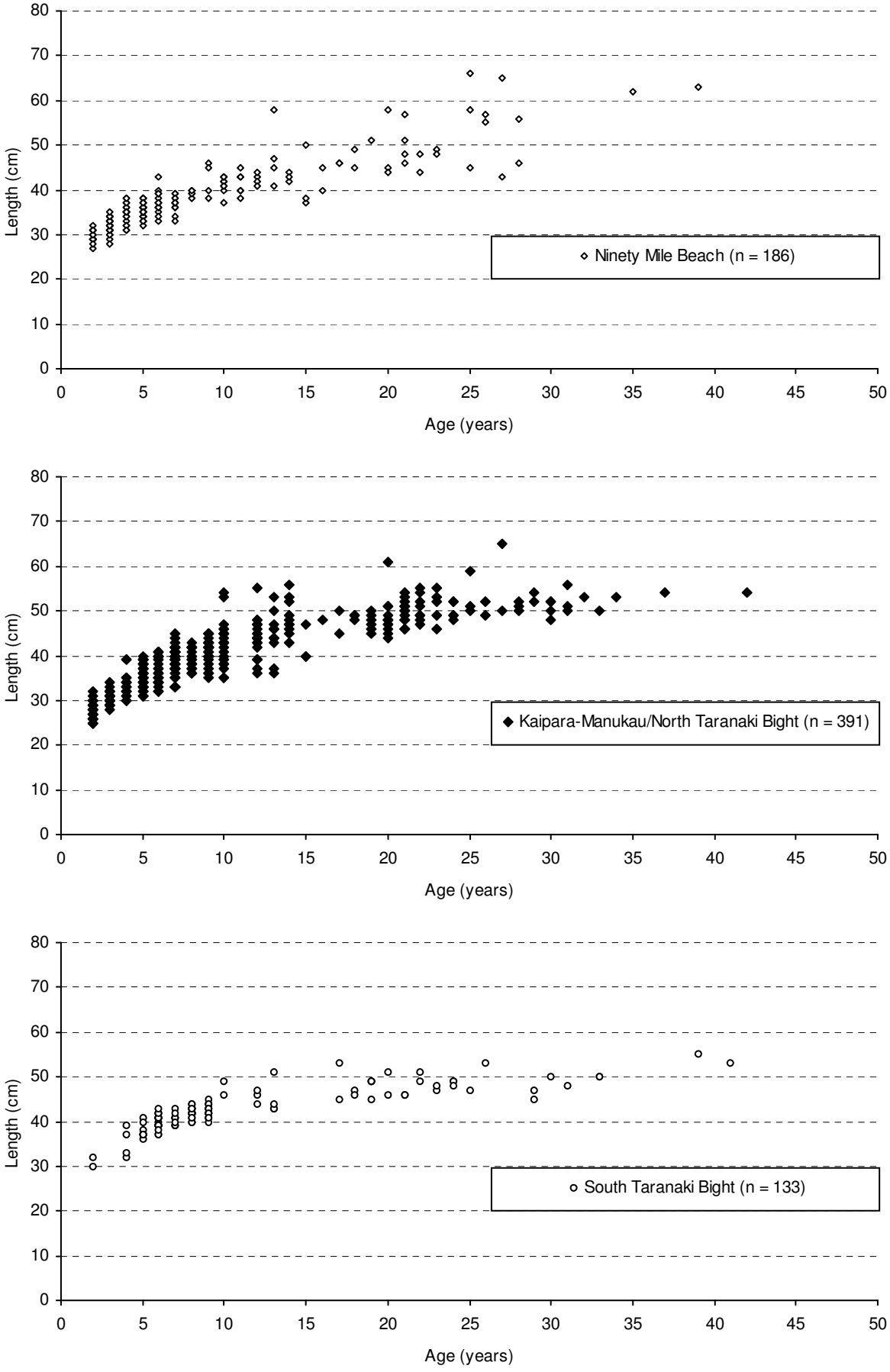


Figure 32: Age-length scatterplots for trevally sampled from the three sub-areas of TRE 7 in 2007–08 (*n*, sample size).

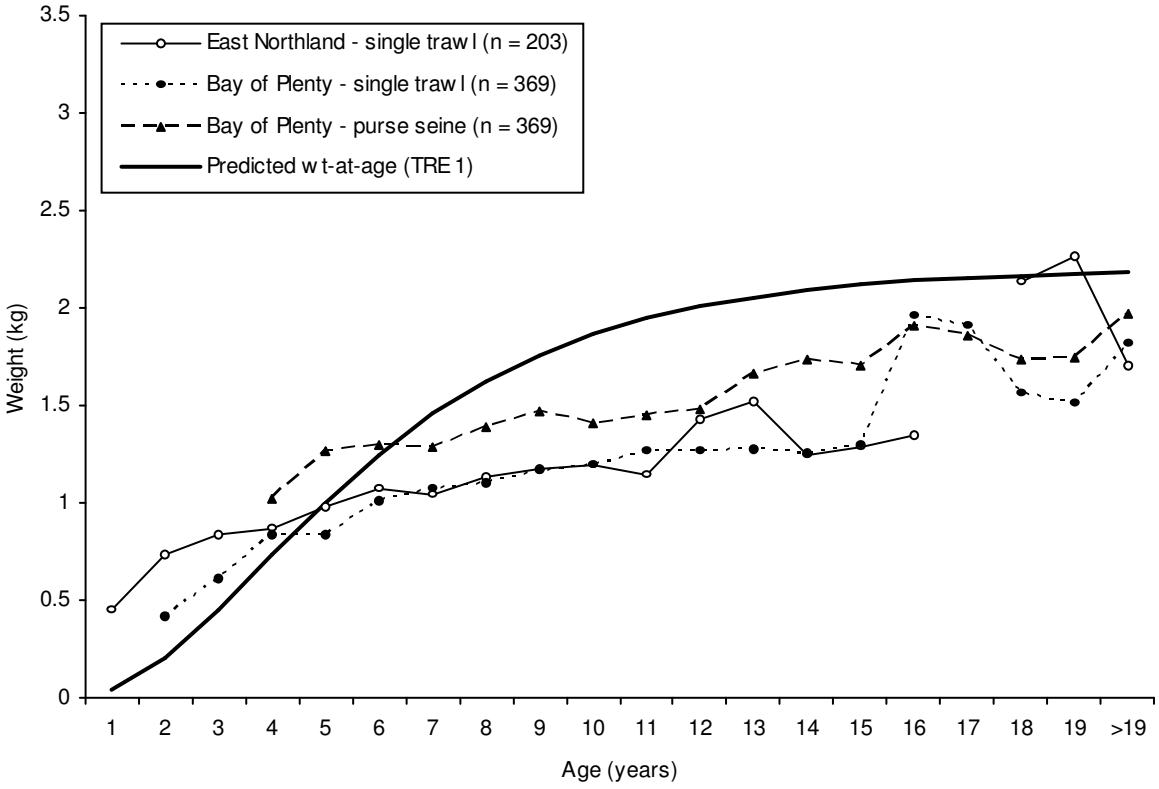


Figure 33: Observed and predicted mean weight-at-age estimates from trevally landings sampled from the East Northland and Bay of Plenty sub-area method fisheries of TRE 1 in 2007–08 (*n*, sample size). Note: Predicted estimates are based on published growth (Walsh et al. 1999) and length-weight (James 1984) parameters.

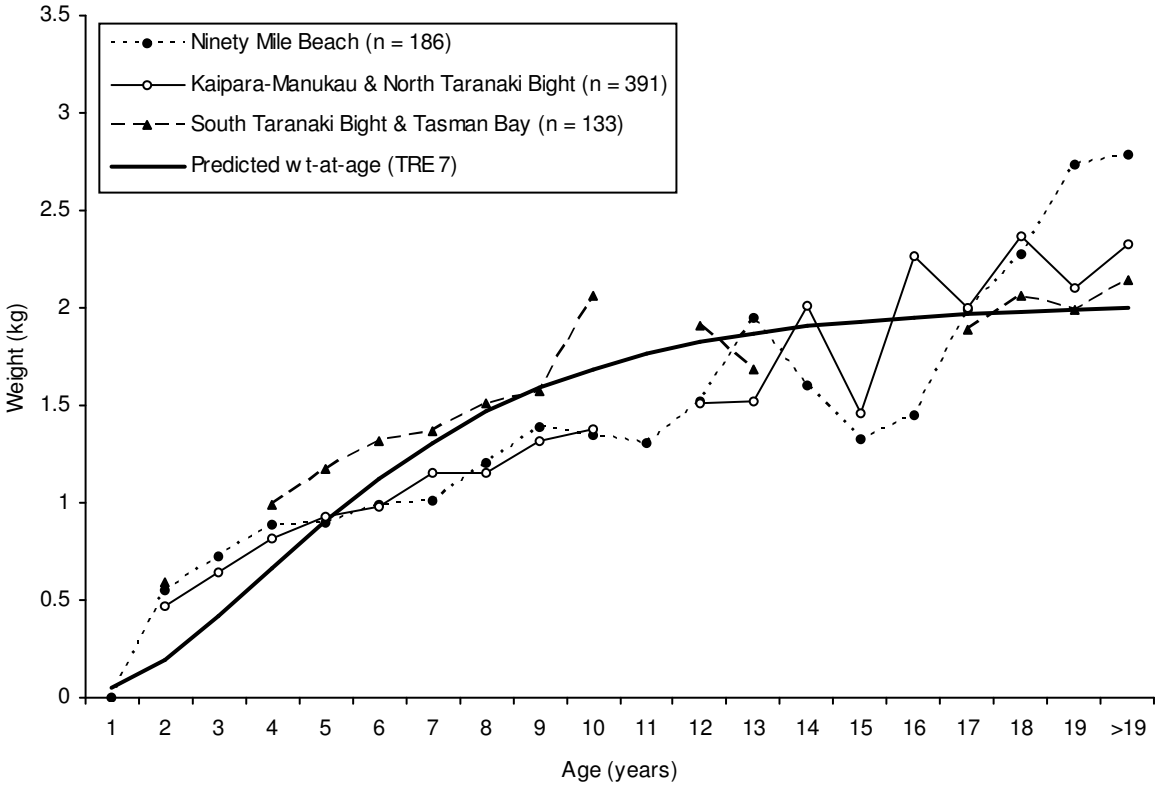


Figure 34: Observed and predicted mean weight-at-age estimates from trevally single trawl landings sampled from three different sub-areas of TRE 7 in 2007–08 (*n*, sample size). Note: Predicted estimates are based on published growth (Walsh et al. 1999) and length-weight (James 1984) parameters.

Appendix 1: Estimates of the proportion at length of trevally from the TRE 1 single trawl and purse-seine fisheries in 2007–08. The proportion at length for each sub-area is also presented (Area codes: ENLD, East Northland; BPLE, Bay of Plenty).

P.i. = proportion of fish in length class. *Nt* = scaled total number of fish caught.
c.v. = coefficient of variation. *n* = total number of fish sampled.

					Single trawl		Purse-seine	
Length	TRE 1		ENLD		BPLE		BPLE	
(cm)	*P.i.*	c.v.	*P.i.*	c.v.	*P.i.*	c.v.	*P.i.*	*c.v.*
20	0.0000	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.00
21	0.0000	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.00
22	0.0000	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.00
23	0.0000	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.00
24	0.0000	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.00
25	0.0002	0.95	0.0000	0.00	0.0002	0.95	0.0000	0.00
26	0.0011	0.95	0.0000	0.00	0.0012	0.95	0.0000	0.00
27	0.0053	0.80	0.0000	0.00	0.0058	0.81	0.0000	0.00
28	0.0067	0.91	0.0007	1.14	0.0073	0.93	0.0000	0.00
29	0.0091	0.81	0.0003	1.14	0.0099	0.82	0.0000	0.00
30	0.0209	0.55	0.0025	0.64	0.0227	0.56	0.0000	0.00
31	0.0271	0.53	0.0007	1.14	0.0297	0.54	0.0000	0.00
32	0.0417	0.31	0.0042	0.68	0.0454	0.31	0.0000	0.00
33	0.0484	0.22	0.0145	0.43	0.0518	0.23	0.0000	0.00
34	0.0714	0.20	0.0381	0.24	0.0747	0.20	0.0000	0.00
35	0.0886	0.10	0.0876	0.21	0.0887	0.11	0.0000	0.00
36	0.1116	0.10	0.1501	0.19	0.1078	0.11	0.0000	0.00
37	0.1265	0.10	0.1803	0.11	0.1212	0.11	0.0019	0.05
38	0.1291	0.11	0.1885	0.09	0.1232	0.13	0.0136	0.02
39	0.1220	0.13	0.1202	0.05	0.1222	0.14	0.0172	0.01
40	0.0774	0.16	0.0845	0.20	0.0767	0.17	0.0617	0.01
41	0.0527	0.18	0.0414	0.32	0.0538	0.19	0.0970	0.01
42	0.0276	0.21	0.0399	0.37	0.0264	0.23	0.1506	0.00
43	0.0142	0.21	0.0158	0.71	0.0140	0.22	0.1257	0.01
44	0.0056	0.34	0.0105	0.66	0.0052	0.38	0.1807	0.00
45	0.0027	0.56	0.0060	0.93	0.0024	0.65	0.0993	0.01
46	0.0035	0.47	0.0041	0.71	0.0035	0.52	0.1032	0.01
47	0.0027	0.36	0.0044	1.04	0.0025	0.39	0.0757	0.01
48	0.0019	0.53	0.0038	1.03	0.0017	0.61	0.0240	0.01
49	0.0006	0.59	0.0013	1.12	0.0006	0.67	0.0286	0.01
50	0.0007	0.83	0.0004	0.91	0.0007	0.88	0.0096	0.02
51	0.0002	0.70	0.0000	0.00	0.0003	0.71	0.0111	0.02
52	0.0001	1.00	0.0000	0.00	0.0002	1.01	0.0001	0.05
53	0.0001	1.00	0.0000	0.00	0.0001	1.01	0.0000	0.00
54	0.0001	1.00	0.0000	0.00	0.0001	1.01	0.0000	0.00
55	0.0001	1.00	0.0000	0.00	0.0001	1.01	0.0000	0.00
56	0.0000	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.00
57	0.0000	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.00
58	0.0000	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.00
59	0.0000	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.00
60	0.0000	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.00
61	0.0000	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.00
62	0.0000	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.00
63	0.0000	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.00
64	0.0000	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.00
65	0.0000	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.00
66	0.0000	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.00
67	0.0000	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.00
68	0.0000	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.00
69	0.0000	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.00
70	0.0000	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.00
71	0.0000	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.00
72	0.0000	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.00
73	0.0000	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.00
74	0.0000	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.00
75	0.0000	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.00
Nt	536 215		79 463		410 323		69 278	
n	6 728		1 553		5 175		833	

Appendix 1 – continued:
Estimates of the proportion at length of trevally from the TRE 7 single trawl fishery in 2007–08.
The proportion at length for each sub-area is also presented (Area codes: NMB, Ninety Mile Beach; KMH-NTB, Kaipara-Manukau & North Taranaki Bight; STB, South Taranaki Bight).

P.i. = proportion of fish in length class. *Nt* = scaled total number of fish caught.
c.v. = coefficient of variation. *n* = total number of fish sampled.

Length	TRE 7		NMB		KMH-NTB		STB	
(cm)	*P.i.*	c.v.	*P.i.*	c.v.	*P.i.*	c.v.	*P.i.*	c.v.
20	0.0001	0.87	0.0000	0.00	0.0001	0.88	0.0000	0.00
21	0.0000	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.00
22	0.0000	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.00
23	0.0000	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.00
24	0.0000	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.00
25	0.0002	0.62	0.0000	0.00	0.0003	0.62	0.0000	0.00
26	0.0005	0.52	0.0000	0.00	0.0006	0.59	0.0000	0.00
27	0.0029	0.36	0.0007	1.46	0.0032	0.43	0.0000	0.00
28	0.0049	0.38	0.0009	0.45	0.0042	0.45	0.0000	0.00
29	0.0060	0.34	0.0033	0.05	0.0040	0.53	0.0000	0.00
30	0.0070	0.21	0.0104	0.45	0.0048	0.29	0.0008	1.03
31	0.0111	0.19	0.0139	0.02	0.0092	0.29	0.0000	0.00
32	0.0248	0.15	0.0279	0.03	0.0229	0.22	0.0017	1.03
33	0.0491	0.13	0.0525	0.03	0.0475	0.19	0.0038	0.50
34	0.0923	0.11	0.0989	0.12	0.0883	0.17	0.0000	0.00
35	0.1270	0.10	0.1748	0.01	0.1118	0.14	0.0000	0.00
36	0.1332	0.09	0.1952	0.15	0.1222	0.12	0.0087	0.34
37	0.1121	0.09	0.1271	0.12	0.1040	0.11	0.0128	0.51
38	0.0826	0.08	0.0766	0.03	0.0815	0.11	0.0421	0.15
39	0.0627	0.09	0.0460	0.09	0.0664	0.12	0.0740	0.24
40	0.0498	0.10	0.0295	0.39	0.0563	0.09	0.1130	0.16
41	0.0426	0.14	0.0267	0.09	0.0458	0.18	0.1783	0.09
42	0.0380	0.18	0.0194	0.09	0.0441	0.20	0.1452	0.24
43	0.0336	0.21	0.0080	0.21	0.0392	0.23	0.1365	0.13
44	0.0320	0.26	0.0145	0.54	0.0393	0.29	0.0979	0.17
45	0.0211	0.27	0.0091	0.55	0.0264	0.29	0.0622	0.35
46	0.0191	0.25	0.0119	0.21	0.0238	0.27	0.0445	0.50
47	0.0130	0.28	0.0086	0.31	0.0157	0.31	0.0364	0.49
48	0.0108	0.25	0.0055	0.26	0.0131	0.29	0.0246	0.19
49	0.0093	0.28	0.0078	0.39	0.0114	0.31	0.0113	0.32
50	0.0045	0.28	0.0031	0.39	0.0046	0.35	0.0017	0.91
51	0.0027	0.29	0.0036	1.00	0.0028	0.39	0.0017	0.91
52	0.0027	0.25	0.0031	0.39	0.0032	0.29	0.0000	0.00
53	0.0015	0.31	0.0026	0.45	0.0015	0.44	0.0011	1.41
54	0.0010	0.23	0.0017	0.45	0.0009	0.21	0.0000	0.00
55	0.0005	0.38	0.0031	0.39	0.0004	0.58	0.0014	0.54
56	0.0003	0.44	0.0022	0.72	0.0000	0.00	0.0000	0.00
57	0.0005	0.39	0.0033	0.05	0.0002	0.87	0.0000	0.00
58	0.0002	0.66	0.0031	0.39	0.0000	0.00	0.0000	0.00
59	0.0001	0.70	0.0007	1.46	0.0001	0.94	0.0000	0.00
60	0.0000	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.00
61	0.0000	0.94	0.0007	1.46	0.0000	0.00	0.0000	0.00
62	0.0001	0.94	0.0014	1.46	0.0000	0.00	0.0000	0.00
63	0.0000	0.91	0.0009	0.45	0.0000	0.00	0.0000	0.00
64	0.0000	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.00
65	0.0001	0.67	0.0007	1.46	0.0001	0.96	0.0000	0.00
66	0.0000	0.94	0.0007	1.46	0.0000	0.00	0.0000	0.00
67	0.0000	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.00
68	0.0000	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.00
69	0.0000	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.00
70	0.0000	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.00
71	0.0000	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.00
72	0.0000	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.00
73	0.0000	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.00
74	0.0000	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.00
75	0.0000	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.00
Nt	1 160 688		143 746		910 839		59 342	
n	14 658		1223		8 922		1 086	

Appendix 2: Estimates of proportion at age of trevally from the TRE 1 single trawl and purse-seine fisheries in 2007–08. The proportion at age for each sub-area is also presented (Area codes: ENLD, East Northland; BPLE, Bay of Plenty).

P.j. = proportion of fish in age class; c.v. = coefficient of variation; *n* = number of fish aged.

					Single trawl		Purse-seine	
Age	TRE 1		ENLD		BPLE		BPLE	
(years)	*P.j.*	c.v.	*P.j.*	c.v.	*P.j.*	c.v.	*P.j.*	c.v.
1	0.0014	0.72	0.0005	1.09	0.0000	0.00	0.0000	0.00
2	0.0496	0.17	0.0264	0.28	0.0167	0.14	0.0000	0.00
3	0.0804	0.12	0.0213	0.51	0.0911	0.11	0.0000	0.00
4	0.1172	0.13	0.0369	0.41	0.1734	0.15	0.0003	0.96
5	0.1223	0.14	0.1933	0.18	0.0666	0.25	0.0040	0.84
6	0.1203	0.15	0.1519	0.22	0.1168	0.22	0.0136	0.55
7	0.1154	0.16	0.1349	0.24	0.1203	0.21	0.0200	0.42
8	0.0438	0.27	0.0412	0.46	0.0534	0.34	0.0167	0.64
9	0.1083	0.15	0.0702	0.33	0.1511	0.18	0.1123	0.23
10	0.1074	0.15	0.1541	0.20	0.0815	0.24	0.0559	0.33
11	0.0291	0.32	0.0442	0.46	0.0223	0.46	0.0364	0.46
12	0.0084	0.53	0.0109	0.62	0.0082	0.81	0.0109	0.92
13	0.0208	0.33	0.0118	0.53	0.0290	0.41	0.0946	0.28
14	0.0169	0.39	0.0207	0.60	0.0161	0.55	0.0483	0.40
15	0.0169	0.37	0.0225	0.56	0.0169	0.52	0.0602	0.34
16	0.0058	0.64	0.0131	0.66	0.0009	0.50	0.0292	0.50
17	0.0004	0.66	0.0000	0.00	0.0006	0.68	0.0181	0.71
18	0.0060	0.41	0.0023	0.62	0.0090	0.47	0.0983	0.28
19	0.0040	0.58	0.0008	1.08	0.0064	0.63	0.0508	0.39
>19	0.0255	0.17	0.0432	0.22	0.0198	0.23	0.3303	0.10
n	572		203		369		369	

Appendix 2 – continued:
Estimates of proportion at age of trevally from the TRE 7 single trawl fishery in 2007–08.
The proportion at age for each sub-area is also presented (Area codes: NMB, Ninety Mile Beach; KMH-NTB, Kaipara-Manukau & North Taranaki Bight; STB, South Taranaki Bight).

P.j. = proportion of fish in age class; c.v. = coefficient of variation; *n* = number of fish aged.

Age	TRE 7		NMB		KMH-NTB		STB	
(years)	*P.j.*	c.v.	*P.j.*	c.v.	*P.j.*	c.v.	*P.j.*	c.v.
1	0.0000	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.00
2	0.0199	0.11	0.0157	0.34	0.0128	0.17	0.0017	0.81
3	0.0527	0.16	0.0998	0.22	0.0240	0.27	0.0000	0.00
4	0.0923	0.16	0.1457	0.23	0.0550	0.26	0.0119	0.53
5	0.2320	0.09	0.2863	0.14	0.2188	0.13	0.0665	0.46
6	0.1555	0.11	0.1081	0.28	0.1385	0.17	0.1762	0.22
7	0.1183	0.13	0.1203	0.24	0.1295	0.17	0.1066	0.29
8	0.0662	0.16	0.0291	0.44	0.0868	0.22	0.1906	0.21
9	0.0653	0.15	0.0138	0.58	0.0915	0.20	0.2344	0.18
10	0.0471	0.19	0.0373	0.36	0.0712	0.22	0.0090	0.85
11	0.0127	0.31	0.0168	0.49	0.0000	0.00	0.0000	0.00
12	0.0338	0.19	0.0160	0.57	0.0624	0.22	0.0269	0.60
13	0.0234	0.24	0.0176	0.42	0.0349	0.33	0.0310	0.56
14	0.0098	0.27	0.0094	0.67	0.0116	0.39	0.0000	0.00
15	0.0108	0.39	0.0174	0.59	0.0067	0.59	0.0000	0.00
16	0.0041	0.45	0.0050	0.80	0.0009	1.00	0.0000	0.00
17	0.0039	0.40	0.0048	0.66	0.0022	0.83	0.0159	0.98
18	0.0036	0.38	0.0052	0.83	0.0028	0.56	0.0147	0.71
19	0.0054	0.30	0.0018	1.11	0.0074	0.45	0.0204	0.78
>19	0.0431	0.09	0.0410	0.20	0.0426	0.14	0.0941	0.23
n	848		186		391		133	

Appendix 3: Estimates of mean weight-at-age (kg) of trevally from the TRE 1 single trawl and purse-seine fisheries in 2007–08. The mean weight-at-age for each sub-area is also presented (Area codes: ENLD, East Northland; BPLE, Bay of Plenty).

					Single trawl		Purse-seine	
Age	TRE 1		ENLD		BPLE		BPLE	
(years)	Mean	c.v.	Mean	c.v.	Mean	c.v.	Mean	c.v.
1	0.46	0.04	0.45	0.05	–	–	–	–
2	0.61	0.04	0.74	0.04	0.42	0.02	–	–
3	0.64	0.03	0.84	0.06	0.61	0.02	–	–
4	0.83	0.02	0.87	0.03	0.84	0.02	1.02	–
5	0.92	0.02	0.98	0.02	0.84	0.05	1.26	0.03
6	1.05	0.02	1.07	0.02	1.01	0.03	1.30	0.04
7	1.06	0.02	1.04	0.02	1.07	0.03	1.28	0.03
8	1.12	0.03	1.14	0.05	1.10	0.04	1.39	0.05
9	1.18	0.02	1.18	0.04	1.17	0.02	1.47	0.03
10	1.20	0.02	1.20	0.03	1.20	0.03	1.41	0.03
11	1.20	0.04	1.14	0.04	1.27	0.07	1.45	0.02
12	1.33	0.05	1.42	0.05	1.27	0.06	1.48	0.02
13	1.34	0.06	1.52	0.04	1.27	0.06	1.67	0.03
14	1.26	0.04	1.24	0.07	1.25	0.05	1.73	0.03
15	1.30	0.07	1.28	0.11	1.30	0.10	1.71	0.05
16	1.39	0.09	1.35	0.08	1.96	0.06	1.91	0.05
17	1.92	0.07	–	–	1.90	0.06	1.86	0.05
18	1.61	0.05	2.13	0.03	1.56	0.04	1.73	0.03
19	1.56	0.06	2.27	–	1.51	0.05	1.74	0.05
>19	1.74	0.03	1.71	0.04	1.81	0.05	1.97	0.02

Appendix 3 – continued:
Estimates of mean weight-at-age (kg) of trevally from the TRE 7 single trawl fishery in 2007–08.
The mean weight-at-age for each sub-area is also presented (Area codes: NMB, Ninety Mile Beach; KMH-NTB, Kaipara-Manukau & North Taranaki Bight; STB, South Taranaki Bight).

Age	TRE 7		NMB		KMH-NTB		STB	
(years)	Mean	c.v.	Mean	c.v.	Mean	c.v.	Mean	c.v.
1	–	–	–	–	–	–	–	–
2	0.50	0.02	0.55	0.04	0.47	0.05	0.60	0.08
3	0.69	0.02	0.73	0.03	0.64	0.05	–	–
4	0.88	0.02	0.89	0.02	0.82	0.04	0.99	0.12
5	0.92	0.01	0.90	0.01	0.92	0.02	1.17	0.05
6	1.01	0.02	0.99	0.04	0.98	0.03	1.32	0.03
7	1.11	0.02	1.01	0.03	1.16	0.04	1.36	0.02
8	1.24	0.03	1.20	0.02	1.15	0.04	1.51	0.02
9	1.36	0.04	1.38	0.13	1.31	0.05	1.57	0.02
10	1.38	0.05	1.35	0.06	1.38	0.06	2.07	0.04
11	1.51	0.06	1.30	0.07	–	–	–	–
12	1.56	0.06	1.52	0.05	1.51	0.06	1.91	0.05
13	1.56	0.07	1.94	0.13	1.52	0.10	1.69	0.02
14	1.83	0.05	1.61	0.05	2.01	0.06	–	–
15	1.45	0.10	1.33	0.15	1.46	0.11	–	–
16	1.75	0.10	1.44	0.11	2.27	–	–	–
17	1.93	0.06	1.99	–	2.00	0.08	1.89	0.02
18	2.18	0.04	2.28	0.07	2.37	0.02	2.06	0.02
19	2.21	0.04	2.73	–	2.11	0.04	1.99	0.06
>19	2.30	0.02	2.79	0.07	2.33	0.02	2.14	0.03

Appendix 4: Estimates of mean length-at-age (cm) of trevally from the TRE 1 single trawl and purse-seine fisheries in 2007–08. The mean length-at-age for each sub-area is also presented (Area codes: ENLD, East Northland; BPLE, Bay of Plenty).

					Single trawl		Purse-seine	
Age	TRE 1		ENLD		BPLE		BPLE	
(years)	Mean	c.v.	Mean	c.v.	Mean	c.v.	Mean	c.v.
1	28.6	0.012	28.3	0.017	–	–	–	–
2	31.0	0.013	33.2	0.013	27.7	0.005	–	–
3	31.7	0.008	34.6	0.019	31.2	0.007	–	–
4	34.4	0.007	35.1	0.011	34.6	0.007	37.0	–
5	35.6	0.008	36.4	0.007	34.6	0.015	39.6	0.011
6	37.2	0.006	37.5	0.007	36.8	0.010	40.0	0.013
7	37.3	0.007	37.2	0.008	37.5	0.009	39.8	0.010
8	38.0	0.010	38.2	0.017	37.9	0.012	40.9	0.018
9	38.7	0.007	38.7	0.013	38.6	0.008	41.6	0.009
10	38.9	0.006	38.9	0.010	38.9	0.008	41.1	0.009
11	39.0	0.013	38.3	0.012	39.6	0.025	41.4	0.007
12	40.3	0.016	41.2	0.018	39.6	0.018	41.8	0.008
13	40.2	0.019	42.1	0.013	39.6	0.021	43.3	0.008
14	39.6	0.013	39.4	0.021	39.5	0.017	43.9	0.011
15	39.8	0.025	39.7	0.038	39.8	0.034	43.6	0.015
16	40.8	0.028	40.4	0.025	45.7	0.019	45.3	0.015
17	45.4	0.021	–	–	45.3	0.020	44.9	0.016
18	42.8	0.016	47.0	0.010	42.4	0.014	43.9	0.009
19	42.4	0.018	48.0	–	42.0	0.015	44.0	0.015
>19	43.8	0.011	43.6	0.013	44.4	0.016	45.7	0.005

Appendix 4 – continued:
Estimates of mean length-at-age (cm) of trevally from the TRE 7 single trawl fishery in 2007–08.
The mean length-at-age for each sub-area is also presented (Area codes: NMB, Ninety Mile Beach; KMH-NTB, Kaipara-Manukau & North Taranaki Bight; STB, South Taranaki Bight).

Age	TRE 7		NMB		KMH-NTB		STB	
(years)	Mean	c.v.	Mean	c.v.	Mean	c.v.	Mean	c.v.
1	–	–	–	–	–	–	–	–
2	29.2	0.008	30.2	0.014	28.5	0.016	31.0	0.026
3	32.5	0.008	33.1	0.010	31.7	0.016	–	–
4	35.1	0.007	35.3	0.008	34.3	0.013	36.3	0.040
5	35.7	0.004	35.5	0.005	35.7	0.006	38.6	0.015
6	36.7	0.006	36.6	0.012	36.3	0.010	40.2	0.009
7	37.8	0.008	36.8	0.009	38.3	0.012	40.6	0.007
8	39.3	0.010	39.0	0.007	38.3	0.012	42.0	0.008
9	40.5	0.013	40.6	0.040	40.0	0.016	42.5	0.007
10	40.4	0.019	40.5	0.020	40.5	0.021	46.5	0.014
11	41.8	0.021	39.9	0.022	–	–	–	–
12	42.2	0.020	42.1	0.015	41.7	0.022	45.4	0.017
13	42.1	0.027	45.2	0.041	41.7	0.036	43.5	0.008
14	44.5	0.016	42.9	0.015	46.0	0.018	–	–
15	41.0	0.033	39.7	0.042	41.4	0.033	–	–
16	43.8	0.032	41.3	0.034	48.0	–	–	–
17	45.4	0.018	46.0	–	46.0	0.024	45.2	0.007
18	47.3	0.013	48.0	0.023	48.7	0.006	46.5	0.008
19	47.5	0.012	51.0	–	46.8	0.013	45.9	0.018
>19	48.0	0.006	50.6	0.022	48.3	0.008	47.1	0.008

Appendix 5: Age-length key derived from otolith samples collected from trevally fisheries in TRE 1 in 2007–08.

Estimates of proportion of age at length for trevally sampled from all TRE 1 sub-areas combined, 2007–08.
(Note: Aged to 01/01/2008)

Length	Age (years)																				No.
(cm)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	>19	Aged
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	1.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
26	0	1.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6
27	0	1.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4
28	0.09	0.82	0.09	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	11
29	0.08	0.33	0.58	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	12
30	0	0.21	0.79	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	14
31	0	0.23	0.69	0.08	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	13
32	0	0.16	0.32	0.42	0.11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	19
33	0	0.09	0.31	0.38	0.16	0.03	0.03	0	0	0	0	0	0	0	0	0	0	0	0	0	32
34	0	0.14	0.10	0.31	0.38	0.07	0	0	0	0	0	0	0	0	0	0	0	0	0	0	29
35	0	0.03	0	0.19	0.34	0.16	0.19	0	0.06	0.03	0	0	0	0	0	0	0	0	0	0	32
36	0	0	0.03	0.26	0.10	0.13	0.19	0.10	0.10	0.10	0	0	0	0	0	0	0	0	0	0	31
37	0	0	0	0.09	0.16	0.28	0.19	0.03	0.06	0.03	0.06	0	0.03	0	0.06	0	0	0	0	0	32
38	0	0	0	0	0.11	0.14	0.14	0.11	0.19	0.17	0.06	0	0.03	0.06	0	0	0	0	0	0	36
39	0	0	0	0	0.03	0.23	0.17	0.06	0.20	0.23	0.03	0.03	0	0	0	0.03	0	0	0	0	35
40	0	0	0	0	0.06	0.03	0.14	0.06	0.20	0.31	0.03	0.03	0.03	0.09	0	0	0	0	0	0.03	35
41	0	0	0	0	0	0.04	0.04	0.04	0.27	0.19	0.12	0	0.08	0.04	0.04	0	0	0.04	0.04	0.08	26
42	0	0	0	0	0	0	0	0.04	0.12	0.19	0.08	0.08	0.12	0	0.15	0.04	0	0.04	0.04	0.12	26
43	0	0	0	0	0	0	0	0	0.08	0.04	0	0.04	0.20	0	0.16	0.04	0	0.08	0	0.36	25
44	0	0	0	0	0	0	0	0.04	0.08	0	0	0	0.08	0.12	0	0.04	0.04	0.20	0.04	0.36	25
45	0	0	0	0	0	0	0	0	0.05	0.05	0	0	0.05	0.10	0.05	0.10	0	0	0.10	0.50	20
46	0	0	0	0	0	0	0	0	0	0	0.04	0	0.04	0.04	0	0	0.04	0.04	0.04	0.74	23
47	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.09	0	0	0.09	0.05	0.77	22
48	0	0	0	0	0	0	0	0	0	0	0	0	0.06	0	0	0.06	0	0.11	0.06	0.72	18
49	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.08	0.08	0	0.08	0	0.75	12
50	0	0	0	0	0	0	0	0	0	0	0	0	0.07	0	0.07	0.07	0.07	0	0	0.73	15
51	0	0	0	0	0	0	0	0	0	0	0	0	0.13	0	0	0	0	0.13	0	0.75	8
52	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.25	0.75	4
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	2
55	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00	3
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
66	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
67	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
68	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
69	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
70	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
71	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
72	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
73	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
74	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
75	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total																					572

Appendix 5 – continued:
Estimates of proportion of age at length for trevally sampled from the East Northland sub-area of TRE 1, 2007–08.
(Note: Aged to 01/01/2008)

Length	Age (years)																				No.
(cm)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	>19	Aged
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	0.50	0.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
29	0.50	0.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
30	0	1.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
31	0	1.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
32	0	1.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
33	0	0.21	0.43	0.29	0.07	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	14
34	0	0.27	0.13	0.20	0.40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15
35	0	0.06	0	0.06	0.53	0.12	0.18	0	0	0.06	0	0	0	0	0	0	0	0	0	0	17
36	0	0	0.07	0.13	0.20	0.13	0.20	0.07	0.07	0.13	0	0	0	0	0	0	0	0	0	0	15
37	0	0	0	0	0.31	0.25	0.25	0	0	0.06	0.06	0	0	0	0.06	0	0	0	0	0	16
38	0	0	0	0	0.17	0.17	0.11	0.11	0.17	0.11	0.11	0	0	0.06	0	0	0	0	0	0	18
39	0	0	0	0	0.06	0.38	0.06	0	0.06	0.31	0.06	0	0	0	0	0.06	0	0	0	0	16
40	0	0	0	0	0.06	0	0.19	0.06	0.13	0.38	0	0.06	0	0.06	0	0	0	0	0	0.06	16
41	0	0	0	0	0	0	0	0.09	0.18	0.36	0.09	0	0.09	0.09	0	0	0	0	0	0.09	11
42	0	0	0	0	0	0	0	0	0	0.27	0	0.09	0.18	0	0.18	0.09	0	0	0	0.18	11
43	0	0	0	0	0	0	0	0	0.13	0	0	0.13	0	0	0.25	0.13	0	0	0	0.38	8
44	0	0	0	0	0	0	0	0.11	0.11	0	0	0	0	0.11	0	0	0	0	0	0.67	9
45	0	0	0	0	0	0	0	0	0	0.25	0	0	0	0	0	0	0	0	0	0.75	4
46	0	0	0	0	0	0	0	0	0	0	0.17	0	0	0	0	0	0	0.17	0	0.67	6
47	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.20	0	0.80	5
48	0	0	0	0	0	0	0	0	0	0	0	0	0.20	0	0	0	0	0.20	0.20	0.40	5
49	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00	2
50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00	2
51	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
52	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
53	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
54	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
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
66	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
67	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
68	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
69	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
70	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
71	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
72	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
73	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
74	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
75	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total																					203

Appendix 5 – continued:
Estimates of proportion of age at length for trevally sampled from the Bay of Plenty sub-area of TRE 1, 2007–08.
(Note: Aged to 01/01/2008)

Length	Age (years)																				No.
(cm)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	>19	Aged
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	1.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
26	0	1.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6
27	0	1.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4
28	0	0.89	0.11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9
29	0	0.30	0.70	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10
30	0	0	1.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	11
31	0	0	0.90	0.10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10
32	0	0	0.38	0.50	0.13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	16
33	0	0	0.22	0.44	0.22	0.06	0.06	0	0	0	0	0	0	0	0	0	0	0	0	0	18
34	0	0	0.07	0.43	0.36	0.14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	14
35	0	0	0	0.33	0.13	0.20	0.20	0	0.13	0	0	0	0	0	0	0	0	0	0	0	15
36	0	0	0	0.38	0	0.13	0.19	0.13	0.13	0.06	0	0	0	0	0	0	0	0	0	0	16
37	0	0	0	0.19	0	0.31	0.13	0.06	0.13	0	0.06	0	0.06	0	0.06	0	0	0	0	0	16
38	0	0	0	0	0.06	0.11	0.17	0.11	0.22	0.22	0	0	0.06	0.06	0	0	0	0	0	0	18
39	0	0	0	0	0	0.11	0.26	0.11	0.32	0.16	0	0.05	0	0	0	0	0	0	0	0	19
40	0	0	0	0	0.05	0.05	0.11	0.05	0.26	0.26	0.05	0	0.05	0.11	0	0	0	0	0	0	19
41	0	0	0	0	0	0.07	0.07	0	0.33	0.07	0.13	0	0.07	0	0.07	0	0	0.07	0.07	0.07	15
42	0	0	0	0	0	0	0	0.07	0.20	0.13	0.13	0.07	0.07	0	0.13	0	0	0.07	0.07	0.07	15
43	0	0	0	0	0	0	0	0	0.06	0.06	0	0	0.29	0	0.12	0	0	0.12	0	0.35	17
44	0	0	0	0	0	0	0	0	0.06	0	0	0	0.13	0.13	0	0.06	0.06	0.31	0.06	0.19	16
45	0	0	0	0	0	0	0	0	0.06	0	0	0	0.06	0.13	0.06	0.13	0	0	0.13	0.44	16
46	0	0	0	0	0	0	0	0	0	0	0	0	0.06	0.06	0	0	0.06	0	0.06	0.76	17
47	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.12	0	0	0.06	0.06	0.76	17
48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.08	0	0.08	0	0.85	13
49	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.10	0.10	0	0.10	0	0.70	10
50	0	0	0	0	0	0	0	0	0	0	0	0	0.08	0	0.08	0.08	0.08	0	0	0.69	13
51	0	0	0	0	0	0	0	0	0	0	0	0	0.13	0	0	0	0	0.13	0	0.75	8
52	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.25	0.75	4
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	2
55	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00	3
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
66	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
67	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
68	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
69	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
70	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
71	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
72	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
73	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
74	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
75	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total																					369

Appendix 6: Age-length key derived from otolith samples collected from trevally fisheries in TRE 7 in 2007–08.

Estimates of proportion of age at length for trevally sampled from all TRE 7 sub-areas combined, 2007–08.
(Note: Aged to 01/01/2008)

Length	Age (years)																				No.
(cm)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	>19	Aged
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	1.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
26	0	1.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8
27	0	1.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	12
28	0	0.86	0.14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	14
29	0	0.65	0.35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	23
30	0	0.42	0.50	0.08	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	24
31	0	0.21	0.56	0.12	0.12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	34
32	0	0.12	0.42	0.24	0.12	0.09	0	0	0	0	0	0	0	0	0	0	0	0	0	0	33
33	0	0	0.25	0.19	0.36	0.06	0.14	0	0	0	0	0	0	0	0	0	0	0	0	0	36
34	0	0	0.15	0.18	0.38	0.26	0.03	0	0	0	0	0	0	0	0	0	0	0	0	0	34
35	0	0	0.03	0.21	0.36	0.21	0.09	0	0.03	0.06	0	0	0	0	0	0	0	0	0	0	33
36	0	0	0	0.08	0.44	0.21	0.10	0.08	0.05	0	0	0.03	0.03	0	0	0	0	0	0	0	39
37	0	0	0	0.09	0.31	0.18	0.22	0.07	0.02	0.04	0	0.02	0.02	0	0.02	0	0	0	0	0	45
38	0	0	0	0.09	0.29	0.11	0.20	0.14	0.06	0.06	0.03	0	0	0	0.03	0	0	0	0	0	35
39	0	0	0	0.07	0.12	0.30	0.23	0.12	0.02	0.05	0	0.09	0	0	0	0	0	0	0	0	43
40	0	0	0	0	0.05	0.21	0.16	0.16	0.21	0.05	0.05	0	0.03	0	0.05	0.03	0	0	0	0	38
41	0	0	0	0	0.05	0.21	0.26	0.07	0.14	0.10	0.02	0.02	0.05	0.05	0	0	0	0	0	0.02	42
42	0	0	0	0	0	0.06	0.09	0.30	0.34	0.11	0	0.04	0.02	0.02	0	0	0.02	0	0	0	47
43	0	0	0	0	0	0.04	0.07	0.16	0.22	0.18	0.09	0.07	0.07	0.04	0	0.02	0	0	0	0.04	45
44	0	0	0	0	0	0	0.03	0.06	0.15	0.09	0.06	0.27	0.18	0.03	0.03	0	0	0	0	0.09	33
45	0	0	0	0	0	0	0.10	0	0.16	0.16	0.06	0.10	0.03	0.03	0	0.06	0.06	0.03	0.06	0.13	31
46	0	0	0	0	0	0	0	0	0.04	0.11	0.00	0.11	0.11	0.07	0.04	0	0.07	0.04	0.04	0.39	28
47	0	0	0	0	0	0	0	0	0	0.09	0.00	0.23	0.14	0.09	0.05	0	0	0.05	0.05	0.32	22
48	0	0	0	0	0	0	0	0	0	0	0	0.09	0	0.05	0.05	0.05	0	0.05	0.05	0.68	22
49	0	0	0	0	0	0	0	0	0	0.04	0.04	0.04	0	0.04	0	0	0	0.12	0.20	0.52	25
50	0	0	0	0	0	0	0	0	0	0	0	0	0.10	0	0.10	0	0.05	0	0.05	0.70	20
51	0	0	0	0	0	0	0	0	0	0	0	0	0.06	0	0	0.06	0	0	0.06	0.81	16
52	0	0	0	0	0	0	0	0	0	0	0	0	0	0.08	0	0	0	0	0	0.92	12
53	0	0	0	0	0	0	0	0	0	0.08	0	0	0.08	0.08	0	0	0.08	0	0	0.69	13
54	0	0	0	0	0	0	0	0	0	0.10	0	0	0	0	0	0	0	0	0	0.90	10
55	0	0	0	0	0	0	0	0	0	0	0	0.13	0	0	0	0.13	0	0.13	0	0.63	8
56	0	0	0	0	0	0	0	0	0	0	0	0	0	0.17	0	0	0.17	0	0.17	0.50	6
57	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.25	0	0	0	0	0.75	4
58	0	0	0	0	0	0	0	0	0	0	0	0	0.33	0	0	0	0	0	0	0.67	3
59	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00	1
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	1.00	1
62	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00	1
63	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00	1
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	1.00	2
66	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00	1
67	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
68	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
69	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
70	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
71	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
72	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
73	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
74	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
75	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total																					848

Appendix 6 – continued:
Estimates of proportion of age at length for trevally sampled from the Ninety Mile Beach sub-area of TRE 7, 2007–08.
(Note: Aged to 01/01/2008)

Length	Age (years)																				No.
(cm)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	>19	Aged
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	1.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
28	0	0.50	0.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
29	0	0.86	0.14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7
30	0	0.50	0.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4
31	0	0.25	0.58	0.17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	12
32	0	0.11	0.56	0.22	0.11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9
33	0	0	0.50	0.08	0.25	0.08	0.08	0	0	0	0	0	0	0	0	0	0	0	0	0	12
34	0	0	0.31	0.15	0.38	0.08	0.08	0	0	0	0	0	0	0	0	0	0	0	0	0	13
35	0	0	0.08	0.38	0.46	0.08	0	0	0	0	0	0	0	0	0	0	0	0	0	0	13
36	0	0	0	0.11	0.56	0.17	0.17	0	0	0	0	0	0	0	0	0	0	0	0	0	18
37	0	0	0	0.13	0.19	0.19	0.38	0	0	0.06	0	0	0	0	0.06	0	0	0	0	0	16
38	0	0	0	0.17	0.25	0.08	0.17	0.08	0.08	0	0.08	0	0	0	0.08	0	0	0	0	0	12
39	0	0	0	0	0	0.33	0.33	0.33	0	0	0	0	0	0	0	0	0	0	0	0	6
40	0	0	0	0	0	0.13	0	0.25	0.13	0.13	0.25	0	0	0	0	0.13	0	0	0	0	8
41	0	0	0	0	0	0	0	0	0	0.50	0	0.25	0.25	0	0	0	0	0	0	0	4
42	0	0	0	0	0	0	0	0	0	0.50	0	0.25	0	0.25	0	0	0	0	0	0	4
43	0	0	0	0	0	0.11	0	0	0	0.33	0.22	0.11	0	0.11	0	0	0	0	0	0.11	9
44	0	0	0	0	0	0	0	0	0	0	0	0.25	0	0.25	0	0	0	0	0	0.50	4
45	0	0	0	0	0	0	0	0	0.14	0	0.14	0	0.14	0	0	0.14	0	0.14	0	0.29	7
46	0	0	0	0	0	0	0	0	0.20	0	0	0	0	0	0	0	0.40	0	0	0.40	5
47	0	0	0	0	0	0	0	0	0	0	0	0	1.00	0	0	0	0	0	0	0	1
48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00	3
49	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.50	2
50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00	0	0	0	0	0	1
51	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.50	0.50	2
52	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
53	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
54	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
55	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00	1
56	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00	1
57	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00	2
58	0	0	0	0	0	0	0	0	0	0	0	0	0.33	0	0	0	0	0	0	0.67	3
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	1.00	1
63	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00	1
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	1.00	1
66	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00	1
67	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
68	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
69	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
70	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
71	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
72	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
73	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
74	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
75	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total																					186

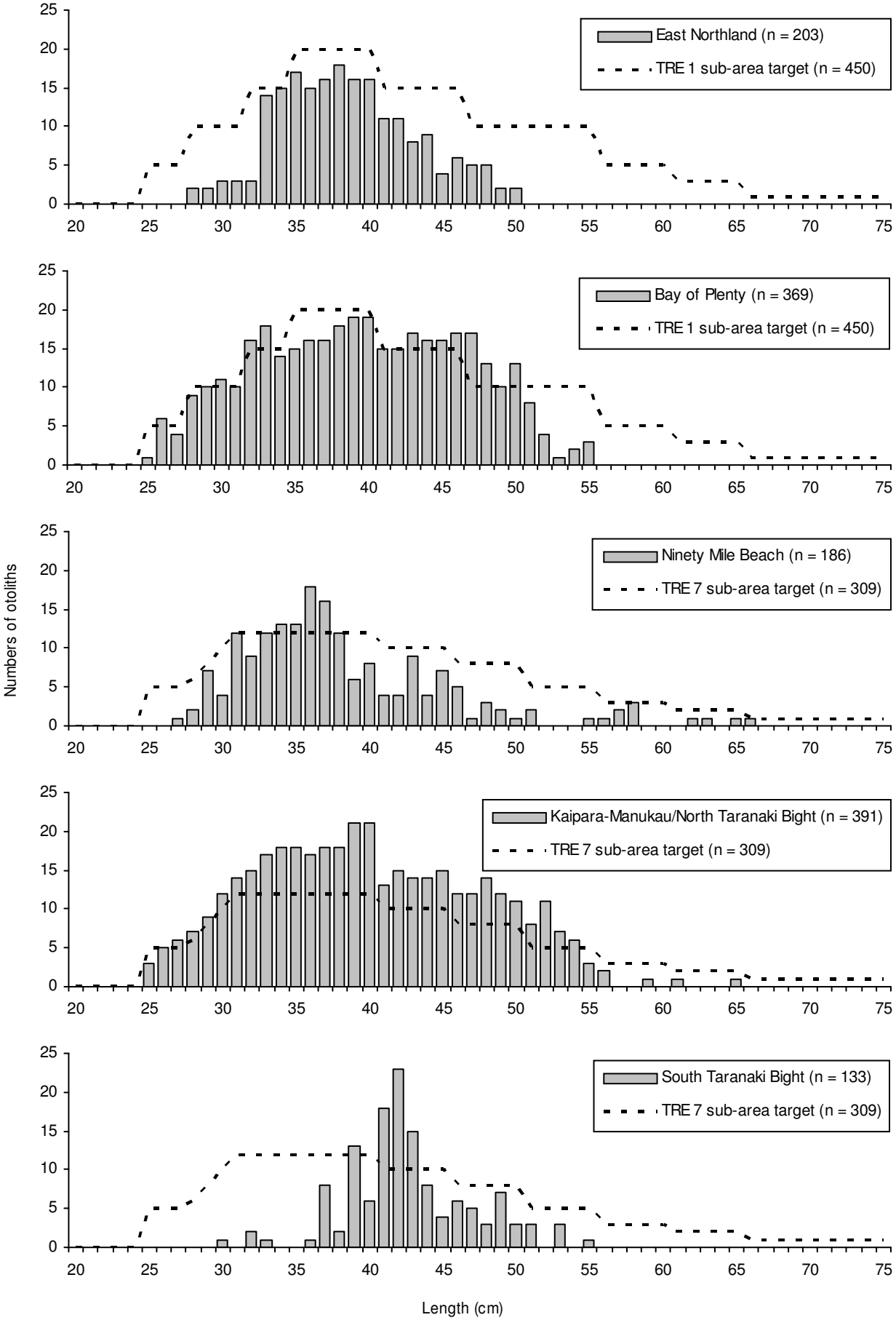
Appendix 6 – continued:
Estimates of proportion of age at length for trevally sampled from the combined Kaipara-Manukau and North Taranaki Bight sub-areas of TRE 7, 2007–08 (Note: Aged to 01/01/2008).

Length	Age (years)																				No.
(cm)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	>19	Aged
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	1.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
26	0	1.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5
27	0	1.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6
28	0	0.86	0.14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7
29	0	0.44	0.56	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9
30	0	0.25	0.58	0.17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	12
31	0	0.07	0.50	0.14	0.29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	14
32	0	0.07	0.27	0.27	0.20	0.20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15
33	0	0	0.06	0.18	0.47	0.06	0.24	0	0	0	0	0	0	0	0	0	0	0	0	0	17
34	0	0	0.06	0.22	0.39	0.33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	18
35	0	0	0	0.11	0.33	0.28	0.11	0	0.06	0.11	0	0	0	0	0	0	0	0	0	0	18
36	0	0	0	0	0.35	0.18	0.06	0.18	0.12	0	0	0.06	0.06	0	0	0	0	0	0	0	17
37	0	0	0	0	0.28	0.11	0.22	0.17	0.06	0.06	0	0.06	0.06	0	0	0	0	0	0	0	18
38	0	0	0	0	0.33	0.06	0.22	0.22	0.06	0.11	0	0	0	0	0	0	0	0	0	0	18
39	0	0	0	0.10	0.24	0.10	0.14	0.10	0.05	0.10	0	0.19	0	0	0	0	0	0	0	0	21
40	0	0	0	0	0.05	0.29	0.19	0.10	0.24	0.05	0	0	0	0	0.10	0	0	0	0	0	21
41	0	0	0	0	0	0.23	0.46	0.08	0.15	0.08	0	0	0	0	0	0	0	0	0	0	13
42	0	0	0	0	0	0	0.20	0.27	0.40	0.07	0	0.07	0	0	0	0	0	0	0	0	15
43	0	0	0	0	0	0	0.07	0.07	0.29	0.29	0	0.14	0.07	0.07	0	0	0	0	0	0	14
44	0	0	0	0	0	0	0.07	0.00	0.07	0.07	0	0.43	0.29	0	0	0	0	0	0	0.07	14
45	0	0	0	0	0	0	0.07	0.00	0.20	0.33	0	0.13	0	0.07	0	0	0.07	0	0.07	0.07	15
46	0	0	0	0	0	0	0	0	0	0.17	0	0.08	0.25	0.08	0	0	0	0	0.08	0.33	12
47	0	0	0	0	0	0	0	0	0	0.08	0	0.25	0.08	0.17	0.08	0	0	0	0.08	0.25	12
48	0	0	0	0	0	0	0	0	0	0	0	0.14	0	0.07	0	0.07	0	0.07	0.07	0.57	14
49	0	0	0	0	0	0	0	0	0	0	0	0	0	0.08	0	0	0	0.17	0.08	0.67	12
50	0	0	0	0	0	0	0	0	0	0	0	0	0.09	0	0	0	0.09	0	0.09	0.73	11
51	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00	8
52	0	0	0	0	0	0	0	0	0	0	0	0	0	0.09	0	0	0	0	0	0.91	11
53	0	0	0	0	0	0	0	0	0	0.14	0	0	0.14	0.14	0	0	0	0	0	0.57	7
54	0	0	0	0	0	0	0	0	0	0.17	0	0	0	0	0	0	0	0	0	0.83	6
55	0	0	0	0	0	0	0	0	0	0	0	0.33	0	0	0	0	0	0	0	0.67	3
56	0	0	0	0	0	0	0	0	0	0	0	0	0	0.50	0	0	0	0	0	0.50	2
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	1.00	1
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	1.00	1
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	1.00	1
66	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
67	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
68	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
69	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
70	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
71	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
72	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
73	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
74	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
75	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total																					391

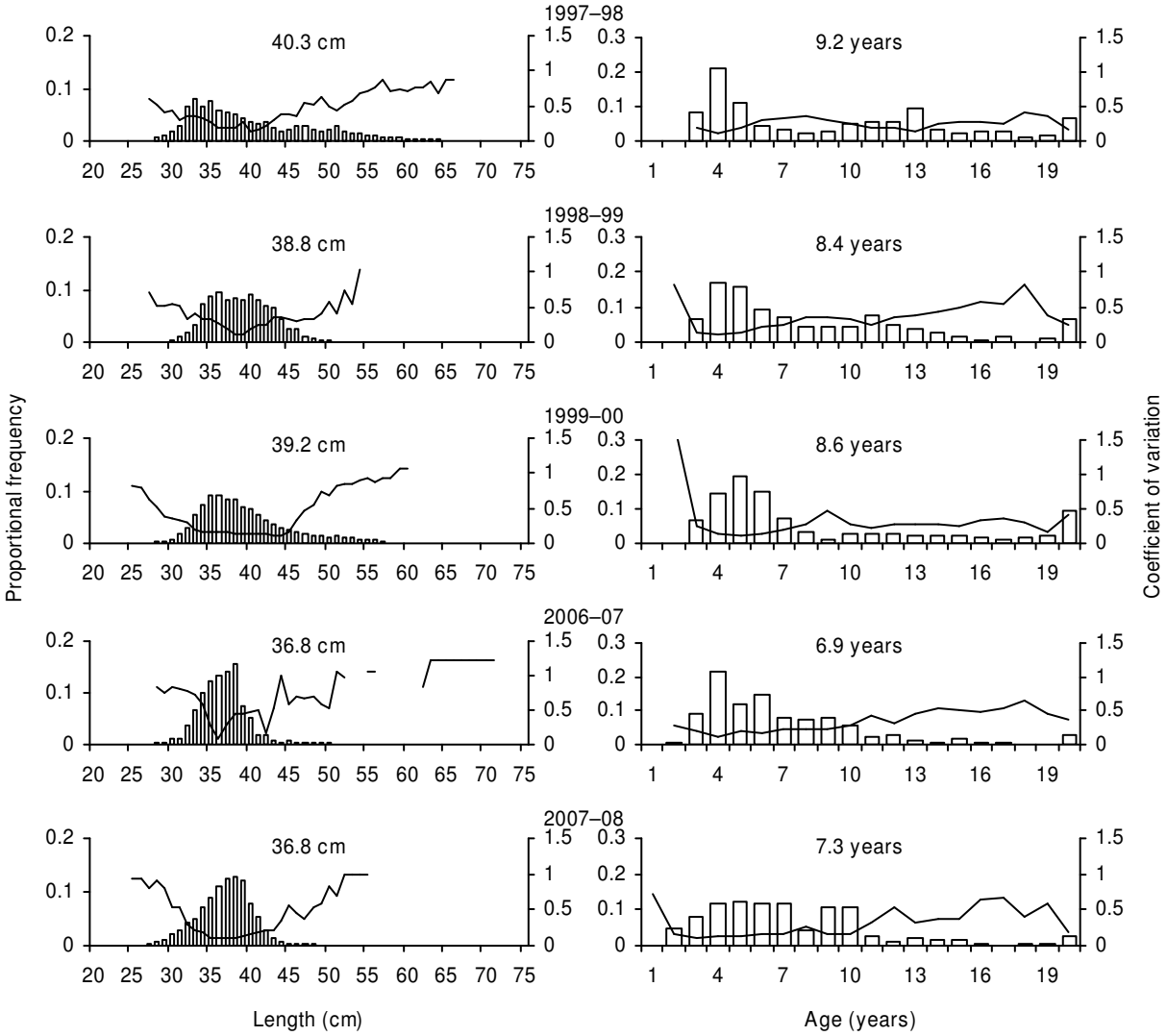
Appendix 6 – continued:
Estimates of proportion of age at length for trevally sampled from the South Taranaki Bight sub-area of TRE 7, 2007–08. (Note: Aged to 01/01/2008)

Length	Age (years)																				No.
(cm)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	>19	Aged
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	1.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
32	0	0.50	0	0.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
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	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
36	0	0	0	0	1.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
37	0	0	0	0.13	0.63	0.25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8
38	0	0	0	0	0.50	0.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
39	0	0	0	0.08	0	0.62	0.31	0	0	0	0	0	0	0	0	0	0	0	0	0	13
40	0	0	0	0	0.17	0.17	0.17	0.33	0.17	0	0	0	0	0	0	0	0	0	0	0	6
41	0	0	0	0	0.06	0.33	0.28	0.11	0.22	0	0	0	0	0	0	0	0	0	0	0	18
42	0	0	0	0	0	0.13	0.04	0.43	0.39	0	0	0	0	0	0	0	0	0	0	0	23
43	0	0	0	0	0	0.07	0.07	0.33	0.40	0	0	0	0	0	0	0	0	0	0	0	15
44	0	0	0	0	0	0	0	0.25	0.50	0	0	0.13	0.13	0	0	0	0	0	0	0	8
45	0	0	0	0	0	0	0	0	0.25	0	0	0	0	0	0	0	0.25	0	0.25	0.25	4
46	0	0	0	0	0	0	0	0	0	0.17	0	0.17	0	0	0	0	0	0.17	0	0.50	6
47	0	0	0	0	0	0	0	0	0	0	0	0.20	0	0	0	0	0	0.20	0	0.60	5
48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00	3
49	0	0	0	0	0	0	0	0	0	0.14	0	0	0	0	0	0	0	0	0.43	0.43	7
50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00	3
51	0	0	0	0	0	0	0	0	0	0	0	0	0.33	0	0	0	0	0	0	0.67	3
52	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
53	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.33	0	0	0.67	3
54	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
55	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00	1
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
66	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
67	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
68	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
69	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
70	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
71	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
72	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
73	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
74	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
75	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total																					133

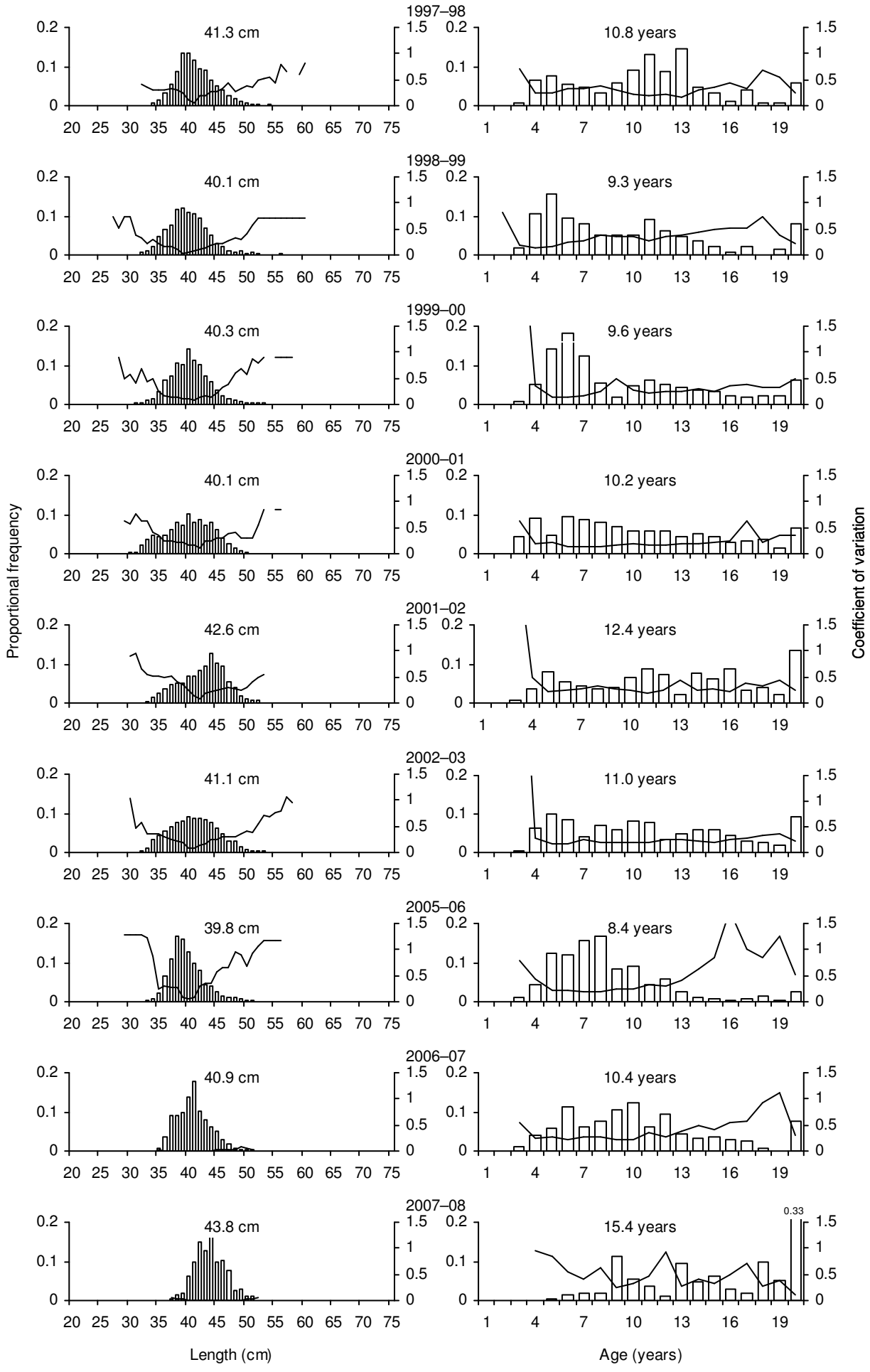
Appendix 7: Length distributions of the target fixed allocation otolith samples (dashed lines) and the achieved otolith collections (histograms) for the sub-area strata of the TRE 1 and TRE 7 stocks in 2007–08.



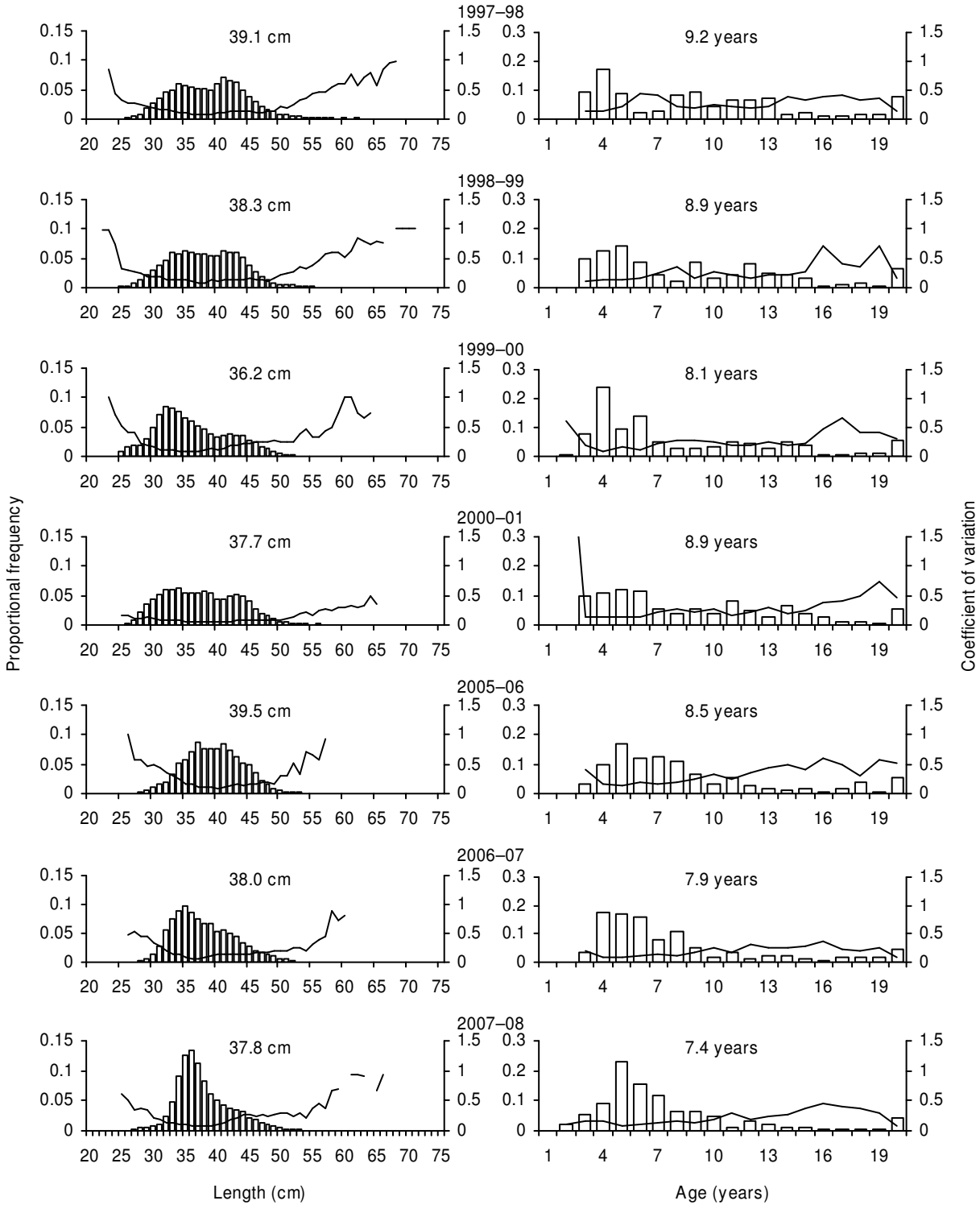
Appendix 8: A discontinuous time series of proportion at length and age distributions and c.v.s for trevally from the TRE 1 single trawl fishery from 1997–98 to 2007–08. Average length and age are also given.



Appendix 8 – continued: A discontinuous time series of proportion at length and age distributions and c.v.s for trevally from the TRE 1 purse seine fishery from 1997–98 to 2007–08. Average length and age are also given.



Appendix 8 – continued: A discontinuous time series of proportion at length and age distributions and c.v.s for trevally from the TRE 7 single trawl fishery from 1997–98 to 2007–08. Average length and age are also given.



Appendix 8 – continued: A discontinuous time series of proportion at length and age distributions and c.v.s for trevally from the TRE 7 pair trawl fishery from 1997–98 to 2000–01. Average length and age are also given.