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EXECUTIVE SUMMARY

Walsh, C.; Davies, N.M.; Buckthought, D.; Rush, N.; Vaughan, M.; Spong, K.; Smith, M. (2008). Age composition of commercial snapper landings in SNA 1, 2006–07.

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This report presents the results of Objective 1 of the Ministry of Fisheries project "Estimation of snapper year class strength in SNA 1" (SNA2006/01). The general objective was to determine by market sampling the age structure of commercial landings from the three snapper stocks that constitute SNA 1 for use in stock assessment models.

The random age frequency sampling approach was employed over four seasons from spring 2006 to winter 2007 to estimate catch-at-age for snapper from the three bottom longline fisheries in SNA 1; Bay of Plenty, Hauraki Gulf, and East Northland. Target sample sizes were achieved for the Hauraki Gulf (46) and East Northland (43) fisheries, with the Bay of Plenty collection falling just short of the targeted 40 landings with 38 being sampled.

Year class strengths inferred from the age distributions sampled from the SNA 1 longline fisheries in 2006–07 were generally consistent with trends observed in previous years. The 1999 year class, which currently makes up about 20–25% of the SNA 1 catch by number, continues to remain the singularly most dominant year class in the fishery, the fourth consecutive year in the Bay of Plenty and East Northland stocks, and the third for the Hauraki Gulf stock. The 1999 year class is one of the strongest year classes seen in the SNA 1 fishery, and will be of considerable importance in sustaining the SNA 1 fishery this decade and probably well into the next. The recent recruitment of the 2000–2002 year classes across all the SNA 1 fisheries in similar average strength has helped to boost the numbers of young fish in the fishery, and these too should continue to be of importance to the fishery over the next few years.

The Bay of Plenty age distribution is largely based on fish less than 10 years of age and continues to have the lowest numbers of old fish in SNA 1, with only 2% of the total annual catch based on fish 14 years and older, a handful of these in the aggregate (over 19 years) age group. Because of the high level of fishing pressure exerted on the Bay of Plenty stock, it is unlikely that any appreciable growth in the right hand limb of the age distribution will occur in this fishery for some years to come. The Hauraki Gulf stock is the broadest of the SNA 1 age distributions and accordingly has the highest estimate of mean age, although numbers in the aggregate age group continue to be low. Catch-at-age estimates for the East Northland stock lie somewhere between the other two stocks and although comprised of relatively high abundances below 12 years of age, still have an appreciable number of fish in the right hand limb of the distribution including the aggregate age group.

The seasonal variability in the age structure of longline landings from SNA 1 was mostly consistent and similar to trends observed in year-round sampling in 2003–04 and 2004–05. The highest proportions of older fish in the catch were found in spring in East Northland, summer in the Bay of Plenty, and in winter in the Hauraki Gulf. The highest proportions of young fish were caught in autumn in the Bay of Plenty and Hauraki Gulf stocks, and during winter in East Northland.

Because collections were made across all four seasons, comparisons with spring-summer estimates collected in previous years should be treated with caution because of the effects of growth and recruitment during autumn and winter. This is particularly true for estimates from the Bay of Plenty and East Northland stocks, where the relative abundance of young fish recruiting into the stock appears to be highest mainly in autumn and winter when a high proportion of the annual catch is landed. These seasonal differences in proportions at age may

also be exacerbated by the recruitment of young year classes into the Bay of Plenty and East Northland stocks, and the faster growth rates exhibited there. Low winter catches and slower growth rates exhibited in snapper from the Hauraki Gulf have resulted in only minor differences in proportion-at-age estimates for spring-summer compared to those sampled year-round.

Mean weight-at-age estimates determined for each season were generally more similar within a stock than between stocks, although estimates for the Hauraki Gulf and East Northland stocks in 2006–07 were not overly dissimilar. Estimates from the Bay of Plenty more closely approximate values predicted from published parameters than those from other areas.

Some variability was evident in the relative year class strengths inferred from catch-at-age estimates for the SNA 1 stocks and most likely reflects between-stock differences in recruitment, growth rates, and fishing mortality, as well as sampling error. Mean weighted coefficients of variation (for analytical estimates) of below 20% across all age classes in the SNA 1 catch-at-age compositions were achieved. Only for the Hauraki Gulf longline estimates were bootstrap mean weighted coefficients of variation higher at 21%.

1. INTRODUCTION

Staff of the National Institute of Water and Atmospheric Research (NIWA) and, formerly, MAF Fisheries have sampled the length and age compositions of snapper from commercial landings in port (market sampling) intermittently since 1963 (Davies et al. 1993). In the 1988–89 fishing year, a structured sampling programme was designed to establish a time series of length and age composition data for the main snapper fisheries in the east and west coast North Island stocks, SNA 1 and SNA 8 respectively. Because of heterogeneity in snapper biology and fishing patterns, SNA 1 is often further subdivided into three substocks (referred to herein as stocks): Bay of Plenty, Hauraki Gulf, and East Northland. The time series of length and age information has been summarised in previous reports (Davies & Walsh 1995, Walsh et al. 1995, 1997, 1998, 1999, 2000, 2001, 2002, 2003, 2004, 2006a, 2006b, 2007). This report presents the results of market sampling between October 2006 and August 2007, thus continuing the time series. Funding for this project, SNA2006/01, was provided by the Ministry of Fisheries.

The specific objective of this project for 2006–07 was:

1. To carry out sampling and estimate the relative proportion at age and length of recruited snapper sampled from the commercial longline catch in SNA 1 throughout the fishing year 2006–07. The target coefficient of variation (c.v.) for the catch-at-age will be 20% (mean weighted c.v. across all age classes).

The approach for sampling SNA 1 commercial longline landings for length and age data in 2003–04 was modified from a spring and summer sampling programme to one that encompassed the entire year (see Walsh et al. 2006b). This change was largely brought about so that sampling reflected the seasonal characteristics of the longline fleet and its fishing operations, whereby more of the snapper catch in recent years was landed year-round, rather than just over spring and summer. The sampling undertaken in 2006–07 continued with the year-round approach as implemented in 2003–04 and 2004–05, but landings were sampled randomly for age only. Davies et al. (1993) investigated the relative benefit of catch-at-age precision associated with particular length frequency and otolith sample sizes in snapper landings so as to optimise sampling resources. It was evident that no considerable benefit was gained from collecting large length frequency samples. The aim of this study in 2006–07 was to estimate the annual catch-at-age of snapper from the SNA 1 stocks for its use in a population model.

2. METHODS

Landings from the snapper fishery were stratified by stock, fishing method, and quarter, e.g., Bay of Plenty – longline – spring. The stocks correspond to the three areas that make up the Quota Management Area SNA 1 on the northeast coast of New Zealand: Bay of Plenty, Hauraki Gulf, and East Northland (Figure 1). The fishing method sampled was longline (BLL) and the samples were collected over four seasons that make up the fishing year; spring (October–November), summer (December–February), autumn (March–May), and winter (June–August), unlike in previous years when spring and summer sampling was the norm. September, normally clustered with spring, was not included in the seasonal stratification as it lies outside the bounds of the fishing year (October to September) that the sampling relates to. As limited fishing occurs in September (the last month of the fishing year), its absence from the spring sampling strata was deemed to have minimal effect on the final results. The percentages of the snapper catch taken by method in each of the stocks for the sampling period in 2006–07 are given in Table 1 to indicate the dominant methods.

Age frequency samples were collected from the SNA 1 longline fisheries using a two-stage sampling procedure similar to that described for length sampling (West 1978). The random selection of landings and a random sample of bins within landings represent the first and second stages respectively. The sampling procedure was modified to account for the grading of fish according to length and quality (within-landing strata) by taking a stratified random sample of bins within a landing (Davies et al. 1993).

The random age frequency sampling method for collecting otoliths was used for each stratum. Age-frequency samples were collected by taking random otolith samples from each within-landing stratum using a systematic selection interval. This involved taking a random sample of bins from each stratum that was roughly proportional to the total number of bins in a landing, hence large samples were taken from large landings and small samples from small landings. A systematic selection of every n^{th} fish was taken from the sampled bins by counting in a continuous sequence. The optimum selection interval, n, was determined from simulations using data from historical length and age samples that achieved a desired level of precision. This range took account of the expected mean number of fish in a bin and the total number of bins in landings. Sample sizes typically ranged from 15 fish being collected from landings having a total of 10 bins, to 45 fish from landings of over 100 bins. A total sample size of 800 otoliths was targeted from the Bay of Plenty and East Northland longline fisheries over the entire year, with about 200 otoliths collected per season. Similarly, 1000 otoliths were targeted from the Hauraki Gulf longline fishery with about 250 otoliths collected per season.

All fish making up the sample were measured to the nearest centimetre below the fork length. As snapper show no differential growth between sexes (Paul 1976), sex was not determined.

In 2001–02, the random age frequency design for the East Northland stock was substratified by the statistical areas 002 and 003 (Figure 1) to improve the precision on catch-at-age estimates (Davies & Walsh 2003). In previous years, the allocation of sample collections from each statistical area was generally dependent on the availability of landings from those areas during the season. It was anticipated that the expected number of samples collected from each statistical area would be proportional to the landings from each area during the period of sampling. However, Walsh et al. (2006b) reported that year-round sampling can result in sub-optimal numbers of landings being sampled in a sub-stratum-quarter that may increase observation error and create possible bias in the sample estimates. Therefore, for each season in 2006–07 the sample allocation over statistical areas was targeted at about five landings (half the stock seasonal target of ten) to ensure adequate sample sizes were obtained.

Proportion at age and variance (analytical and bootstrap) estimates for the SNA 1 longline fisheries were calculated from the random age frequency samples collected from each landing. Proportions at age across all landings within a season were estimated from sample proportions, weighted by the estimated number of fish in each landing. The weighted mean proportion at age and variance across temporal (seasons) and spatial (East Northland only) strata for each fishery was calculated following Blackwell et al. (1999).

Calculation of mean weight-at-age was based on $w\ (g) = 0.04467 l^{2.793} (cm)$ (Paul 1976). Mean weight-at-age estimates were calculated as a weighted mean with respect to the total number of fish estimated in each within-landing stratum sampled (Walsh et al. 2006b) and is directly analogous to estimating proportion catch-at-age (Davies et al. 2003). Landing-specific weight-at-age was scaled up to the season-fishery stratum and combined over all seasons (and spatial strata in East Northland).

Proportions at age and mean weight-at-age (bootstrap variances) were calculated for the range of age classes recruited, with the maximum age being an aggregate of all age classes over 19 years.

Random age frequency data were collected primarily to derive catch-at-age estimates. However, it can be assumed that fish sampled randomly for age were also random observations from within each length interval. Consequently, age-length keys could be derived from the random age frequency otolith samples. However, fish in the larger length classes, collected by the random age frequency method, were infrequently sampled and are likely to be poorly described in the age-length key. Age-length keys are assumed to be representative of the seasonal strata of the samples, that being the entire year, and may not be directly comparable to collections in years where only spring and summer were usually sampled. The main assumption that must be satisfied for an age-length key is that the sample was taken randomly with respect to age from within each length interval (Southward 1976). Age-length keys are included to give the reader an appreciation of the age at length differences between the stocks.

A standardised procedure for reading otoliths was followed (Davies & Walsh 1995). Age was defined as the rounded whole year from a nominal birth date of 1 January, e.g., in 2006–07, the 1999 year class was 8 years old, whether sampled in December 2006 or February 2007.

Snapper age data were stored on the Ministry of Fisheries *age* database, administered by NIWA.

3. RESULTS

3.1 Sample collections

Summaries of the sample sizes for stock-method-season strata are given in Tables 2–4, and summaries of the otolith sample collections in Table 5. Catch data from spring 2006 to winter 2007 are provided in Tables 2–4, displaying seasonal patterns in the fisheries. Although longline catches from the SNA 1 fishery were spread over the entire year, the greatest proportion of annual catch was taken from spring-autumn in the Hauraki Gulf, summer-autumn in East Northland, and summer-winter in the Bay of Plenty (Tables 2–4). Single trawl and longline were the dominant methods in the Hauraki Gulf accounting for 38% and 37% of the annual catch respectively (see Table 1). In East Northland, longline continues to dominate the fishery (46%), while in the Bay of Plenty, single trawl accounts for just under half the annual catch (47%), with longline taking 23%.

In 2006–07 it was possible to sample from all sectors of the fishing industry. A total of 40 landings (about 10 per season) were targeted from each longline fishery in SNA 1 with sample sizes achieved in both the Hauraki Gulf (46) and East Northland (43) fisheries. The Bay of Plenty target fell just short of the target with 38 landings being sampled. This was because some months after sampling and just before loading the data onto the *market* and *age* databases, a number of landings had to be moved between substocks after confirmation (from MFish catch and effort records) that the statistical area was found to differ from the substock in which the vessel was first thought to have fished in. The cumulative proportion of the number of snapper longline landings and those sampled in the respective SNA 1 stocks from October 2006 to August 2007 are given in Appendix 1.

3.2 Age distributions

For all fisheries sampled in 2006–07, catch-at-age compositions (sampled using the random age frequency sampling approach) were derived for each stock, season, and combined over all seasons (spring to winter) to produce annual compositions. These are presented in Figures 2–5 and used to compare differences in the age structure of each stock and season stratum and to identify year class strengths. Combined seasonal catch-at-age distributions are presented with analytical and bootstrap variance estimates (Figures 2–4). A comparison of the relative proportions at age for the spring-summer combined season with that from the year-round sampling using cumulative plots is presented in Figure 6. Mean weight-at-age estimates for each stock–season stratum are presented in Figure 7.

The estimated proportions at age and mean weight-at-age are tabled in Appendices 2 and 3. The age-length keys are tabled in Appendix 4. A time series comparison of the catch-at-age compositions for each stock where year-round sampling was undertaken is presented in Appendix 5.

3.3 Bay of Plenty

The Bay of Plenty longline age distribution consisted mainly of fish between 4 and 9 years old with very low numbers of fish in age classes 14 years and older (Figure 2). The mean age was 7.4 years and the analytical and bootstrap mean weighted coefficients of variation (MWCVs) were 0.12 and 0.18 respectively. Although the previously strong 1999 year class (8 year olds) continues to dominate the age composition it now only makes up about one-quarter by number of the Bay of Plenty longline catch. The 2002 to 2000 year classes (5–7 year olds), equally the second most dominant age classes in the fishery, combined make up 44% of the annual catch, and are likely to be of average to above average strength. The 1996 and 1995 year classes (11 and 12 year olds) continue to remain of moderate strength as they have in recent years, and combined make up about 8% of fish landed. The 2000 and 2001 year classes appear to be almost fully recruited to the fishery, while the 2002 year class is not because it is still well represented in the 25–27 cm length intervals (see age-length key, Appendix 4).

The seasonal catch-at-age samples for the Bay of Plenty longline fishery were generally similar over all seasons and showed a high level of consistency in the relative strengths of common age classes. Summer and spring samples contained proportionally more old fish than winter and autumn samples (Figure 5).

3.4 Hauraki Gulf

The Hauraki Gulf longline age distribution was dominated by the 1999 year class (8 year olds) making up just over 20% of the annual landed catch (Figure 3). The distribution was comparatively broad, with most year classes, including those in the right hand limb, comprising appreciable numbers of fish (i.e., 1996, 1995, 1991, and 1989). The 2002 to 2000 year classes (5–7 year olds) appear to be of relatively similar average strengths, and along with the 1999 and 1998 (9 year olds) year classes dominate the left hand limb of the age distribution, making up just under two-thirds by number of snapper landed by longline. Only those age classes over 9 years of age are considered fully recruited to the fishery because they no longer contain a noticeable proportion of fish in the 25–27 cm length intervals (see age-length key, Appendix 4). The mean age of snapper in the fishery was 9.5 years and the analytical and bootstrap MWCVs for the random age frequency approach were 0.16 and 0.21 respectively.

The seasonal catch-at-age samples for the Hauraki Gulf longline fishery were generally similar over all seasons and showed a high level of consistency in the relative strengths of common age classes, a pattern similar to that seen in previous year-round sampling. Winter and spring samples contained proportionally more old fish than summer and autumn samples (Figure 5).

3.5 East Northland

The East Northland longline age distribution continues to be dominated by the strong 1999 year class (8 year olds) making up one-quarter of the annual landed catch (Figure 4). In most recent years the distribution has comprised a relatively high number of young fish, although an appreciable number of old fish (of similar relative strength) still exist in the right hand limb, but their relative numbers appear much lower now. The 2001 and 2000 year classes (6 and 7 year olds), the second most dominant age classes present in the fishery, appear to be of relatively similar average strengths and also dominate the left hand limb of the age distribution. The 1996 year class (11 year olds) and the aggregate (over 19 years) age group also appear relatively dominant, although the latter is considerably lower than estimates from the fishery in the late 1990s. Only those age classes over 8 years of age are considered fully recruited because they no longer contain a noticeable proportion of fish in the 25–27 cm length intervals (see age-length key, Appendix 4). The mean age of the East Northland distribution was 8.7 years and the analytical and bootstrap MWCVs were 0.14 and 0.19 respectively.

The seasonal catch-at-age samples for the East Northland longline fishery were largely similar over all seasons and generally showed a high level of consistency in the relative strengths of common age classes. Spring samples contained proportionally more old fish than autumn, summer and winter samples (Figure 5).

3.6 Mean weight-at-age

Seasonal mean weight-at-age estimates for the Bay of Plenty and Hauraki Gulf stocks in 2006–07 are similar to those estimates previously observed in year-round sampling in 2003–04 and 2004–05, being more different between stocks than within stocks for the most common age classes (Figure 7, Appendix 3). Estimates for the East Northland stock were more like those derived from the Hauraki Gulf fishery in 2006–07, and appear slightly lower over most of the common age classes than those derived in 2003–04 and 2004–05. As previously seen, mean weight-at-age estimates were generally highest from samples collected in the Bay of Plenty longline fishery, and in 2006–07 these were found to be 10–15% greater for the most common age classes (e.g., 5–14 year olds) than those determined for the Hauraki Gulf and East Northland stocks. Similarly, Bay of Plenty longline estimates of mean weight-at-age were also similar on average to the predicted values for the SNA 1 stock for the common age classes, while those for the Hauraki Gulf and East Northland were on average lower than the predicted SNA 1 values. The mean weight-at-age estimates for some of the young age classes (3–5 year olds) lie on or above the predicted weight-at-age curve because commercial catches do not contain the full length distribution because of the minimum legal size (MLS) of 25 cm.

Unlike in past years, there was no noticeable seasonal difference in mean weight-at-age estimates within stocks in 2006–07, with most estimates especially for the common age classes being relatively similar.

4. DISCUSSION

The relative year class strengths inferred from the age distributions sampled from the SNA 1 fisheries in the 2006–07 fishing year are generally consistent with trends observed in previous years (Walsh et al. 1995, 1997, 1998, 1999, 2000, 2001, 2002, 2003, 2004, 2006a, 2006b, 2007). The collection of otolith samples in 2006–07 followed the same design as that first implemented in 2003–04 and 2004–05 (Walsh et al. 2006a, 2006b) spanning the entire year, whereas collections before 2003–04 (and in 2005–06) were made only in the spring and summer seasons. The change was made largely so that sampling better reflected the seasonal characteristics of the longline fleet and its fishing operations, as more of the snapper catch in recent years was landed year-round. However, compared to spring and summer sampling, year-round sampling was found to influence annual length and age compositions by two main factors: a higher rate of recruitment of small and young fish in autumn and winter; and the high catch in these seasons relative to spring and summer both influence the relative weight (in terms of the total numbers of fish) us[illegible] nbining season strata, especially in the East

Northland and the Bay of Plenty stocks (Walsh et al. 2006a, 2006b). Similarly, the potential influence of resident fish being more common in catches in autumn and winter, and assumed to be of a smaller average size, therefore of higher relative abundance, may also have some bearing on the results (Walsh et al. 2006b) apparent in the Hauraki Gulf stock. Therefore, any direct comparisons made with the annual age composition estimates collected in 2006–07 to those sampled only in spring and summer in previous years should be treated with some caution. The Snapper Fishery Assessment Working Group in March 2006 concluded that future market sampling of the SNA 1 fisheries should take place throughout the year.

There have been considerable developments within the fishing industry in recent years. Veteran skippers who have been in the fishery since the implementation of the Quota Management System (QMS) in 1986, and made their living by fishing for snapper, have now all but retired and have either sold their quota and vessels, or are now leasing these out. There have been fewer new skippers entering the industry and learning the trade. Fishing companies have been bought and sold and now only a few of the larger entities remain within the industry. The economics of fishing has become less profitable in recent years with a high valued New Zealand dollar, a shortage of overseas markets that deliver favourable returns for exported product, a somewhat inflated lease price for sought-after commercial species, and the ever increasing costs of fuel and other fishing related commodities all having their effect (authors' communication with industry managers and fishers). As a result, there has been a gradual downsizing and rationalisation of the commercial fishing fleet. Some of the bigger companies have moved away from longlining and mainly use Danish seining and trawling because of the economics of scale, selling their catch either on the domestic market, or overseas where an acceptance of a lower valued product in reasonable volume is becoming more common. Most longline fishers who have remained in the industry now catch higher tonnages of snapper than in the past for a similar financial return, most of which is still destined for export. In 2006–07, samples were collected from 40 different vessels of a total of 57 longline vessels operating in SNA 1, two-thirds the fleet size that operated four years ago. By the time this document goes to print, a number of these fishers will also have left the fishery. Although the number of longline vessels within the fishery may have decreased in recent years, the catch of snapper by longline continues to remain substantial at around one-third of the Total Allowable Commercial Catch (TACC). Unlike other methods, longlining operates extensively in most spatial strata of SNA 1, across a wide range of habitats (soft and hard substrates), and has few fine-scale management (area and effort) restrictions imposed on its use. Importantly, catch-at-age data from the longline fishery provides a particularly useful tool for stock monitoring. Longline is believed to be the most uniform of all the fishing methods in its selection of fish across both size and age. Thus, method-specific mortality at age may be calculated using the longline catch-at-age estimates that also reflect the population age structure, and reveal the relative strength of newly recruiting year classes entering the fishery. These are important estimates that are derived from fitting a population model to longline catch-at-age estimates and are significant for the long-term monitoring of the fishery.

The Bay of Plenty combined age distribution for 2006–07, although broadening slightly, was generally similar to that seen in previous years, being largely comprised of fish less than 10 years of age. The 1999 year class (8-year-olds), the most dominant in the fishery for the fourth consecutive year, continues to make up just under one-quarter by number of snapper landed by longline. The average size of fish from the 1999 year class was about 33 cm (about 750 g), and the year class is likely to be fully recruited to the commercial fishery having low numbers of individuals in the 27 cm length interval only (see age-length key, Appendix 4). The recruitment strength of the 2003–2000 year classes (4–7 year olds) has boosted the left hand limb of the age distribution considerably, and comparisons made with the relative strength of the 1999 year class estimates these four year classes to be of about average strength. As a result, most of the other age classes in the Bay of Plenty catch-at-age distribution appear now to be of low relative strength, except perhaps the 1996 and 1995 year classes (11 and 12 year olds). Those age classes 14 years or older make up less than 2% of the total annual catch by number, the lowest estimate in recent years. Proportionally, the aggregate (over 19 years) age group comprises one-third of this total, made up only of fish between 20 and 22 years of age, indicating as it has over recent years, that few older fish now exist in this fishery. Like many of the older age classes in the Bay of Plenty fishery in recent years, the 1992 year class (15 year olds) was absent in 2006–07.

Since sampling first began in 1989–90, the Bay of Plenty fishery has always had the youngest and narrowest age distribution of any of the SNA 1 stocks. More recently, Walsh et al. (2004, 2006a, 2006b) reported that the Bay of Plenty has continued to have the youngest age distribution, largely as a result of the increased commercial fishing pressure there, where the level of exploitation was considerably higher than other stocks relative to its size. For 2004–05, Walsh et al. (2006a) reported the level of exploitation (estimated to be close to 40% of the SNA 1 TACC of 4500 t (N. Davies, unpublished data)) to be the highest for more than two decades, although in 2006–07, this level has now decreased to below 30% of the TACC, with more pressure being directed toward other stocks. As a result, the mean age of snapper landed in the longline fishery has remained stable over the last three years, ranging between 7.2 and 7.4 years, and reflects only modest changes in the age structure of the population. Because of the past and present high fishing pressure imposed on the Bay of Plenty stock, the age structure of snapper from the longline fishery is unlikely to broaden to any extent in the near future, especially if high fishing pressure is to continue.

The Hauraki Gulf longline age distribution in 2006–07 was similar to that seen in 2005–06 and comprises the broadest age distribution of any of the SNA 1 fisheries. The strong 1999 year class (8-year-olds) has decreased in its relative dominance from the previous year and now accounts for about 20% of fish landed by longline. The 1999 year class continues to remain the singularly most dominant year class in the Hauraki Gulf fishery, having two-fold or more fish than any other year class, but largely made up of small fish with an average size centred around 32 cm (about 750 g). Currently, those year classes less than 10 years of age make up two-thirds of snapper landed by longline in the Hauraki Gulf. The recent recruitment of the 2002–2000 year classes (5–7 year olds) has boosted the left hand limb of the age distribution, and comparisons made with the relative strength of the 1999 year class estimates these three year classes to be of about average strength, although none of these are yet fully recruited. Hauraki Gulf snapper exhibit some of the slowest growth rates of any New Zealand snapper stock (Davies et al. 2003), this being reflected in the rate of cohort recruitment above the MLS, where the left hand limb for cohorts up to about 10 years of age (largely since sampling first began in 1989–90) still contain some snapper at about, and probably below, the MLS of 25 cm (see Appendix 4). For 2005–06, Walsh et al. (2007) reported that although the age composition for the Hauraki Gulf is perceived to be broadening and, hence, potentially rebuilding, the average size of the fish landed there is still comparatively small. Consequently, the yield-per-recruit (by weight) to the fishery from one year to the next is relatively low compared to that seen in other stocks with higher growth rates, like SNA 8. Although there has been no noticeable accumulation of older fish into the Hauraki Gulf aggregate age group in recent years (currently comprising less than 2% of the longline catch), previously dominant year classes, such as 1996, 1995, 1991, and 1989 (11, 12, 16, and 18 year olds) persist in the age distribution and are expected to further broaden the right hand limb of the distribution and boost the aggregate age group over the next few years.

The mean age of snapper from the Hauraki Gulf fishery has risen to 9.5 years in 2006–07, up almost one year on the previous two years' estimates, and the third highest since sampling began in 1989–90. The increase in mean age in the fishery is almost certainly related to a number of factors: the dominance of the 1999 year class and other relatively dominant older age classes still present in the fishery, and the progression of these by one year into the next; the slower rate of recruitment of younger age classes into the fishery because of the slow growth exhibited by Hauraki Gulf snapper; and an apparently lower exploitation rate (compared to the other SNA 1 stocks) that allows snapper to attain a greater average age (albeit at a relatively small average size because of the slower growth rate). The analytical (0.16) and bootstrap (0.21) MWCV estimates for the random age frequency collection remain relatively high and most likely reflect higher catch-at-age variability between landings in the fishery and the broadening of the age distribution.

The East Northland age distribution was similar to that seen in the last few years, allowing for the progression of strong and weak year classes, but continues to have a narrower range than that of previous years when samples were collected only over spring and summer. Similar to that seen in the Bay of Plenty, the East Northland age distribution continues to be dominated by the strong recruiting 1999 year class (8-year-olds) for the fourth consecutive year, making up about one-quarter of fish landed annually by longline in 2006–07, and as predicted by Walsh et al. (2006b) in 2003–04 will continue to be of considerable importance for the sustainability of the fishery. The 2001 and 2000 year classes (6 and 7 year olds), equally the second most dominant in the fishery, combined with the 1999 year class make up over half the number of snapper landed by longline in East Northland, and at present are unlikely to be fully recruited to the commercial fishery as they are well represented in the smaller length intervals (i.e., below 28 cm; see age-length key, Appendix 4). The current age distribution, although not as broad as it was in the 1990s, still contains an appreciable number of fish across all age classes, including the aggregate (over 19 years) age group, with just under a quarter of all fish landed being over 10 years of age. As a result the mean age in the fishery has remained relatively high and stable for a third consecutive year, increasing slightly to 8.7 years in 2006–07.

Walsh et al. (2006b) first reported considerable changes apparent in the proportion at age of the East Northland longline catch in 2003–04. Catches in the mid 1990s typically comprised a broad range of fish of various ages, 5–10% over 19 years, with estimates of mean age about 10 years old, and this continued to some degree until 2001–02. However, in 2006–07 and the previous three years, there has been a noticeable decline in the relative abundance of older fish in catches, with length and age distributions mainly comprising smaller and younger fish respectively, resulting in lower estimates of mean length and age than were previously experienced (Walsh et al. 2006a, 2006b, 2007). It was thought that this trend in East Northland was most likely related to a combination of following factors: high fishing mortality has reduced the relative abundance of older fish in the fishery in more recent years; some year classes have recently recruited with above average strength to dominate the left hand limb of the age distribution; and the effect caused by sampling being undertaken year-round where high numbers of small young fish (and a high relative tonnage) are caught during autumn and winter, exacerbated by early recruitment and faster growth rates (in young fish), contribute to a higher relative abundance in year-round estimates than those from spring and summer (Walsh et al. 2006a, 2006b).

Another factor to influence catch-at-age estimates from the year-round sampling of the East Northland stock is the substratified sampling design applied. Walsh et al. (2006b) reported that estimates from year-round sampling of East Northland may be subject to relatively high sampling variability, largely because of the substratification of landings by statistical area and season. As already mentioned above, this can result in suboptimal numbers of landings sampled in a substratum in a quarter (see Walsh et al. 2006b), especially in year-round sampling and may increase observation error, and creates bias in the catch-at-age estimates. Similarly, the spatial variability in the age structure between landings within a stratum, the use of different fishing practices, and the natural anomalies in year class strength (Walsh et al. 2006a, 2007) that occur both within and between statistical areas 002 and 003 are a reflection of the heterogeneity in catch-at-age from the East Northland stock (Davies & Walsh 2003). In the past, all of these factors have been found to have some effect on the catch-at-age results for this fishery, apparent in the variation in year class strengths from year to year. Although Davies & Walsh (2003) found that there was negligible benefit in catch-at-age precision to be gained from using a substratified sampling design compared to one un-stratified for East Northland, the former design is likely to provide better estimates of catch-at-age.

Since 1989–90, broad similarities in relative year class strengths and recruitment patterns have been evident between the SNA 1 stocks, particularly for extremely strong and weak year classes (Davies & Walsh 1995, Walsh et al. 1995, 1997, 1998, 1999, 2000, 2001, 2002, 2003, 2004, 2006a, 2006b, 2007). The current catch-at-age compositions from all the SNA 1 longline fisheries are singularly dominated by the strong 1999 year class, which, although not quite fully recruited, now accounts for about 20–25% of all snapper landed. Walsh et al. (2006b) reported the 1999 year class will be of considerable importance in sustaining the SNA 1 stock in this decade, and this is supported by the fact that other than the 1989 year class in the early 1990s and probably the 1981 year class before it, the 1999 year class is the only other year class to have dominated the SNA 1 longline fisheries for so long. As in past years, the previously dominant 1996 year class continues to be of similar relative strength in all the SNA 1 stocks, as does the weak 1997 year class (10-year-olds). More recently, the recruitment of the 2000–2002 year classes across all the SNA 1 fisheries appears likely to be of similar relative strength between the stocks. Most of the older age classes (i.e., 1989 and 1991 year classes), especially those that were once very dominant, are now becoming less apparent in stocks as they are fished down, most noticeably in the Bay of Plenty. Although broad similarities in year class strength exist between the SNA 1 stocks, there are some anomalies such as the relative strength of the 1998 and 1995 year classes in East Northland. Any variability in relative year class proportions between the SNA 1 stocks is most likely due to the variable recruitment specific to a stock (a reflection of unique environmental conditions), growth differences, and fishing mortality differences (Walsh et al. 2003).

Similar to previous results from year-round sampling in 2003–04 and 2004–05, the seasonal catch-at-age distributions in 2006–07 within a stock generally showed a high level of consistency between seasons in the relative strengths of the most common age classes. It is generally expected that older and larger fish are found to be more common in summer, and younger and smaller fish more common in winter, a result determined from year-round sampling of SNA 2 landings (Blackwell et al. 2000, Blackwell & Gilbert 2001). Similarly, in 2006–07, catch-at-age estimates from the Bay of Plenty consisted of catches with a slightly higher proportion of older fish from spring and summer compared to autumn and winter, reflecting those estimates collected in the previous year-round sampling events (Walsh et al. 2006a, 2006b). These seasonal differences however, although consistent between years, are not as obvious in the Bay of Plenty compared to other stocks, as few old fish are present in the fishery. Those samples collected from the Hauraki Gulf in 2006–07 did not follow this expected relationship, and the highest proportions of older fish over all seasons in the Hauraki Gulf were again found in winter, the same result as in 2003–04 and 2004–05. Walsh et al. (2006b) thought the most likely reason for this difference in winter samples may relate to the low abundance of school fish compared to resident fish in the population, the latter of which may not be fished to the same intensity as the school fish, hence, having similar year strengths but of different relative proportions. Resident fish, typically smaller, of lower abundance, and generally more dispersed, continue to occupy shallow inshore areas at least over the winter, and perhaps the entire year (Walsh et al. 2006b). Most apparent throughout all SNA 1 stocks in 2006–07 was the high relative abundance of the strong 1999 year class in summer compared to other seasons, resulting in summer having a proportionally lower expected number of older fish present than seen in past years because of the relative strength of this young year class. In the East Northland stock, spring dominated as the season with the highest proportion of older fish, largely because of the high numbers of 11 and 12 year old fish present (1996 and 1995 year classes), with the other seasons not dissimilar to each other in their relative proportions at age.

Differences were apparent between the analytical and bootstrap variances of proportion-at-age estimates with the bootstrap variances being higher, particularly in the less abundant young and old age classes. Given the sizes of the random age frequency samples collected from these fisheries, the bootstrap solutions probably provide more accurate variance estimates (Davies et al. 2003).

The results from this report (for 2006–07) relative to the previous years indicate a high level of consistency in catch-at-age sample estimates from the SNA 1 fisheries. This consistency, indicative of relatively low sampling error has generally meant the proportions of every year class in the age distributions are similar to those from the previous year, given the potential changes resulting from strong and weak year classes recruiting into the fishery, and the heterogeneity present in the East Northland substock strata. The level of precision for the age distributions is also relatively low (MWCVs below 20% for analytical estimates), especially given that sampling events were conducted year-round, and as such reflects the rigorous sampling methodology and accurate ageing currently in place. Low between-year variability in the distribution of fishing effort relative to the recruited population would also contribute to this result. The analytical MWCV estimates for the age distributions sampled from the SNA 1 fisheries in 2006–07 ranged between 0.12 and 0.16 and bootstrap MWCV estimates for the same age distributions ranged between 0.18 and 0.21.

4.1 Mean weight-at-age

Similar to the findings in 2003–04 and 2004–05, mean weight-at-age estimates derived for each stock of SNA 1 in 2006–07 were similar to those recorded for the same fisheries for 1993–94 to 1997–98 (Davies et al. 2003), with only those estimates from the Bay of Plenty more closely approximating those predicted values based on published parameters. Overall there appeared to be little variation in seasonal mean weight-at-age estimates (for the most common age classes) within a stock, or between those for the Hauraki Gulf and East Northland stocks in 2006–07.

Walsh et al. (2006b) found mean weight-at-age estimates from the Hauraki Gulf winter longline fishery in 2003–04 to be almost consistently the lowest seasonal estimates over all age classes, and hypothesised that this may reflect the high abundance of resident fish in the Hauraki Gulf population during winter. For 2004–05, Walsh et al. (2006a) determined this feature was largely caused by catches sampled from the Firth of Thames area (statistical area 007), where low mean weight-at-age estimates appeared to relate to the lower water temperatures experienced by fish occupying shallow inshore strata, especially over winter, and most likely for a longer period than that experienced by school fish that are unlikely to remain in the Firth area. However, this feature was not apparent in the winter samples in 2006–07 and showed no visible difference in mean weight-at-age estimates from those of other seasons. We did not investigate this by examining where the collections were derived from catches made in the Firth of Thames. This may be undertaken in future years.

Bootstrap variance estimates determined from the random age frequency mean weight-at-age data in this report are higher than those given in catch sampling reports before 2003–04. This difference is attributable to the methods used to calculate mean weight-at-age from random age frequency samples (i.e., length frequency and age-length keys with analytical variance estimates were used previously).

5. CONCLUSIONS

1. The 2006–07 SNA 1 age distributions of the SNA 1 longline fisheries were generally similar to those observed in previous years using the same year-round sampling design, and are consistent with observed trends. Estimates differ slightly from collections made only in spring and summer, evident in the Bay of Plenty and East Northland stocks, and may be attributable to the higher proportion of catch, and hence the higher proportion of young fish, landed over the autumn and winter seasons. The substratified design used in sampling the East Northland stock year-round may cause an increase in observation error and may possibly bias sample estimates.

2. All SNA 1 longline fisheries in 2006–07 are dominated by the 1999 year class, which currently makes up about 20–25% of the catch by number. The 1999 year class has been the dominant

year class in the Bay of Plenty and East Northland stocks for the fourth consecutive year, and in the Hauraki Gulf for the third consecutive year, making this one of the strongest year classes seen in the SNA 1 fishery in recent years, and of considerable importance in sustaining the SNA 1 fishery this decade and probably well into the next.

3. The Hauraki Gulf stock continues to have the broadest age distribution of all SNA 1 stocks and the highest estimate of mean age, although few fish exist in the aggregate (over 19 years) age group. In East Northland the proportion of fish in the aggregate age group, although less than 3% in 2006–07, remains the highest estimate of the SNA 1 fisheries. There continues to be a relatively high proportion of young fish present in the East Northland catch compared to estimates four or more years ago. The Bay of Plenty age distribution continues to have the lowest numbers of old fish in SNA 1, with only 2% of the total annual catch based on fish 14 years and older, with a handful of these in the aggregate age group. Because of the high level of fishing pressure exerted on the Bay of Plenty stock, it is unlikely that any appreciable growth in the right hand limb of the age distribution will occur in this fishery for some years to come.

4. Seasonal variability in snapper catch-at-age for the stocks of SNA 1 was mostly consistent and similar to trends observed in year-round sampling in 2003–04 and 2004–05. The highest proportions of old fish in the catch were found in spring in East Northland, summer in the Bay of Plenty, and in winter in the Hauraki Gulf. The highest proportions of young fish were caught in autumn in the Bay of Plenty and Hauraki Gulf stocks, and during winter in East Northland.

5. Similarities in relative year class proportions exist between the SNA 1 stocks for most year classes, with differences mainly due to variable recruitment specific to a stock, growth differences, and fishing mortality differences.

6. There appears to be little variation in seasonal mean weight-at-age estimates for the most common age classes within a stock, or between those for the Hauraki Gulf and East Northland stocks in 2006–07. Only those estimates from the Bay of Plenty more closely approximate predicted values from published parameters.

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Table 1: Percentage of snapper catch by fishing method* in SNA 1 for the 2006–07 sampling period.†

	BPT	BT	BLL	DS	Other
Bay of Plenty	1	47	23	29	0
Hauraki Gulf	0	38	37	22	3
East Northland	9	31	46	11	3

* BPT, pair trawl; BT, single trawl; BLL, longline; DS, Danish seine.
† 2006–07 represents 01/10/06 to 31/08/07 only.

Table 2: Summary of the catch (total number and weight of landings) and samples (number of landings and weight sampled, and number of fish sampled for otoliths) in method–season strata for the Bay of Plenty snapper fisheries from spring 2006 to winter 2007.*

		Number of landings			No. of fish	Weight of landings (t)		
Method	Season	Total	Sampled	% of total	sampled	Total	Sampled	% of total
BLL	Spring	115	10	8.7	211	52	5	9.6
	Summer	215	8	3.7	190	74	5	6.8
	Autumn	251	10	4.0	231	74	5	6.8
	Winter	194	10	5.2	187	59	2	3.4
BT	Spring	53	0	0	0	90	0	0
	Summer	82	0	0	0	137	0	0
	Autumn	121	0	0	0	179	0	0
	Winter	87	0	0	0	119	0	0
DS	Spring	39	0	0	0	48	0	0
	Summer	50	0	0	0	125	0	0
	Autumn	17	0	0	0	32	0	0
	Winter	44	0	0	0	116	0	0

* BLL, longline; BT, single trawl; DS, Danish seine.

Table 3: Summary of the catch (total number and weight of landings) and samples (number of landings and weight sampled, and number of fish sampled for otoliths) in method–season strata for the Hauraki Gulf snapper fisheries from spring 2006 to winter 2007.*

		Number of landings			No. of fish	Weight of landings (t)		
Method	Season	Total	Sampled	% of total	sampled	Total	Sampled	% of total
BLL	Spring	241	11	4.6	231	165	4	2.4
	Summer	443	13	2.9	297	224	8	3.6
	Autumn	313	9	2.9	210	129	6	4.7
	Winter	185	13	7.0	280	70	6	8.6
BT	Spring	69	0	0	0	200	0	0
	Summer	82	0	0	0	178	0	0
	Autumn	67	0	0	0	81	0	0
	Winter	78	0	0	0	149	0	0
DS	Spring	44	0	0	0	51	0	0
	Summer	85	0	0	0	155	0	0
	Autumn	89	0	0	0	101	0	0
	Winter	50	0	0	0	41	0	0

* BLL, longline; BT, single trawl; DS, Danish seine.

Table 4: Summary of the catch (total number and weight of landings) and samples (number of landings and weight sampled, and number of fish sampled for otoliths) in method–season strata for the East Northland snapper fisheries from spring 2006 to winter 2007.* Data presented for statistical areas 002, 003, and both combined.

		Number of landings			No. of fish	Weight of landings (t)		
Method	Season	Total	Sampled	% of total	sampled	Total	Sampled	% of total
BLL (002)	Spring	122	6	4.9	120	46	2	4.3
	Summer	203	7	3.4	155	63	3	4.8
	Autumn	253	6	2.4	148	115	4	3.5
	Winter	165	8	4.8	159	57	2	3.5
BLL (003)	Spring	132	4	3.0	89	70	2	2.9
	Summer	171	3	1.8	61	73	1	1.4
	Autumn	141	6	4.3	129	51	3	5.9
	Winter	113	3	2.7	75	62	2	3.2
BLL (comb.)	Spring	252	10	4.0	209	115	4	3.5
	Summer	376	10	2.7	216	137	4	2.9
	Autumn	395	12	3.0	277	171	7	4.1
	Winter	280	11	3.9	234	125	4	3.2

* BLL, longline.

Table 5: Details of snapper otolith samples collected in spring-winter 2006–07 from the stocks in SNA 1.* ENLD data presented for statistical areas 002, 003, and both combined.

Area	Fishing method †	Sample method ††	Length range (cm)	No. aged
BPLE	BLL	R	24–57	819
HAGU	BLL	R	25–64	1 018
ENLD (002)	BLL	R	25–67	582
ENLD (003)	BLL	R	23–64	354
ENLD (comb.)	BLL	R	23–67	936

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

† BLL, longline.

†† R, random sample.

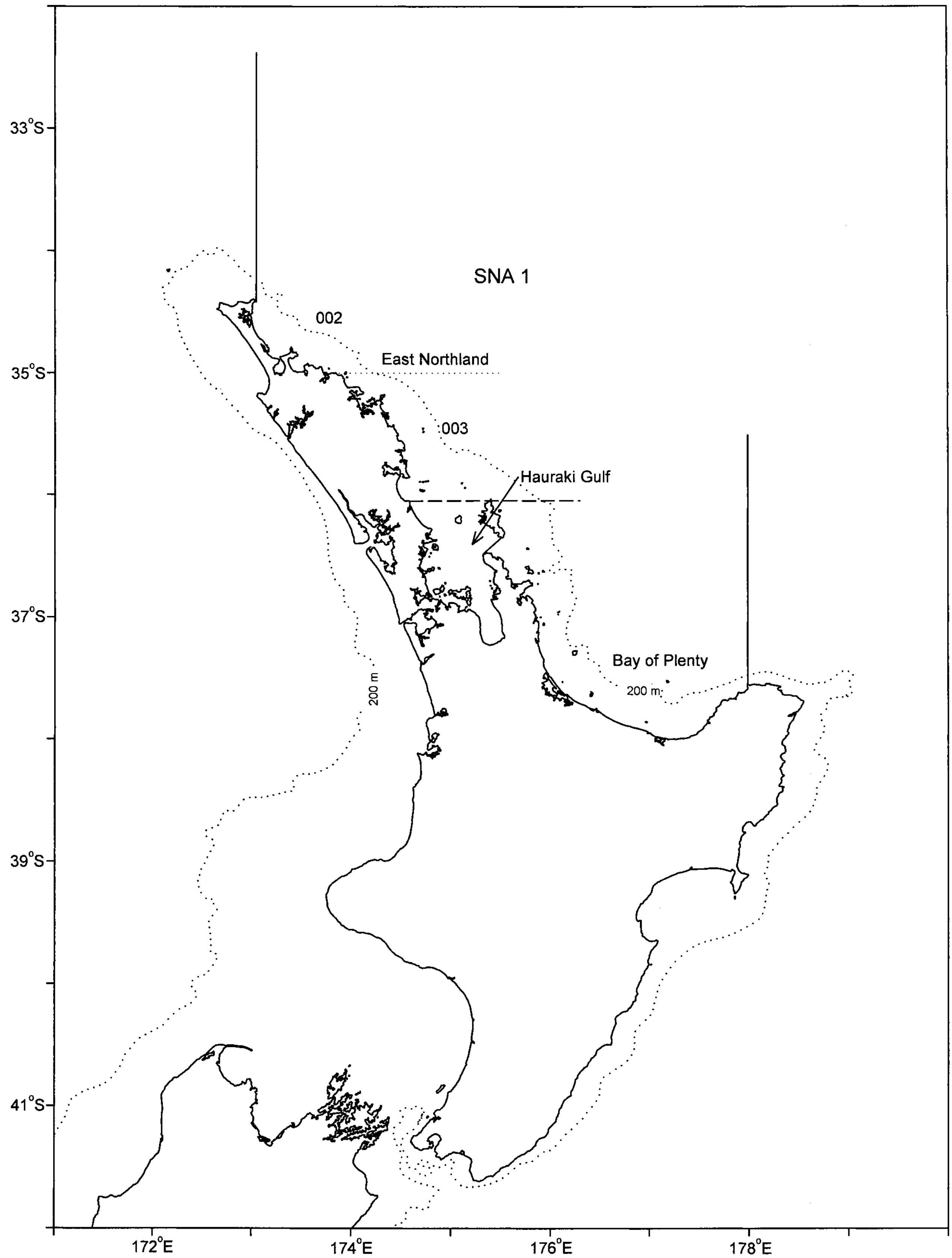


Figure 1: Quota management area for the east coast North Island snapper stock, SNA 1, and the range of the three SNA 1 substocks; East Northland, Hauraki Gulf, and Bay of Plenty.

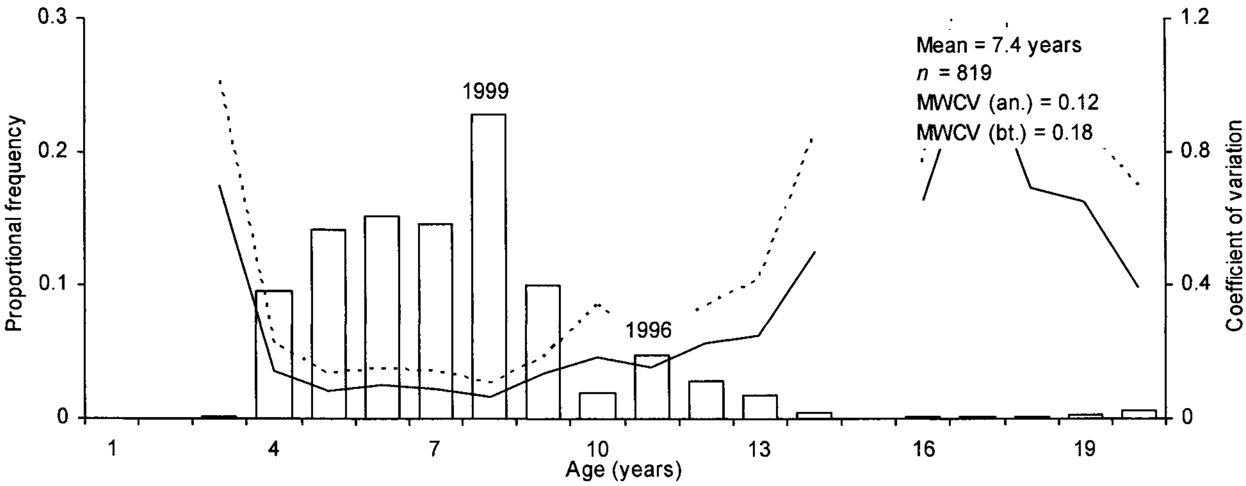


Figure 2: Proportion at age distribution (histogram) and analytical (solid line) and bootstrap (dashed line) c.v.s determined from snapper landings sampled from the Bay of Plenty longline fishery in 2006–07 using the random age frequency approach (*n*, otolith sample size; MWCV, mean weighted c.v.).

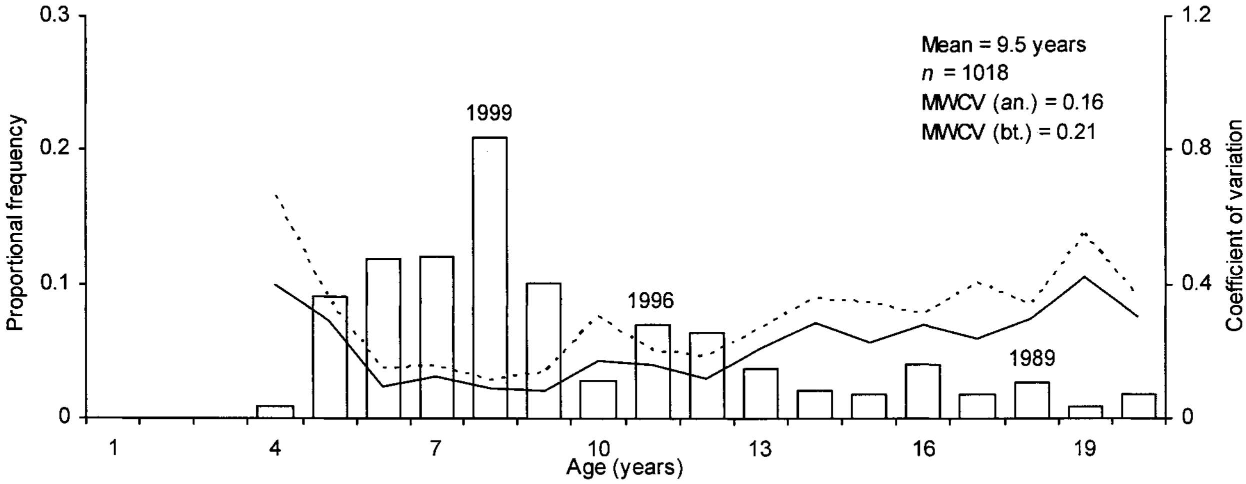


Figure 3: Proportion at age distribution (histogram) and analytical (solid line) and bootstrap (dashed line) c.v.s determined from snapper landings sampled from the Hauraki Gulf longline fishery in 2006–07 using the random age frequency approach (*n*, otolith sample size; MWCV, mean weighted c.v.).

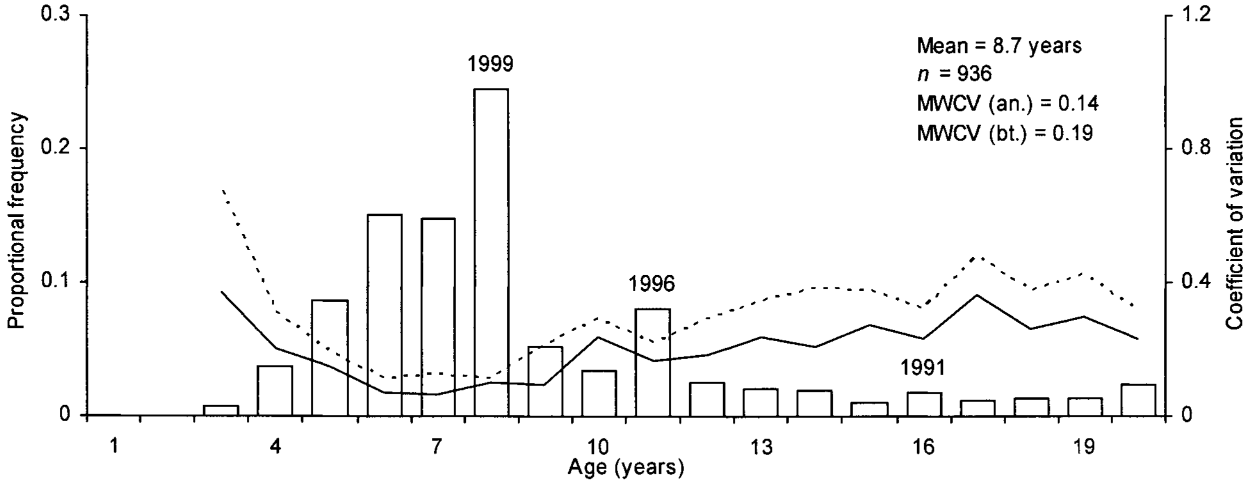


Figure 4: Proportion at age distribution (histogram) and analytical (solid line) and bootstrap (dashed line) c.v.s determined from snapper landings sampled from the East Northland longline fishery in 2006–07 using the random age frequency approach (*n*, otolith sample size; MWCV, mean weighted c.v.).

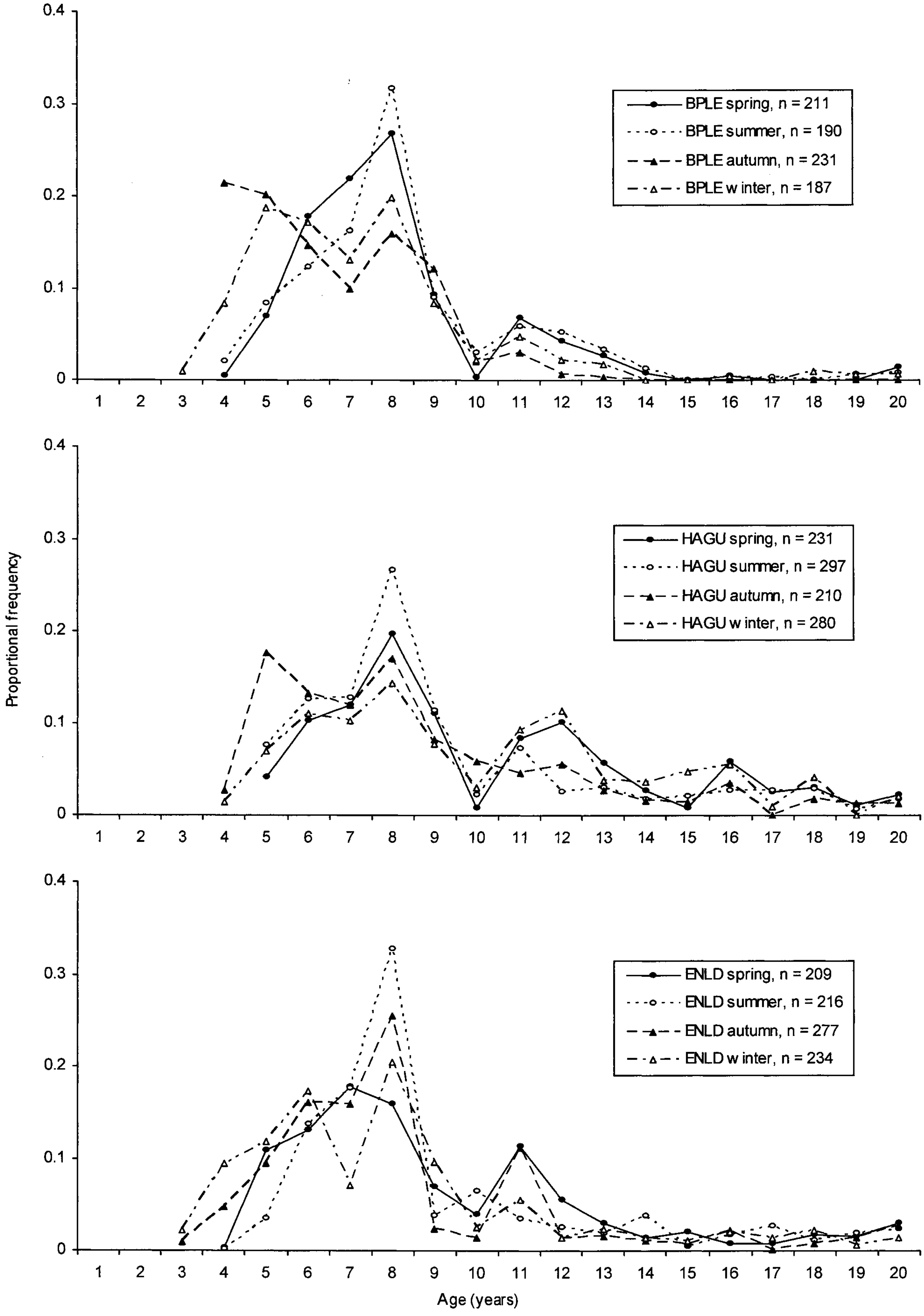


Figure 5: Proportion at age distributions determined from snapper landings sampled over four seasons from the Bay of Plenty (BPLE), Hauraki Gulf (HAGU), and East Northland (ENLD) longline fisheries in 2006–07 (*n*, sample size).

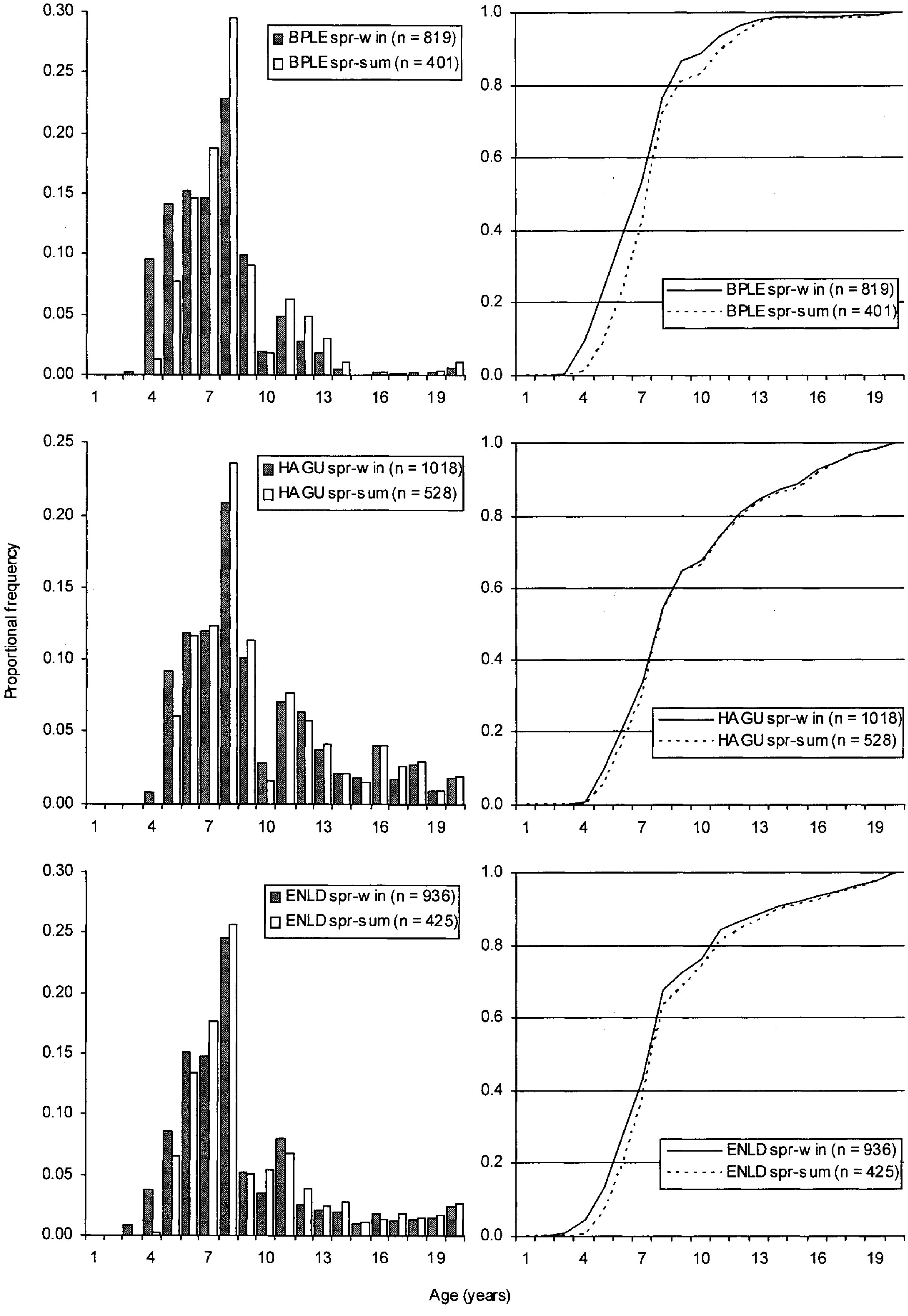


Figure 6: Comparison of the proportion and cumulative proportion at age distributions determined from snapper landings sampled over the spring and summer combined, and year-round seasons from the Bay of Plenty (BPLE), Hauraki Gulf (HAGU), and East Northland (ENLD) longline fisheries in 2006–07 (*n*, sample size).
Note: y-axis scales on proportion at age distributions are not equivalent.

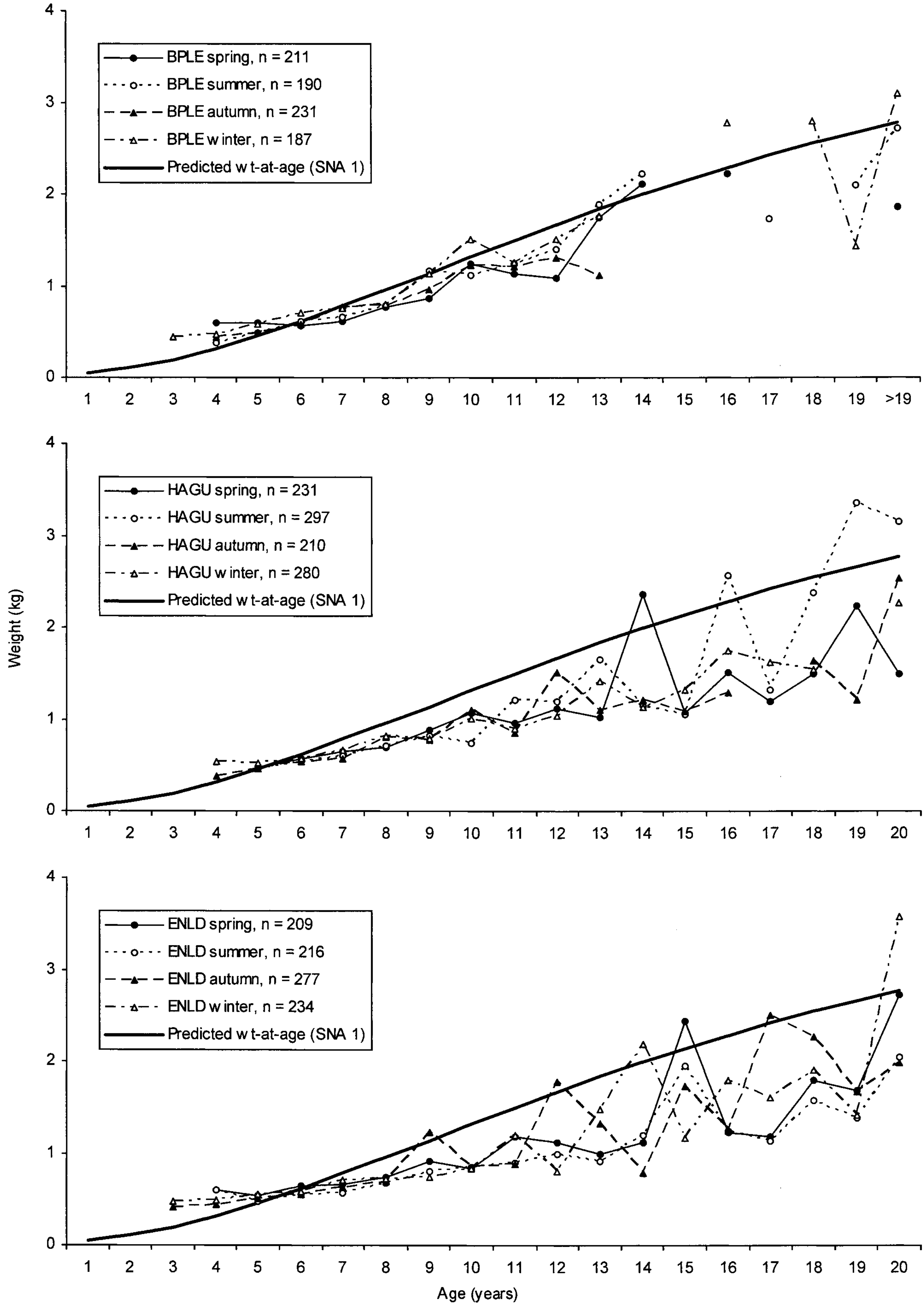
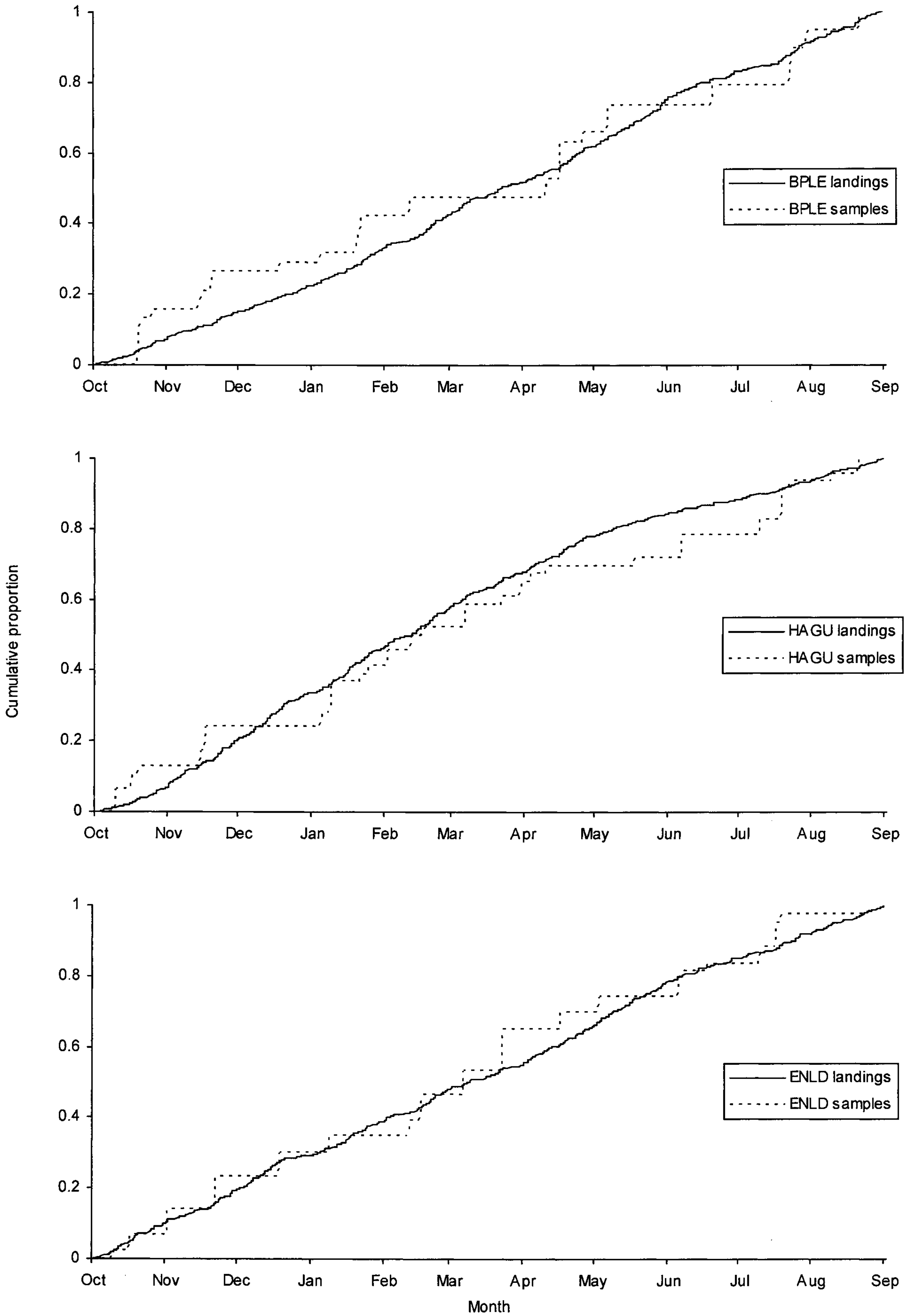


Figure 7: Observed and predicted mean weight-at-age estimates from snapper landings sampled over four seasons from the Bay of Plenty (BPLE), Hauraki Gulf (HAGU), and East Northland (ENLD) longline fisheries in 2006–07 (*n*, sample size). Note: Predicted estimates are based on published growth (Gilbert & Sullivan 1994) and length-weight (Paul 1976) parameters.

Appendix 1: The cumulative proportion of the number of landings and samples taken from the Bay of Plenty (BPLE), Hauraki Gulf (HAGU), and East Northland (ENLD) longline fisheries in 2006–07.



Appendix 2: Estimated seasonal proportion at age and c.v.s for snapper fisheries in SNA 1 in 2006–07.
P.j., proportion of fish in age class; c.v., coefficient of variation; *n*, total number of fish aged.

Estimates of proportion at age with coefficients of variation (analytical and bootstrap estimates) for snapper from the Bay of Plenty longline fishery in 2006–07.

Random age frequency

Age	Spring		Summer		Autumn		Winter		Longline Spr-win		
(years)	*P.j.*	c.v. (an)	*P.j.*	c.v. (an)	*P.j.*	c.v. (an)	*P.j.*	c.v. (an)	*P.j.*	c.v. (an)	c.v. (bt)
1	0.0000	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.00	0.00
2	0.0000	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.00	0.00
3	0.0000	0.00	0.0000	0.00	0.0000	0.00	0.0100	0.70	0.0021	0.70	1.02
4	0.0049	1.11	0.0202	0.33	0.2136	0.18	0.0838	0.24	0.0959	0.15	0.22
5	0.0686	0.36	0.0842	0.16	0.2009	0.11	0.1872	0.16	0.1421	0.08	0.14
6	0.1776	0.09	0.1229	0.43	0.1471	0.07	0.1719	0.16	0.1522	0.10	0.15
7	0.2189	0.11	0.1627	0.22	0.0992	0.20	0.1314	0.21	0.1458	0.09	0.14
8	0.2681	0.10	0.3161	0.11	0.1594	0.11	0.1977	0.21	0.2288	0.07	0.11
9	0.0929	0.16	0.0899	0.19	0.1214	0.28	0.0830	0.29	0.0997	0.14	0.18
10	0.0035	0.97	0.0302	0.20	0.0200	0.39	0.0228	0.40	0.0199	0.18	0.34
11	0.0683	0.10	0.0586	0.43	0.0292	0.22	0.0470	0.32	0.0481	0.16	0.23
12	0.0429	0.35	0.0522	0.36	0.0059	0.83	0.0215	0.54	0.0283	0.22	0.34
13	0.0265	0.21	0.0330	0.41	0.0034	1.13	0.0174	0.72	0.0185	0.25	0.42
14	0.0081	0.84	0.0132	0.62	0.0000	0.00	0.0000	0.00	0.0050	0.50	0.85
15	0.0000	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.00	0.00
16	0.0051	0.85	0.0000	0.00	0.0000	0.00	0.0042	1.02	0.0019	0.66	0.77
17	0.0000	0.00	0.0030	1.14	0.0000	0.00	0.0000	0.00	0.0008	1.14	1.54
18	0.0000	0.00	0.0000	0.00	0.0000	0.00	0.0099	0.69	0.0021	0.69	0.90
19	0.0000	0.00	0.0057	0.86	0.0000	0.00	0.0062	0.98	0.0027	0.65	0.88
>19	0.0147	0.47	0.0082	0.78	0.0000	0.00	0.0060	0.97	0.0062	0.39	0.70
n	211		190		231		187		819		

Estimates of proportion at age with coefficients of variation (analytical and bootstrap estimates) for snapper from the Hauraki Gulf longline fishery in 2006–07.

Random age frequency

Age	Spring		Summer		Autumn		Winter		Longline Spr-win		
(years)	*P.j.*	c.v. (an)	*P.j.*	c.v. (an)	*P.j.*	c.v. (an)	*P.j.*	c.v. (an)	*P.j.*	c.v. (an)	c.v. (bt)
1	0.0000	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.00	0.00
2	0.0000	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.00	0.00
3	0.0000	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.00	0.00
4	0.0000	0.00	0.0000	0.00	0.0269	0.48	0.0145	0.48	0.0085	0.40	0.66
5	0.0413	0.50	0.0758	0.52	0.1759	0.48	0.0696	0.34	0.0913	0.29	0.35
6	0.1019	0.21	0.1263	0.11	0.1315	0.21	0.1105	0.29	0.1193	0.09	0.15
7	0.1199	0.22	0.1271	0.16	0.1192	0.36	0.1020	0.22	0.1204	0.13	0.16
8	0.1968	0.15	0.2654	0.12	0.1707	0.28	0.1430	0.15	0.2090	0.09	0.12
9	0.1104	0.19	0.1140	0.10	0.0817	0.20	0.0779	0.32	0.1008	0.08	0.14
10	0.0074	0.95	0.0222	0.23	0.0575	0.26	0.0297	0.37	0.0280	0.17	0.30
11	0.0828	0.28	0.0718	0.21	0.0459	0.57	0.0929	0.28	0.0705	0.16	0.20
12	0.1014	0.14	0.0247	0.51	0.0552	0.30	0.1132	0.18	0.0631	0.12	0.18
13	0.0560	0.37	0.0299	0.24	0.0273	0.60	0.0379	0.41	0.0372	0.20	0.27
14	0.0260	0.47	0.0177	0.58	0.0153	0.75	0.0354	0.42	0.0213	0.28	0.35
15	0.0082	0.70	0.0204	0.22	0.0137	0.82	0.0465	0.37	0.0183	0.23	0.34
16	0.0583	0.48	0.0270	0.56	0.0353	0.66	0.0558	0.43	0.0408	0.28	0.31
17	0.0256	0.31	0.0264	0.37	0.0000	0.00	0.0095	0.60	0.0176	0.24	0.40
18	0.0302	0.45	0.0277	0.60	0.0175	0.76	0.0408	0.38	0.0272	0.30	0.34
19	0.0118	0.56	0.0070	0.69	0.0130	0.87	0.0000	0.00	0.0091	0.42	0.55
>19	0.0220	0.59	0.0167	0.53	0.0133	0.62	0.0205	0.52	0.0177	0.30	0.36
n	231		297		210		280		1018		

Appendix 2 – continued:
Estimates of proportion at age with coefficients of variation (analytical and bootstrap estimates) for snapper from the East Northland longline fishery in 2006–07.

Random age frequency

Age	Spring		Summer		Autumn		Winter		Longline Spr-win		
(years)	*P.j.*	c.v. (an)	*P.j.*	c.v. (an)	*P.j.*	c.v. (an)	*P.j.*	c.v. (an)	*P.j.*	c.v. (an)	c.v. (bt)
1	0.0000	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.00	0.00
2	0.0000	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.00	0.00
3	0.0000	0.00	0.0000	0.00	0.0102	0.71	0.0223	0.39	0.0081	0.37	0.68
4	0.0033	0.88	0.0018	1.07	0.0480	0.37	0.0943	0.24	0.0371	0.20	0.31
5	0.1084	0.14	0.0341	0.43	0.0938	0.35	0.1187	0.20	0.0862	0.15	0.19
6	0.1307	0.21	0.1368	0.22	0.1600	0.07	0.1735	0.11	0.1511	0.07	0.12
7	0.1780	0.19	0.1758	0.13	0.1591	0.08	0.0701	0.16	0.1481	0.07	0.12
8	0.1589	0.13	0.3277	0.26	0.2556	0.10	0.2047	0.17	0.2450	0.10	0.11
9	0.0694	0.22	0.0380	0.09	0.0234	0.39	0.0964	0.13	0.0518	0.10	0.22
10	0.0387	0.42	0.0650	0.42	0.0138	0.54	0.0254	0.29	0.0346	0.24	0.29
11	0.1135	0.24	0.0351	0.45	0.1122	0.31	0.0554	0.20	0.0800	0.17	0.22
12	0.0555	0.15	0.0255	0.50	0.0135	0.48	0.0144	0.52	0.0250	0.18	0.29
13	0.0302	0.39	0.0190	0.65	0.0158	0.49	0.0229	0.33	0.0209	0.24	0.35
14	0.0147	0.46	0.0385	0.28	0.0118	0.58	0.0140	0.44	0.0199	0.21	0.38
15	0.0202	0.38	0.0051	0.57	0.0086	0.70	0.0104	0.52	0.0103	0.27	0.38
16	0.0086	0.42	0.0176	0.49	0.0227	0.42	0.0208	0.32	0.0182	0.23	0.32
17	0.0072	0.51	0.0260	0.48	0.0020	0.82	0.0143	0.89	0.0120	0.37	0.48
18	0.0178	0.54	0.0115	0.70	0.0075	0.80	0.0220	0.26	0.0136	0.27	0.38
19	0.0151	0.34	0.0189	0.65	0.0147	0.46	0.0058	0.75	0.0140	0.30	0.42
>19	0.0297	0.42	0.0236	0.35	0.0273	0.49	0.0146	0.37	0.0241	0.23	0.31
n	209		216		277		234		936		

Estimates of proportion at age with coefficients of variation (analytical and bootstrap estimates) for snapper from the East Northland longline fishery (statistical area 002) in 2006–07.

Random age frequency

Age	Spring		Summer		Autumn		Winter		Longline Spr-win		
(years)	*P.j.*	c.v. (an)	*P.j.*	c.v. (an)	*P.j.*	c.v. (an)	*P.j.*	c.v. (an)	*P.j.*	c.v. (an)	c.v. (bt)
1	0.0000	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.00	0.00
2	0.0000	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.00	0.00
3	0.0000	0.00	0.0000	0.00	0.0144	0.71	0.0060	1.08	0.0082	0.61	0.85
4	0.0110	0.88	0.0054	1.07	0.0425	0.39	0.0940	0.32	0.0442	0.24	0.33
5	0.0144	0.75	0.0450	0.55	0.0766	0.58	0.1591	0.25	0.0829	0.28	0.32
6	0.1112	0.58	0.1527	0.31	0.1461	0.07	0.1508	0.24	0.1443	0.10	0.17
7	0.1106	0.18	0.1318	0.24	0.1766	0.09	0.1005	0.20	0.1431	0.08	0.16
8	0.1352	0.48	0.2697	0.08	0.2693	0.11	0.2337	0.27	0.2454	0.09	0.13
9	0.0310	0.34	0.0164	0.62	0.0065	0.92	0.0321	0.36	0.0171	0.26	0.40
10	0.0282	0.62	0.0634	0.14	0.0105	0.85	0.0223	0.57	0.0248	0.23	0.34
11	0.1448	0.26	0.0695	0.29	0.1367	0.36	0.0602	0.32	0.1078	0.23	0.28
12	0.0522	0.28	0.0180	0.47	0.0017	1.19	0.0195	0.51	0.0147	0.23	0.40
13	0.0527	0.48	0.0175	0.56	0.0178	0.57	0.0249	0.48	0.0235	0.28	0.38
14	0.0491	0.46	0.0350	0.71	0.0139	0.67	0.0084	1.06	0.0205	0.35	0.45
15	0.0471	0.24	0.0151	0.57	0.0106	0.78	0.0193	0.52	0.0177	0.28	0.43
16	0.0289	0.42	0.0350	0.39	0.0124	0.79	0.0209	0.47	0.0204	0.29	0.42
17	0.0242	0.51	0.0384	0.34	0.0014	1.20	0.0120	1.08	0.0132	0.32	0.42
18	0.0388	0.57	0.0168	0.61	0.0076	1.02	0.0160	0.57	0.0149	0.36	0.48
19	0.0507	0.34	0.0173	0.57	0.0194	0.48	0.0108	0.75	0.0207	0.27	0.44
>19	0.0701	0.46	0.0528	0.24	0.0361	0.52	0.0095	0.73	0.0369	0.27	0.36
n	120		155		148		159		582		

Appendix 2 – continued:
Estimates of proportion at age with coefficients of variation (analytical and bootstrap estimates) for snapper from the East Northland longline fishery (statistical area 003) in 2006–07.

												Random age frequency
												Longline
Age	Spring		Summer		Autumn		Winter		Spr-win			
(years)	*P.j.*	c.v. (an)	*P.j.*	c.v. (an)	*P.j.*	c.v. (an)	*P.j.*	c.v. (an)	*P.j.*	c.v. (an)	c.v. (bt)	
1	0.0000	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.00	0.00	
2	0.0000	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.00	0.00	
3	0.0000	0.00	0.0000	0.00	0.0000	0.00	0.0412	0.42	0.0080	0.42	1.02	
4	0.0000	0.00	0.0000	0.00	0.0612	0.72	0.0946	0.37	0.0302	0.36	0.55	
5	0.1484	0.14	0.0285	0.63	0.1349	0.27	0.0716	0.31	0.0895	0.13	0.23	
6	0.1390	0.20	0.1287	0.30	0.1930	0.15	0.2000	0.00	0.1577	0.10	0.16	
7	0.2066	0.23	0.1982	0.15	0.1175	0.12	0.0345	0.19	0.1531	0.11	0.18	
8	0.1691	0.07	0.3571	0.36	0.2228	0.22	0.1709	0.03	0.2446	0.19	0.19	
9	0.0858	0.25	0.0490	0.02	0.0637	0.43	0.1715	0.13	0.0856	0.10	0.23	
10	0.0432	0.51	0.0658	0.62	0.0217	0.62	0.0291	0.20	0.0441	0.35	0.41	
11	0.1002	0.35	0.0176	1.24	0.0540	0.29	0.0497	0.19	0.0530	0.24	0.31	
12	0.0570	0.18	0.0293	0.64	0.0414	0.51	0.0085	1.35	0.0350	0.24	0.36	
13	0.0207	0.61	0.0197	0.90	0.0109	0.84	0.0206	0.42	0.0184	0.40	0.64	
14	0.0000	0.00	0.0402	0.26	0.0069	1.08	0.0206	0.42	0.0192	0.22	0.62	
15	0.0088	1.10	0.0000	0.00	0.0036	1.13	0.0000	0.00	0.0031	0.89	1.07	
16	0.0000	0.00	0.0088	1.24	0.0474	0.48	0.0206	0.42	0.0162	0.37	0.52	
17	0.0000	0.00	0.0197	0.90	0.0036	1.13	0.0170	1.35	0.0108	0.71	0.85	
18	0.0088	1.10	0.0088	1.24	0.0072	1.13	0.0291	0.20	0.0124	0.40	0.61	
19	0.0000	0.00	0.0197	0.90	0.0036	1.13	0.0000	0.00	0.0075	0.82	1.11	
>19	0.0125	0.92	0.0088	1.24	0.0065	0.86	0.0206	0.42	0.0117	0.45	0.67	
n	89		61		129		75		354			

Appendix 3: Estimated mean weight-at-age (kg) and c.v.s for snapper fisheries in SNA 1 in 2006–07.
c.v., coefficient of variation.

Estimates of mean weight-at-age (kg) with coefficients of variation (bootstrap estimates) for snapper from the Bay of Plenty longline fishery in 2006–07.

Age	Spring		Summer		Autumn		Winter		Spr-win	
(years)	Mean	c.v.	Mean	c.v.	Mean	c.v.	Mean	c.v.	Mean	c.v.
1	–	–	–	–	–	–	–	–	–	–
2	–	–	–	–	–	–	–	–	–	–
3	–	–	–	–	–	–	0.44	0.63	0.44	0.63
4	0.60	1.03	0.38	0.38	0.43	0.04	0.47	0.08	0.46	0.17
5	0.61	0.18	0.48	0.06	0.49	0.05	0.58	0.10	0.53	0.05
6	0.57	0.06	0.62	0.07	0.59	0.04	0.70	0.09	0.62	0.03
7	0.62	0.09	0.66	0.04	0.77	0.10	0.76	0.07	0.71	0.04
8	0.78	0.12	0.79	0.05	0.78	0.05	0.81	0.06	0.79	0.03
9	0.86	0.16	1.17	0.11	0.95	0.08	1.13	0.16	1.03	0.06
10	1.24	0.59	1.12	0.20	1.22	0.23	1.51	0.26	1.26	0.15
11	1.14	0.12	1.25	0.10	1.21	0.18	1.26	0.17	1.22	0.08
12	1.08	0.19	1.41	0.24	1.30	0.65	1.52	0.37	1.33	0.23
13	1.74	0.15	1.88	0.47	1.12	0.86	1.76	0.53	1.57	0.27
14	2.11	0.39	2.22	1.09	–	–	–	–	2.17	0.51
15	–	–	–	–	–	–	–	–	–	–
16	2.23	0.41	–	–	–	–	2.77	1.03	2.51	0.49
17	–	–	1.74	1.00	–	–	–	–	1.74	1.01
18	–	–	–	–	–	–	2.79	0.56	2.79	0.56
19	–	–	2.09	0.57	–	–	1.43	1.06	1.79	0.51
>19	1.85	1.05	2.71	0.61	–	–	3.08	1.00	2.57	0.48

Estimates of mean weight-at-age (kg) with coefficients of variation (bootstrap estimates) for snapper from the Hauraki Gulf longline fishery in 2006–07.

Age	Spring		Summer		Autumn		Winter		Spr-win	
(years)	Mean	c.v.	Mean	c.v.	Mean	c.v.	Mean	c.v.	Mean	c.v.
1	–	–	–	–	–	–	–	–	–	–
2	–	–	–	–	–	–	–	–	–	–
3	–	–	–	–	–	–	–	–	–	–
4	–	–	–	–	0.38	0.49	0.54	0.38	0.43	0.34
5	0.47	0.16	0.46	0.15	0.46	0.05	0.52	0.04	0.47	0.07
6	0.57	0.06	0.54	0.05	0.54	0.06	0.57	0.09	0.55	0.03
7	0.65	0.09	0.60	0.06	0.56	0.07	0.66	0.07	0.61	0.04
8	0.70	0.09	0.72	0.08	0.80	0.10	0.82	0.09	0.74	0.05
9	0.88	0.13	0.82	0.08	0.77	0.11	0.79	0.07	0.82	0.06
10	1.07	1.00	0.74	0.39	1.10	0.18	1.00	0.13	0.95	0.23
11	0.96	0.16	1.21	0.09	0.85	0.13	0.89	0.10	1.02	0.06
12	1.12	0.16	1.20	0.14	1.51	0.23	1.05	0.09	1.24	0.10
13	1.02	0.15	1.65	0.21	1.11	0.28	1.42	0.16	1.32	0.12
14	2.36	0.40	1.14	0.21	1.22	0.44	1.13	0.12	1.49	0.20
15	1.07	0.66	1.06	0.34	1.09	0.47	1.33	0.23	1.10	0.22
16	1.52	0.21	2.57	0.27	1.29	0.31	1.74	0.17	1.86	0.16
17	1.19	0.25	1.32	0.33	–	–	1.62	0.59	1.32	0.21
18	1.49	0.30	2.37	0.17	1.63	0.48	1.54	0.19	1.85	0.15
19	2.24	0.65	3.35	0.41	1.21	0.50	–	–	2.39	0.32
>19	1.50	0.28	3.15	0.18	2.53	0.38	2.27	0.16	2.45	0.14

Appendix 3 – continued:
Estimates of mean weight-at-age (kg) with coefficients of variation (bootstrap estimates) for snapper from the East Northland longline fishery in 2006–07.

Age	Spring		Summer		Autumn		Winter		Spr-win	
(years)	Mean	c.v.	Mean	c.v.	Mean	c.v.	Mean	c.v.	Mean	c.v.
1	–	–	–	–	–	–	–	–	–	–
2	–	–	–	–	–	–	–	–	–	–
3	–	–	–	–	0.41	0.50	0.48	0.58	0.44	0.39
4	0.60	0.99	0.60	1.00	0.45	0.15	0.49	0.13	0.49	0.14
5	0.53	0.16	0.48	0.33	0.50	0.15	0.55	0.06	0.51	0.10
6	0.65	0.11	0.55	0.08	0.56	0.08	0.58	0.06	0.58	0.04
7	0.65	0.09	0.57	0.05	0.62	0.11	0.72	0.19	0.64	0.06
8	0.74	0.09	0.68	0.04	0.69	0.10	0.73	0.09	0.71	0.04
9	0.91	0.17	0.81	0.33	1.22	0.47	0.75	0.14	0.95	0.18
10	0.84	0.27	0.85	0.20	0.85	0.51	0.83	0.37	0.85	0.18
11	1.18	0.29	0.90	0.35	0.88	0.14	1.20	0.33	1.01	0.14
12	1.12	0.22	0.99	0.32	1.77	0.65	0.81	0.38	1.23	0.28
13	0.99	0.39	0.92	0.54	1.32	0.54	1.48	0.47	1.18	0.26
14	1.12	0.33	1.20	0.33	0.78	0.51	2.19	0.69	1.28	0.30
15	2.44	0.64	1.95	0.68	1.73	0.38	1.17	0.41	1.86	0.29
16	1.22	0.40	1.25	0.46	1.24	0.34	1.79	0.54	1.38	0.24
17	1.18	0.40	1.13	0.44	2.51	0.88	1.61	0.52	1.78	0.41
18	1.80	0.60	1.57	0.52	2.26	0.78	1.91	0.38	1.92	0.32
19	1.69	0.33	1.38	0.56	1.68	0.59	1.42	0.62	1.54	0.35
>19	2.72	0.58	2.05	0.42	1.99	0.36	3.57	0.64	2.49	0.25

Estimates of mean weight-at-age (kg) with coefficients of variation (bootstrap estimates) for snapper from the East Northland (statistical area 002) longline fishery in 2006–07.

Age	Spring		Summer		Autumn		Winter		Spr-win	
(years)	Mean	c.v.	Mean	c.v.	Mean	c.v.	Mean	c.v.	Mean	c.v.
1	–	–	–	–	–	–	–	–	–	–
2	–	–	–	–	–	–	–	–	–	–
3	–	–	–	–	0.41	0.50	0.52	0.71	0.45	0.41
4	0.60	1.07	0.60	1.01	0.43	0.13	0.50	0.05	0.50	0.17
5	0.65	0.48	0.62	0.25	0.50	0.19	0.58	0.06	0.56	0.12
6	0.72	0.18	0.66	0.08	0.55	0.12	0.59	0.06	0.60	0.06
7	0.78	0.16	0.78	0.08	0.62	0.17	0.60	0.04	0.66	0.08
8	0.95	0.13	0.89	0.08	0.67	0.15	0.77	0.13	0.77	0.08
9	1.32	0.30	1.12	0.63	1.41	0.63	0.71	0.20	1.18	0.32
10	1.06	0.49	1.10	0.08	0.71	1.04	0.67	0.31	0.81	0.29
11	1.20	0.19	1.20	0.11	0.87	0.18	0.81	0.04	0.96	0.09
12	1.32	0.27	1.03	0.35	1.97	0.97	0.99	0.39	1.50	0.48
13	1.19	0.25	0.92	0.32	1.35	0.62	1.25	0.29	1.23	0.33
14	1.12	0.33	1.60	0.47	0.66	0.60	1.81	0.87	1.15	0.34
15	2.01	0.40	1.95	0.66	1.63	0.37	1.17	0.41	1.62	0.25
16	1.22	0.41	1.43	0.20	0.97	0.63	1.20	0.36	1.14	0.26
17	1.18	0.40	1.42	0.26	2.92	0.98	1.80	0.68	2.19	0.52
18	1.68	0.39	1.86	0.42	2.48	1.06	1.49	0.41	2.05	0.46
19	1.69	0.36	1.47	0.61	1.55	0.68	1.42	0.56	1.52	0.40
>19	2.61	0.20	2.67	0.25	1.85	0.45	2.39	0.58	2.21	0.23

Appendix 3 – continued:
Estimates of mean weight-at-age (kg) with coefficients of variation (bootstrap estimates) for snapper from the East Northland (statistical area 003) longline fishery in 2006–07.

Age	Spring		Summer		Autumn		Winter		Spr-win	
(years)	Mean	c.v.	Mean	c.v.	Mean	c.v.	Mean	c.v.	Mean	c.v.
1	–	–	–	–	–	–	–	–	–	–
2	–	–	–	–	–	–	–	–	–	–
3	–	–	–	–	–	–	0.42	0.76	0.42	0.77
4	–	–	–	–	0.48	0.40	0.47	0.24	0.48	0.26
5	0.48	0.09	0.40	0.57	0.51	0.21	0.52	0.10	0.47	0.16
6	0.62	0.13	0.49	0.12	0.58	0.11	0.57	0.11	0.56	0.06
7	0.60	0.12	0.47	0.07	0.63	0.11	0.85	0.39	0.61	0.10
8	0.65	0.11	0.57	0.05	0.74	0.09	0.69	0.11	0.65	0.05
9	0.73	0.17	0.65	0.33	0.78	0.13	0.79	0.13	0.72	0.12
10	0.74	0.31	0.73	0.33	1.19	0.49	1.02	0.65	0.88	0.22
11	1.17	0.38	0.75	0.72	0.90	0.24	1.65	0.56	1.07	0.26
12	1.03	0.30	0.97	0.48	1.31	0.22	0.60	0.94	0.98	0.20
13	0.91	0.62	0.92	0.98	1.24	1.02	1.74	0.95	1.14	0.47
14	–	–	0.99	0.45	1.07	1.06	2.63	0.99	1.45	0.49
15	2.63	0.98	–	–	1.97	1.04	–	–	2.35	0.77
16	–	–	1.15	0.94	1.88	0.19	2.48	0.99	1.70	0.42
17	–	–	0.99	0.96	1.53	1.10	1.39	0.75	1.24	0.53
18	1.85	0.95	1.43	1.00	1.73	0.86	2.40	0.54	1.79	0.43
19	–	–	1.33	0.99	1.97	1.07	–	–	1.56	0.75
>19	2.77	1.01	1.74	1.00	2.32	0.56	4.95	0.99	2.75	0.50

Appendix 4 – continued:
Estimates of proportion of length at age for snapper sampled from the Bay of Plenty, spring-winter 2006–07.
(Note: Aged to 01/01/07)

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	1.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
25	0	0	0	0.65	0.35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	17
26	0	0	0	0.44	0.41	0.10	0.05	0	0	0	0	0	0	0	0	0	0	0	0	0	39
27	0	0	0.04	0.32	0.40	0.13	0.02	0.09	0	0	0	0	0	0	0	0	0	0	0	0	47
28	0	0	0	0.08	0.35	0.25	0.19	0.13	0	0	0	0	0	0	0	0	0	0	0	0	72
29	0	0	0	0.05	0.28	0.35	0.15	0.16	0.01	0	0	0	0	0	0	0	0	0	0	0	80
30	0	0	0	0.02	0.12	0.32	0.25	0.23	0.06	0	0	0	0	0	0	0	0	0	0	0	84
31	0	0	0	0	0.05	0.22	0.36	0.32	0.03	0.01	0	0	0	0	0	0	0	0	0	0	74
32	0	0	0	0.01	0.04	0.13	0.17	0.44	0.16	0.01	0.03	0	0	0	0	0	0	0	0	0	70
33	0	0	0	0.02	0.06	0.08	0.21	0.48	0.15	0	0	0	0	0	0	0	0	0	0	0	52
34	0	0	0	0	0.08	0.08	0.10	0.46	0.15	0.05	0.05	0.03	0	0	0	0	0	0	0	0	39
35	0	0	0	0	0	0.05	0.15	0.49	0.21	0.03	0.03	0.05	0	0	0	0	0	0	0	0	39
36	0	0	0	0	0	0.03	0.15	0.24	0.35	0.09	0.09	0.03	0.03	0	0	0	0	0	0	0	34
37	0	0	0	0	0.05	0.14	0.19	0.19	0.24	0	0.10	0.10	0	0	0	0	0	0	0	0	21
38	0	0	0	0	0	0.03	0.06	0.26	0.35	0	0.19	0.06	0.03	0	0	0	0	0	0	0	31
39	0	0	0	0	0	0	0.05	0.30	0.05	0	0.45	0.05	0.10	0	0	0	0	0	0	0	20
40	0	0	0	0	0	0.06	0.06	0.17	0.28	0.11	0.28	0.06	0	0	0	0	0	0	0	0	18
41	0	0	0	0	0	0	0	0.24	0.24	0.18	0.12	0.12	0.06	0	0	0	0	0	0.06	0	17
42	0	0	0	0	0	0	0	0.09	0.09	0.18	0.27	0.27	0	0	0	0.09	0	0	0	0	11
43	0	0	0	0	0	0	0	0	0.20	0.20	0	0.10	0.50	0	0	0	0	0	0	0	10
44	0	0	0	0	0	0	0	0	0.25	0	0.25	0.25	0.13	0	0	0	0.13	0	0	0	8
45	0	0	0	0	0	0	0	0	0	0.10	0.30	0.30	0.10	0	0	0.10	0	0	0	0.10	10
46	0	0	0	0	0	0	0	0	0	0	0	0.67	0	0.33	0	0	0	0	0	0	3
47	0	0	0	0	0	0	0	0	0	0	0.25	0	0.25	0	0	0	0	0	0.50	0	4
48	0	0	0	0	0	0	0	0	0	0	0	0.25	0.25	0.50	0	0	0	0	0	0	4
49	0	0	0	0	0	0	0	0	0.50	0.50	0	0	0	0	0	0	0	0	0	0	2
50	0	0	0	0	0	0	0	0	0.33	0	0.33	0	0	0	0	0	0	0.33	0	0	3
51	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00	1
52	0	0	0	0	0	0	0	0	0	0	0	0	0.25	0.25	0	0.25	0	0	0	0.25	4
53	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.50	0	0.50	0	0	2
54	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00	1
55	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
56	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
57	0	0	0	0	0	0	0	0	0	0	0	0	1.00	0	0	0	0	0	0	0	1
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
76	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
77	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
78	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
79	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total																					819

Appendix 4 – continued:
Estimates of proportion of length at age for snapper sampled from the Hauraki Gulf, spring-winter 2006–07. (Note: Aged to 01/01/07)

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	0.17	0.33	0	0.17	0.17	0	0	0	0	0.17	0	0	0	0	0	0	0	6
26	0	0	0	0	0.50	0.17	0.17	0.11	0.06	0	0	0	0	0	0	0	0	0	0	0	18
27	0	0	0	0.02	0.33	0.24	0.09	0.16	0.09	0	0	0.02	0	0	0	0.04	0	0	0	0	45
28	0	0	0	0.05	0.19	0.33	0.14	0.15	0.03	0.01	0.03	0.01	0.03	0	0	0.01	0.01	0	0	0	78
29	0	0	0	0	0.13	0.34	0.22	0.13	0.07	0.01	0.06	0.01	0.02	0	0	0	0	0	0	0	89
30	0	0	0	0	0.03	0.22	0.23	0.28	0.10	0.01	0.05	0.03	0	0.01	0	0.02	0	0	0	0	86
31	0	0	0	0.01	0	0.12	0.23	0.32	0.15	0	0.02	0.06	0.02	0.02	0.01	0.02	0	0.01	0	0	93
32	0	0	0	0	0.01	0.07	0.19	0.38	0.11	0	0.06	0.03	0.04	0.01	0.04	0.01	0.01	0.01	0.01	0	72
33	0	0	0	0	0	0.01	0.21	0.25	0.18	0.01	0.12	0.04	0.04	0.03	0.03	0.04	0	0	0.01	0.01	68
34	0	0	0	0	0	0.04	0.09	0.38	0.09	0.09	0.11	0.13	0	0.02	0.02	0	0.02	0	0	0.02	55
35	0	0	0	0	0	0.02	0.05	0.35	0.12	0.02	0.11	0.18	0.04	0.02	0	0.05	0.02	0.02	0.02	0	57
36	0	0	0	0	0	0	0	0.29	0.11	0.05	0.24	0.13	0.05	0.03	0.05	0.05	0	0	0	0	38
37	0	0	0	0	0	0	0	0.10	0.17	0.10	0.19	0.13	0.12	0.02	0.02	0.06	0.02	0.06	0.02	0	52
38	0	0	0	0	0	0	0.03	0.16	0.28	0	0.13	0.19	0.09	0.06	0	0.03	0.03	0	0	0	32
39	0	0	0	0	0	0	0.07	0.22	0.19	0.04	0.19	0.11	0.04	0	0.04	0.04	0	0.07	0	0	27
40	0	0	0	0	0	0	0	0	0.13	0.08	0.25	0.25	0.08	0.08	0.04	0	0	0.08	0	0	24
41	0	0	0	0	0	0	0	0.08	0.04	0.08	0.12	0.04	0.08	0.15	0.12	0.08	0	0.12	0.04	0.08	26
42	0	0	0	0	0	0.05	0	0.05	0.05	0	0.26	0.05	0.11	0.11	0	0.11	0.11	0.11	0	0	19
43	0	0	0	0	0	0	0	0.13	0.06	0.06	0.06	0.31	0.06	0	0.06	0.13	0	0.13	0	0	16
44	0	0	0	0	0	0	0	0	0.06	0	0.13	0.13	0.06	0.13	0.13	0.19	0.06	0.13	0	0	16
45	0	0	0	0	0	0	0	0.08	0.15	0	0.08	0.08	0.15	0	0	0.15	0	0.08	0.08	0.15	13
46	0	0	0	0	0	0	0	0	0	0	0.07	0.14	0.07	0.07	0.14	0.14	0.07	0.21	0	0.07	14
47	0	0	0	0	0	0	0	0	0	0.13	0.06	0.19	0.19	0	0	0.19	0.06	0.06	0	0.13	16
48	0	0	0	0	0	0	0	0	0	0	0	0.20	0.10	0	0	0.20	0.10	0.10	0	0.30	10
49	0	0	0	0	0	0	0	0	0	0.13	0	0.13	0.13	0	0	0.38	0.13	0	0	0.13	8
50	0	0	0	0	0	0	0	0	0	0	0	0.20	0.20	0	0	0	0	0.60	0	0	5
51	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.20	0.20	0	0	0.20	0.40	5
52	0	0	0	0	0	0	0	0	0	0	0.25	0	0	0	0	0.25	0	0.25	0	0.25	4
53	0	0	0	0	0	0	0	0	0	0	0.14	0	0	0.14	0.14	0.14	0	0.29	0	0.14	7
54	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00	0	0	0	0	1
55	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.50	0	0	0	0.50	4
56	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.25	0.75	0	0	4
57	0	0	0	0	0	0	0	0	0	0	0	0	0	0.50	0	0	0	0	0	0.50	2
58	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.67	0.33	3
59	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.50	0	0	0.50	0	2
60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00	1
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	1.00	0	0	0	0	1
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	1.00	1
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
76	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
77	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
78	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
79	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total																					1018

Appendix 4 – continued:
Estimates of proportion of length at age for snapper sampled from East Northland (statistical areas 002 and 003 combined), spring-winter 2006–07. (Note: Aged to 01/01/07)

Length (cm)	Age (years) 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	>19	No. 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	1.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
24	0	0	0	0	0.50	0.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
25	0	0	0	0.08	0.31	0.38	0.23	0	0	0	0	0	0	0	0	0	0	0	0	0	13
26	0	0	0.08	0.16	0.24	0.16	0.19	0.14	0.03	0	0	0	0	0	0	0	0	0	0	0	37
27	0	0	0.04	0.15	0.15	0.31	0.17	0.15	0	0.02	0	0	0	0	0	0	0	0	0	0	52
28	0	0	0	0.11	0.12	0.25	0.21	0.22	0.03	0.03	0.04	0	0	0	0	0	0	0	0	0	76
29	0	0	0	0.09	0.16	0.18	0.19	0.27	0.04	0.01	0.05	0	0.01	0	0	0	0	0	0	0	85
30	0	0	0.01	0.08	0.08	0.26	0.10	0.32	0.09	0.02	0.02	0.02	0	0.01	0	0	0	0	0	0	92
31	0	0	0.01	0.02	0.17	0.15	0.21	0.32	0.02	0.02	0.04	0.01	0.01	0	0.01	0	0	0	0	0	82
32	0	0	0	0	0.12	0.19	0.15	0.24	0.12	0.03	0.15	0	0.01	0	0	0	0	0	0	0	68
33	0	0	0	0	0.03	0.19	0.17	0.30	0.06	0.03	0.16	0.02	0.02	0.02	0	0	0	0	0.02	0	64
34	0	0	0	0	0.05	0.07	0.10	0.32	0.15	0.05	0.12	0.10	0	0	0	0.02	0	0	0	0.02	41
35	0	0	0	0	0	0.05	0.20	0.25	0	0.05	0.11	0.05	0.11	0.05	0.02	0.07	0.02	0.02	0	0	44
36	0	0	0	0	0.05	0.10	0.10	0.19	0.07	0.07	0.17	0.07	0	0.05	0.02	0	0.05	0.02	0.05	0	42
37	0	0	0	0	0	0	0.08	0.36	0	0.20	0.12	0.12	0	0.08	0	0	0.04	0	0	0	25
38	0	0	0	0	0	0	0.04	0.26	0.07	0.04	0.15	0.04	0.11	0.04	0.04	0.07	0.07	0.04	0.04	0	27
39	0	0	0	0	0	0	0.04	0.28	0.08	0.08	0.16	0.04	0.08	0.04	0.04	0.08	0	0.08	0	0	25
40	0	0	0	0	0	0.10	0	0.14	0.10	0.10	0.14	0	0.10	0.10	0	0.05	0	0	0.19	0	21
41	0	0	0	0	0	0	0	0	0	0.13	0.13	0.07	0	0	0.07	0.07	0.13	0.20	0	0.20	15
42	0	0	0	0	0	0	0.10	0.10	0.10	0	0.05	0.10	0.15	0	0.10	0.10	0.10	0	0	0.10	20
43	0	0	0	0	0	0	0.06	0.06	0	0.06	0.22	0.11	0	0	0.11	0.22	0.11	0	0.06	0	18
44	0	0	0	0	0	0	0	0.08	0	0	0	0.08	0.17	0.17	0.08	0.17	0	0.08	0	0.17	12
45	0	0	0	0	0	0	0	0	0	0	0.14	0.14	0	0.14	0.14	0	0.14	0.29	0	0	7
46	0	0	0	0	0	0	0	0.10	0	0.10	0.20	0.10	0	0	0.10	0.10	0.10	0.10	0.10	0	10
47	0	0	0	0	0	0	0	0	0.14	0	0	0.14	0	0.14	0	0.29	0	0	0	0.29	7
48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.14	0	0.43	0.14	0.29	7
49	0	0	0	0	0	0	0	0	0	0	0.13	0	0	0	0.13	0.13	0.25	0	0.13	0.25	8
50	0	0	0	0	0	0	0	0	0.14	0	0	0.14	0	0	0	0.14	0	0.14	0.14	0.29	7
51	0	0	0	0	0	0	0	0	0	0	0	0	0	0.50	0.25	0	0	0.25	0	0	4
52	0	0	0	0	0	0	0	0	0	0	0	0	0.20	0	0	0	0	0	0	0.80	5
53	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.33	0	0.33	0.33	3
54	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.33	0	0	0.33	0	0.33	3
55	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00	2
56	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
57	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.50	0	0	0	0	0.50	2
58	0	0	0	0	0	0	0	0	0	0	0.33	0	0	0	0	0	0	0	0.33	0.33	3
59	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.50	0	0.50	2
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	1.00	0	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	1.00	1
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	1.00	1
67	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00	1
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
76	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
77	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
78	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
79	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total																					936

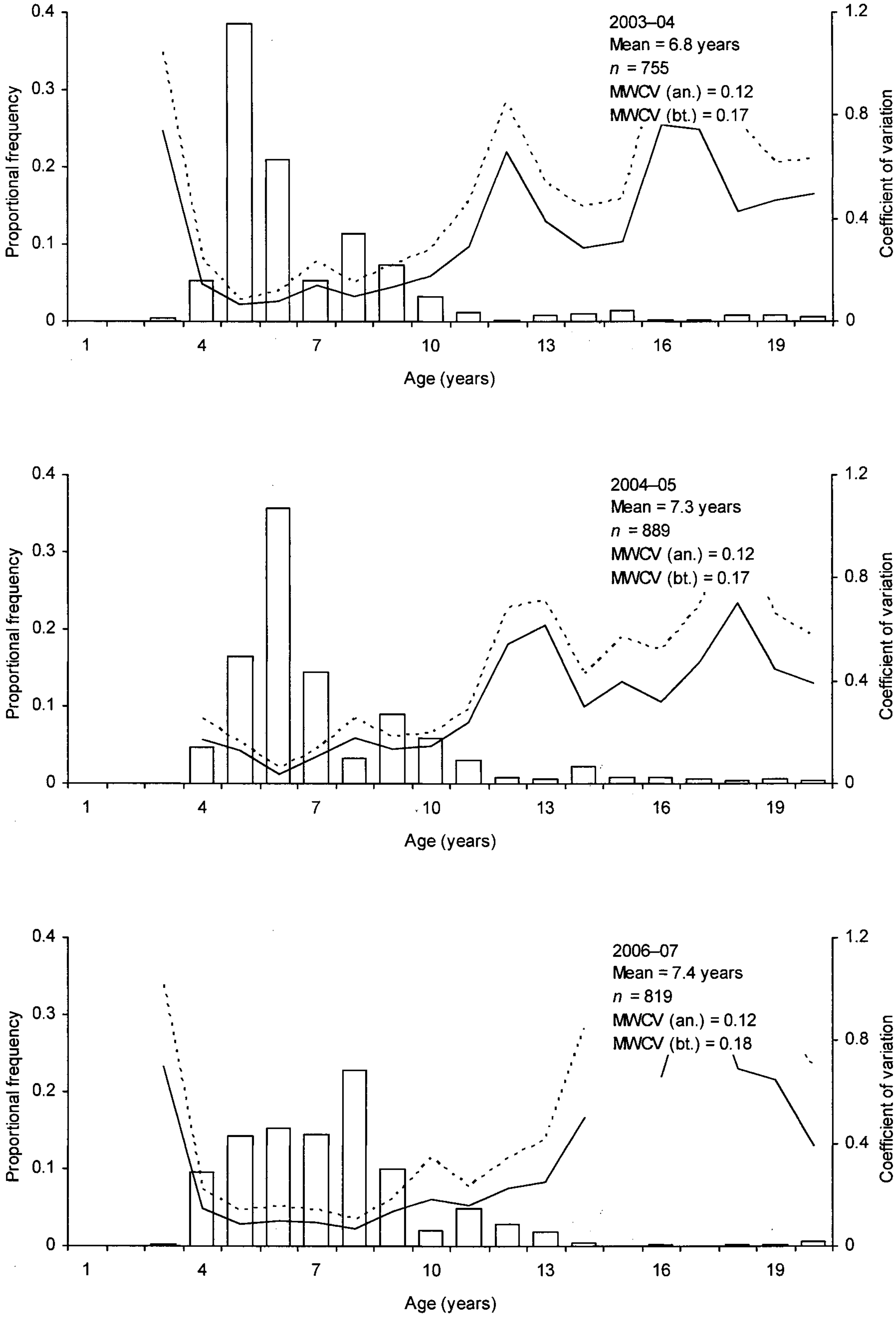
Appendix 4 – continued:
Estimates of proportion of length at age for snapper sampled from East Northland (statistical area 002), spring-winter 2006–07. (Note: Aged to 01/01/07)

Length (cm)	Age (years) 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	>19	No. 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	0.25	0.50	0.25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4
26	0	0	0.15	0.31	0.08	0.31	0.08	0.08	0	0	0	0	0	0	0	0	0	0	0	0	13
27	0	0	0.05	0.14	0.14	0.45	0.18	0.05	0	0	0	0	0	0	0	0	0	0	0	0	22
28	0	0	0	0.17	0.11	0.29	0.20	0.20	0	0	0.03	0	0	0	0	0	0	0	0	0	35
29	0	0	0	0.06	0.21	0.13	0.21	0.30	0.02	0	0.06	0	0.02	0	0	0	0	0	0	0	53
30	0	0	0.02	0.12	0.09	0.28	0.12	0.28	0.02	0.02	0.04	0	0	0.02	0	0	0	0	0	0	57
31	0	0	0.02	0.02	0.16	0.16	0.25	0.32	0	0.02	0.02	0	0	0	0.02	0	0	0	0	0	44
32	0	0	0	0	0.14	0.20	0.14	0.24	0.08	0.02	0.18	0	0.02	0	0	0	0	0	0	0	51
33	0	0	0	0	0.05	0.14	0.17	0.33	0	0.05	0.19	0	0.02	0.02	0	0	0	0	0.02	0	42
34	0	0	0	0	0.04	0.11	0.04	0.39	0.07	0.07	0.11	0.11	0	0	0	0.04	0	0	0	0.04	28
35	0	0	0	0	0	0.05	0.24	0.22	0	0.05	0.14	0	0.11	0.03	0.03	0.08	0.03	0.03	0	0	37
36	0	0	0	0	0.07	0.04	0.11	0.21	0	0.07	0.18	0.07	0	0.07	0.04	0	0.04	0.04	0.07	0	28
37	0	0	0	0	0	0	0.06	0.44	0	0.11	0.17	0.17	0	0	0	0	0.06	0	0	0	18
38	0	0	0	0	0	0	0	0.29	0.10	0	0.14	0.05	0.14	0.05	0.05	0.05	0.05	0.05	0.05	0	21
39	0	0	0	0	0	0	0.06	0.35	0	0.06	0.18	0	0.06	0.06	0.06	0.12	0	0.06	0	0	17
40	0	0	0	0	0	0.07	0	0.20	0.07	0.13	0.07	0	0.07	0.13	0	0.07	0	0	0.20	0	15
41	0	0	0	0	0	0	0	0	0	0.18	0.09	0	0	0	0.09	0.09	0.18	0.09	0	0.27	11
42	0	0	0	0	0	0	0.13	0.07	0.13	0	0.07	0	0.20	0	0.13	0.07	0.07	0	0	0.13	15
43	0	0	0	0	0	0	0.09	0.09	0	0	0.27	0.09	0	0	0.18	0.09	0.09	0	0.09	0	11
44	0	0	0	0	0	0	0	0	0	0	0	0	0.14	0.29	0.14	0.14	0	0.14	0	0.14	7
45	0	0	0	0	0	0	0	0	0	0	0.17	0.17	0	0.17	0.17	0	0.17	0.17	0	0	6
46	0	0	0	0	0	0	0	0.17	0	0	0.17	0.17	0	0	0	0.17	0.17	0.17	0	0	6
47	0	0	0	0	0	0	0	0	0.20	0	0	0	0	0.20	0	0.20	0	0	0	0.40	5
48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.50	0.25	0.25	4
49	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.20	0	0.40	0	0.20	0.20	5
50	0	0	0	0	0	0	0	0	0.20	0	0	0	0	0	0	0	0	0.20	0.20	0.40	5
51	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00	0	0	0	0	0	0	1
52	0	0	0	0	0	0	0	0	0	0	0	0	0.25	0	0	0	0	0	0	0.75	4
53	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.33	0	0.33	0.33	3
54	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.33	0	0	0.33	0	0.33	3
55	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00	2
56	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
57	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.50	0	0	0	0	0.50	2
58	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.50	0.50	2
59	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.50	0	0.50	2
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	1.00	0	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	0	0
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	1.00	1
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
76	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
77	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
78	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
79	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total																					582

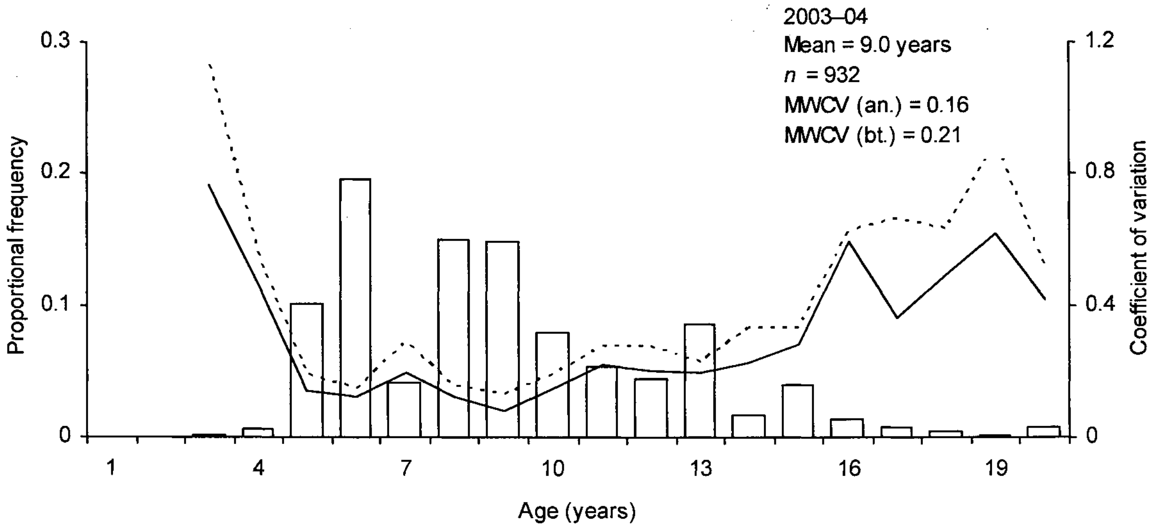
Appendix 4 – continued:
Estimates of proportion of length at age for snapper sampled from East Northland (statistical area 003), spring-winter 2006–07. (Note: Aged to 01/01/07)

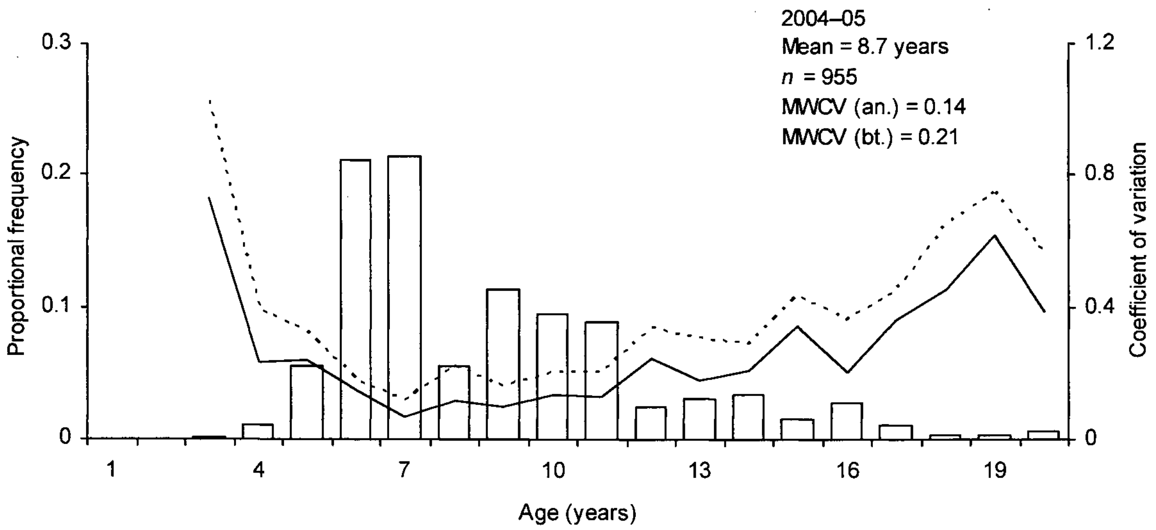
Length (cm)	Age (years) 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	>19	No. aged
20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23	0	0	0	0	0	1.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
24	0	0	0	0	0.50	0.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
25	0	0	0	0	0.22	0.44	0.33	0	0	0	0	0	0	0	0	0	0	0	0	0	9
26	0	0	0.04	0.08	0.33	0.08	0.25	0.17	0.04	0	0	0	0	0	0	0	0	0	0	0	24
27	0	0	0.03	0.17	0.17	0.20	0.17	0.23	0	0.03	0	0	0	0	0	0	0	0	0	0	30
28	0	0	0	0.05	0.12	0.22	0.22	0.24	0.05	0.05	0.05	0	0	0	0	0	0	0	0	0	41
29	0	0	0	0.16	0.09	0.25	0.16	0.22	0.06	0.03	0.03	0	0	0	0	0	0	0	0	0	32
30	0	0	0	0	0.06	0.23	0.06	0.37	0.20	0.03	0	0.06	0	0	0	0	0	0	0	0	35
31	0	0	0	0.03	0.18	0.13	0.16	0.32	0.05	0.03	0.05	0.03	0.03	0	0	0	0	0	0	0	38
32	0	0	0	0	0.06	0.18	0.18	0.24	0.24	0.06	0.06	0	0	0	0	0	0	0	0	0	17
33	0	0	0	0	0	0.27	0.18	0.23	0.18	0	0.09	0.05	0	0	0	0	0	0	0	0	22
34	0	0	0	0	0.08	0	0.23	0.15	0.31	0	0.15	0.08	0	0	0	0	0	0	0	0	13
35	0	0	0	0	0	0	0	0.43	0	0	0	0.29	0.14	0.14	0	0	0	0	0	0	7
36	0	0	0	0	0	0.21	0.07	0.14	0.21	0.07	0.14	0.07	0	0	0	0	0.07	0	0	0	14
37	0	0	0	0	0	0	0.14	0.14	0	0.43	0	0	0	0.29	0	0	0	0	0	0	7
38	0	0	0	0	0	0	0.17	0.17	0	0.17	0.17	0	0	0	0	0.17	0.17	0	0	0	6
39	0	0	0	0	0	0	0	0.13	0.25	0.13	0.13	0.13	0.13	0	0	0	0	0.13	0	0	8
40	0	0	0	0	0	0.17	0	0	0.17	0	0.33	0	0.17	0	0	0	0	0	0.17	0	6
41	0	0	0	0	0	0	0	0	0	0	0.25	0.25	0	0	0	0	0	0.50	0	0	4
42	0	0	0	0	0	0	0	0.20	0	0	0	0.40	0	0	0	0.20	0.20	0	0	0	5
43	0	0	0	0	0	0	0	0	0	0.14	0.14	0.14	0	0	0	0.43	0.14	0	0	0	7
44	0	0	0	0	0	0	0	0.20	0	0	0	0.20	0.20	0	0	0.20	0	0	0	0.20	5
45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00	0	0	1
46	0	0	0	0	0	0	0	0	0	0.25	0.25	0	0	0	0.25	0	0	0	0.25	0	4
47	0	0	0	0	0	0	0	0	0	0	0	0.50	0	0	0	0.50	0	0	0	0	2
48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.33	0	0.33	0	0.33	3
49	0	0	0	0	0	0	0	0	0	0	0.33	0	0	0	0	0.33	0	0	0	0.33	3
50	0	0	0	0	0	0	0	0	0	0	0	0.50	0	0	0	0.50	0	0	0	0	2
51	0	0	0	0	0	0	0	0	0	0	0	0	0	0.33	0.33	0	0	0.33	0	0	3
52	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00	1
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	1.00	0	0	0	0	0	0	0	0	0	1
59	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
61	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
62	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
63	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
64	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00	1
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
76	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
77	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
78	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
79	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total																					354

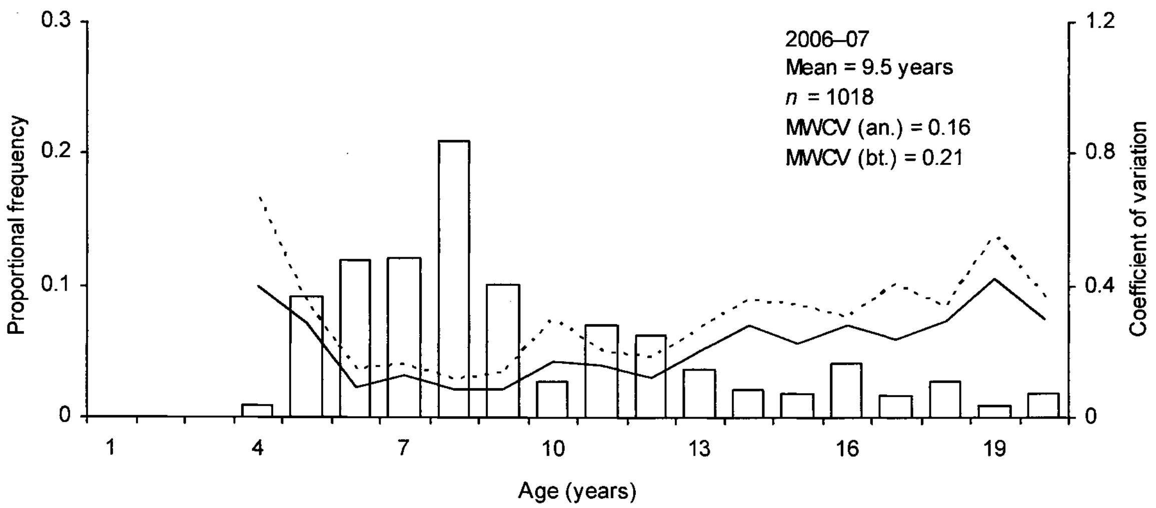
Appendix 5: Comparison of the proportion at age distributions determined from snapper landings sampled year-round from the Bay of Plenty longline fishery in 2003–04, 2004–05, and 2006–07 (*n*, sample size).



Appendix 5 – continued: Comparison of the proportion at age distributions determined from snapper landings sampled year-round from the Hauraki Gulf longline fishery in 2003–04, 2004–05, and 2006–07 (*n*, sample size).







Appendix 5 – continued: Comparison of the proportion at age distributions determined from snapper landings sampled year-round from the East Northland longline fishery in 2003–04, 2004–05, and 2006–07 (*n*, sample size).