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EXECUTIVE SUMMARY

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Commercial purse seine and trawl catches of kahawai in KAH 1, 2, 3, and 8 were sampled during May 2005–June 2006 as part of the Ministry of Fisheries funded research project KAH2005–03 "Stock monitoring of kahawai – commercial catches".

A total of 53 landings were sampled, 5936 fish were measured, and 2442 otolith pairs were collected, of which 1724 were prepared and read. All sampling was carried out on shore in fish processing factories. The sampling coverage of the purse seine fishery exceeded 50% of the total catch for all QMAs. Twenty-one landings were sampled in KAH 1 (18 purse seine, 3 trawl), 2 in KAH 2, 16 in KAH 3 (14 trawl and 2 purse seine), and 14 in KAH 8. Sampling of trawl bycatch in KAH 1 and KAH 3 was sparse, coverage was 10% and 4% of the total catch. As this was a preliminary, exploratory analysis, difficulties arose in obtaining the appropriate level of coverage for gear type and area. Various communication delays at the sampling sheds were common, with the result that the desired level of sampling coverage was not achieved.

Estimated numbers-at-length and numbers-at-age were calculated using all available groomed length and length-at-age data separately by sex and scaled to estimates of the total catch from each of the fisheries. Bootstrapped coefficients of variation (c.v.s) and mean-weighted c.v.s (MW c.v.s) were computed for each length- and age class and overall for each length- and age-frequency distribution in each analysis. Analyses were completed for four QMAs, two subareas in KAH 1 (East Northland and Bay of Plenty), and target vs. non-target catch in the purse seine fishery in KAH 1.

The fisheries in KAH 1, 2, and 8 comprised fish between the ages of 2 and 19; KAH 3 fisheries caught slightly older fish (age 22). The bulk of the catch for most fisheries in all areas was in the age range 4–15 years. In KAH 1 and KAH 3, purse seine fisheries generally caught more younger fish than the trawl fisheries in KAH 1 and 3. Trawl fisheries tended to catch older fish that were not captured in the purse seine fisheries (all areas). The East Northland purse seine fishery caught more fish aged 12–13 than purse seine fisheries in the Bay of Plenty or other QMAs. Target purse seine fisheries in KAH 1 caught younger and smaller fish than non-target purse seine fisheries in KAH 1.

Mean weighted c.v.s for each fishstock were close to the target of 30%. However, estimating catch-at-length and at age for separate subareas or target/non-target fisheries resulted in very large MW c.v.s because of a lack of sampling. If finer divisions for each kahawai QMA are wanted in the future, shed sampling coverage will need to be improved. Sampling of Hauraki Gulf was nonexistent and sampling coverage of the East Northland purse seine fishery was very low. This was an exploratory, preliminary year for analysing commercial catches for kahawai, and some uncertainty over the sampling design did exist. This analysis highlighted areas where additional sampling needs to be completed and includes the KAH 2 trawl fishery, the KAH 8 purse seine fishery, and the set-net fishery (all QMAs).

1. INTRODUCTION

Kahawai (*Arripis trutta* and *A. xylabion*) is a coastal, schooling, pelagic species aggregate found in coastal seas, harbours, estuaries, and occasionally saltwater sections of rivers around the North, South, Kermadec, and Chatham Islands. Kahawai were introduced into the New Zealand Quota Management System (QMS) at the beginning of the 2004–05 fishing year and are currently managed as six Quota Management Areas (QMAs): KAH 1, 2, 3, 4, 8, and 10 (Figure 1).

Kahawai supports important commercial, recreational, and Māori customary fisheries. Most of the commercial catch for kahawai comes from KAH 1, 2, and 8 (Figure 1), with the majority usually taken in KAH 1. The total commercial catch for the 2005–06 fishing year was 1982 t (Table 1).

Commercial fishers take kahawai by a variety of methods (Table 2). A substantial amount is taken seasonally in set net fisheries and as bycatch in longline and trawl fisheries; however, most of the catch is taken by purse seine fisheries. Purse seine vessels target skipjack tuna (*Katsuwonus pelamis*) between December and May and the catches contain very little bycatch (Jones 1995). When skipjack are not available, typically June to November, the fleet fishes for a mix of species including kahawai, jack mackerels (*Trachurus* spp.), trevally (*Pseudocaranx dentex*) and blue mackerel (*Scomber australasicus*). Since kahawai and mackerels school together, kahawai are often taken as bycatch from vessels targeting mackerels. Species are 'caught on demand' as the market dictates, and therefore fluctuations in catches between years may be more a reflection of market demand than stock dynamics (Jones 1995).

Between 1 January 2000 and 1 March 2005, commercial landings were recorded at 91 landing points, but the total landings at most sites were less than 1% of the total landings (Appendix A). Five sites landed 87% of the total landings: Tauranga (55%), Mt Maunganui (13%), Onehunga (10%), Nelson (7%), and Auckland (2%).

Kahawai is a popular recreational species, but recreational fishing surveys currently do not distinguish between the two kahawai species. Recreational catches of kahawai are considered significant in the context of the overall stock removals, and may be more than 50% of the total removals in some areas. The uncertainty associated with estimates of recreational catch is likely to impair the ability to assess the status of stocks, particularly in KAH 1, 2, and 8.

Kahawai is an important traditional food fish for Māori and, although there is very little information available to allow estimation of the amount of kahawai taken in the traditional Māori fishery, catches are assumed moderate in the context of the overall stock removals.

Kahawai have been aged using otoliths, and the ageing technique has been validated (Stevens & Kalish 1998). Recent work on the kahawai recreational fishery (KAH2003/01) adopted an ageing method based on thin sections, as was developed by Stevens & Kalish (1998). The maximum recorded age of kahawai reported by Stevens & Kalish (1998) was 26 years.

This report fulfils a revised Objective 1 of the Ministry of Fisheries project KAH2005–03. The original wording, from the MFish tender document, was as follows:

"To determine the length and age composition of the commercial landings of kahawai in selected KAH areas for the 2005–06 fishing year. The target coefficient of variation (c.v.) for the catch at age will be 30% (mean weighted c.v. across all age classes)".

In correspondence following submission of the NIWA tender, MFish requested that the work be based on sampling beginning on 1 June 2005 and that "substantive elements of this project [be brought forward] to mid 2006", thus requiring completion of sampling some time before 30 June 2006. NIWA agreed to these changes and conducted the work accordingly.

2. METHODS

2.1 Catch and effort data extraction

All fishing trips and associated fishing and landing events records where kahawai landings were recorded from QMAs 1, 2, 3, or 8 between 1 May 2005 and 30 June 2006 were extracted from the Ministry of Fisheries catch-effort and landing database. This is not the typical fishing year, but covered the period of kahawai targeting in the purse seine fishery.

2.2 Commercial catch sampling

The results from Project KAH2004–01 *Characterisation of the kahawai fisheries* were unavailable for consideration when planning the sampling scheme, therefore, a simple summary based on an extract from the catch-effort database (Tables 1 and 2, Appendix A) was used in developing the catch-monitoring programme for commercial kahawai landings. The main gears (purse seine, bottom trawl and set net) were to be sampled from KAH 1, 2, 3, and 8, from the main landing points. This was a preliminary, exploratory analysis. Difficulties arose in obtaining the planned level of coverage for gear type and area. Various communication delays resulted in the inability to achieve the planned level of sampling at the sampling sheds. The results and conclusions of the stock assessment modelling under KAH2005–01 will determine future requirements for catch monitoring of commercial catches, in particular the periodicity of sampling and any future stratification.

Purse seine catches landed were to be sampled according to a random stratified design; however, this was not always the case. Purse seine landings were hampered by the way that skippers often split their catch between holds to maintain balance of the vessel at sea. Some of the vessels used a graded system, others did not.

Sampling by grade provided a set of sampling strata that were reasonably homogeneous with respect to fish size. At the Sanford factory in Tauranga, grades were based on the weight classes: 0–1 kg, 1–2 kg, and over 2 kg. Each sampled landing was characterised by its grade weights, which were available from factory records. Several samples ranging between 3 and 800 kg were taken at random from each grade, which consisted of one sample for each grade chosen at random morning and evening throughout the landing. The sampled weight of the catch from most strata was typically less than 10% of the total stratum weight.

Sampling of the trawl catch and some purse seine landings were based on the ungraded sampling approach used previously at Sanfords South Island (e.g., Manning et al. 2006), modified to sample multiple length classes instead of multiple species. A sample of about 200 kg was taken and measured.

Sampling was conducted from May 2005 to June 2006 and covered the period of kahawai targeting in the purse seine fishery. There was no spatial or temporal allocation of sampling effort; effort was kept consistent throughout the sampling year. Length, to the nearest centimetre below actual fork length, and sex were recorded for each fish sampled. Otoliths were taken at a lower rate than length frequency data. Sampling was non-random and fish were selected so that size classes were equally represented, with more otoliths collected from larger size classes. This is a similar approach to that currently being used for jack and blue mackerels (e.g., Manning et al. 2006).

All landings and length-frequency data were processed and loaded onto the Ministry of Fisheries database *market* (Fisher & Mackay 2005). All otoliths collected were inventoried and lodged in the Ministry of Fisheries otolith collection, and the data were loaded onto the Ministry of Fisheries database *age* (Mackay & George 2006).

2.3 Otolith preparation and analysis

2.3.1 Preparation and reading

Preparation of kahawai otoliths require thin sectioning according to the method described by Stevens & Kalish (1998), who showed that using whole otoliths to age kahawai was unreliable. Up to five otoliths were embedded in blocks of clear epoxy resin (Araldite K142) and cured at 50 °C overnight. Once hardened, a 270 μm thin transverse section was cut from each block through the primordia using a Struers Accutom-2 high speed saw. The thin section was washed, dried, embedded under a cover slip on a glass microscopic slide using K142 Araldite, and left overnight to cure.

Thin sections were read by two readers with a bright field stereomicroscope at x100 magnification. A pattern of hyaline (light) and opaque (dark) zones was described by Stevens & Kalish (1998). The number of complete opaque zones (i.e., opaque zones with hyaline material outside them) were counted. To minimise bias, otolith readers performed blind reading, i.e., they did not have access to fish length and sex data.

As a preliminary step, a sub-sample of 100 otoliths, covering the total size range of fish, was assessed to formulate a standardised reading procedure, based on the protocol outlined by Stevens &Kalish (1998). This sub-sample was used to set the protocol. Once readers were confident with their interpretation of those otoliths, the entire sample was aged.

One reader read all otoliths. Because counting growth rings in otoliths is subjective (different readers may produce different results for the same otolith), "between-reader" variability was determined using data collected by a second reader who independently read a sub-sample of 497 otoliths. Both readers assigned each otolith a zone count and a readability value to indicate the degree of confidence in the zone count according to the following scale:

1 = zones very clear (the reader had a high level of confidence in their band count);
2 = zones relatively clear (the reader may be up to 1 band out);
3 = zones average in clarity (the reader may be up to 2 bands out);
4 = zones relatively unclear (the reader was not confident in band count, possibly more than 2 bands out);
5 = zones unreadable.

Otoliths assigned a readability value of 4 or 5 by either reader were re-examined jointly, using a microscope and image enhancing software. Consensus on the zone count was reached or the otolith was discarded from the analysis. "Within-reader" variability was not assessed; reader one did not re-read a subsection of otoliths.

In young blue mackerel (under 6 years), Morrison et al. (2001) classed the distance from the last visible opaque zone to the otolith edge as either narrow, medium, or wide, based on the relative distance between the two outermost opaque zones. That approach was used in the conversion of zone counts to estimated ages. To convert zone counts in otoliths to estimates of age it is necessary to know:

(i) when spawning occurs;
(ii) when the formation of the opaque zone in the otolith is completed;
(iii) when sampling was conducted.

Work by Stevens & Kalish (1998) suggested that kahawai have an annual reproductive cycle with an early January to late February/early March spawning season with a peak in early February, which prompted them to adopt a "birthday" of 1 February. Eggleston (1975) also noted a January to March spawning season, but Drummond (1994) suggested a slightly later season (March to April) for kahawai sampled in central New Zealand and a corresponding birth date of 1 April. Based on the position of an oxytetracycline marker, Stevens & Kalish (1998) have shown that opaque bands are formed annually during winter.

Information on time of spawning, time of zone formation, and sampling time were used to obtain an estimated age from otolith zone counts. For example, an otolith sampled on 1 November, with a single opaque zone and a wide marginal hyaline zone, was allocated an age of 1 year and 9 months (1.75 years). The wide marginal hyaline zone indicated that the opaque zone formed in the second winter was not yet apparent. If the marginal hyaline zone was of narrow or medium thickness, the otolith was attributed an age of 0.75 years.

2.3.2 Quantifying reader precision

Otolith reading precision was quantified by carrying out between-reader comparison tests following the method of Campana et al. (1995). A subsample of 497 otoliths was randomly selected from the set of all prepared otoliths. The otoliths were read by the second reader and the results were compared with the first reader's results. The Index of Average Percentage Error, IAPE (Beamish & Fournier 1981), and mean coefficient of variation, c.v. (Chang 1982), were calculated for each test. The IAPE is

$$\text{IAPE} = 100 \times \frac{1}{N} \sum_{j=1}^{N} \left[\frac{1}{R} \sum_{i=1}^{R} \frac{\left| X_{ij} - X_j \right|}{X_j} \right],$$

and the mean c.v. is

$$\text{mean c.v.} = 100 \times \frac{1}{N} \sum_{j=1}^{N} \left[\frac{\sqrt{\sum_{i=1}^{R} \frac{\left(X_{ij} - X_j \right)^2}{R-1}}}{X_j} \right]$$

where X_{ij} is the ith count of the jth otolith, R is the number of times each otolith is read, and N is the number of otoliths read or re-read.

2.4 Estimating length and age composition of the catch

2.4.1 Catch-at-age

Scaled length and age frequency distributions and c.v.s were estimated using *Catchatage* (Bull & Dunn 2002), an *R* package (R Development Core Team 2005) of functions developed by NIWA that computes scaled length frequency distributions by sex and stratum from commercial catch and length frequency data using the calculations in Bull & Gilbert (2001). If a set of length-at-age data is inputted, it constructs an age-length key, which is then applied to the estimated scaled length frequency distributions to compute estimated scaled age frequency distributions. It computes the c.v. for each length and age class and the overall mean-weighted c.v. (MW c.v.) for each length and age distribution using a bootstrapping routine: fish length records are resampled within each landing, landings are resampled within each stratum, and the length-at-age data are resampled, all with replacement. The bootstrap length and age frequency distributions are computed for each resample, and the c.v.s for each length and age class are computed from the bootstrap distributions.

2.4.2 Length-weight relationship

The length-weight relationship used for both sexes to calculate the catch-at-length was

$$w = 2.36 \times 10^{-5} (l^{2.89})$$

where l is fish length in centimetres and w is fish weight in kilograms. The relationship is based on a linear regression of log-transformed length and weight data (n = 170, 5–60 cm, Eggleston, unpublished data) and is stored in Ministry of Fisheries database *rdb* (Mackay 2001). Data from this study were not used to generate length-weight relationships because no small fish were landed or sampled; length range of sampled kahawai was 22–65 cm.

2.4.3 Analyses

Numbers-at-length were calculated for each catch stratum sampled in each fishstock. Each fishstock was treated as a separate analysis. The KAH 1 and KAH 3 analyses included two strata, one corresponding to the target purse seine fishery, and the second corresponding to the trawl bycatch fishery. The KAH 1 analysis was further broken down, upon recommendations of the Pelagic Working Group, into the subareas: Bay of Plenty, East Northland, and Hauraki Gulf; however, no landings were sampled from the Hauraki Gulf, therefore no analysis of that subarea could be completed. The KAH 2 analysis had one stratum, pertaining to the purse seine fishery, while the KAH 8 analysis (also one stratum) corresponded to the trawl fishery.

The Pelagic Working Group also requested analyses of the purse seine target versus bycatch fisheries for each fishstock in order to determine if the composition of the catch differed between target and bycatch. The analysis could be completed only for KAH 1 (see Results).

Stratum weights were estimated by multiplying the total reported catch in each fishstock by proportions of catch by weight calculated from the corresponding effort and landings data extracted from the *warehou* database. Age-length keys were computed from the groomed length-at-age data subsets for each fishstock and used to convert the calculated numbers-at-length distributions to numbers-at-age. Bootstrapped c.v.s and MW c.v.s were calculated for each length and age class and frequency distribution by resampling the data 1000 times. When estimating numbers-at-age, kahawai were assigned to a minus (or plus) group if small (or large) fish were measured, but not aged.

3. RESULTS

3.1 Summary of KAH 1, 2, 3, and 8 fisheries

Purse seine vessels caught most of the catch in KAH 1, 2, and 3, May 2005 – June 2006, while most of the catch in KAH 8 was captured by trawlers (Table 3). Kahawai are taken as bycatch in the trawl fisheries, and as targeted catch and bycatch in the purse seine fisheries. All kahawai catch in KAH 2 and KAH 3 by purse seines was targeted catch; 54% of KAH 1 and 65% of KAH 8 purse seine catches were targeted.

3.2 Market sampling

The breakdown of the sampling coverage for the purse seine and trawl fisheries is given in Table 4. Fifty-three landings were sampled from four QMAs and 5936 fish were measured. A total of 2442 otolith pairs were collected; 1724 were prepared and read (Table 4).

The sampling coverage of the purse seine fishery exceeded 50% of the total catch for all QMAs. Twenty-one landings were sampled in KAH 1 (18 purse seine, 3 trawl), 2 in KAH 2, 16 in KAH 3 (14 trawl and 2 purse seine), and 14 in KAH 8. Sampling of trawl bycatch in KAH 1 and KAH 3 was sparse, coverage was 10% and 4% of the total catch. The purse seine fishery in KAH 8, the trawl fishery in KAH 2, and the set net fishery were not sampled due to delays in communicating the availability of landings for sampling.

3.3 Otolith reading results

The two readers have comparable results for ageing kahawai otoliths (Table 5). The mean c.v. and IAPE calculated for the readings by the two readers for the same otoliths were 11.72% and 8.29%. The symmetry in Figure 2(a), the relative clustering of points about the zero-line in Figure 2(b), and the one-to-one line in Figure 2(c) also suggested consistency in ageing between readers. There appeared to be few systematic differences (bias) in the interpretation of kahawai otoliths. The slight positive weighting in Figure 2(a) may mean that the second reader slightly under-counted opaque zones relative to the first reader. The bias and precision plots indicated a slight difficulty in estimating the age of fish at ages 5–10 years, as evidenced by the points lying below the 1:1 line and the high c.v. (Figure 2c, d). Otolith rings for fish aged 1 and 2 can be very difficult to find. Measurements were taken of the distance from the nucleus to the 1st and 2nd annuli from 'good' otoliths; these measurements were used to give an indication of the annuli placement on difficult to read otoliths. Most readability scores for the otoliths were 3 or 4 (Table 5).

3.4 Length and age frequency distributions

The estimated scaled proportions-at-length distributions calculated for the main fisheries in KAH 1, 2, 3, and 8 are plotted in Figure 3; also included are proportions-at-length for the East Northland and Bay of Plenty subareas. Cumulative proportions-at-length for the four QMAs and two subareas are plotted in Figure 4, the estimated scaled proportions-at-age distributions in Figure 5, and cumulative proportions-at-age are plotted in Figure 6.

Length distributions were roughly centred around 50 cm for most of the fishstocks and most of the distributions were unimodal (Figure 3). However, the purse seine fishery in KAH 1 was distinctly bimodal, with peaks in length distributions around 35 and 50 cm. The KAH 1, 3, and 8 trawl fisheries had slightly skewed distributions; these fisheries also captured kahawai in the 30–40 cm range. The KAH 1 purse seine fishery captured a higher proportion of smaller fish than the KAH 1 trawl fishery (Figure 4). Trawl fisheries in KAH 3 and KAH 8 caught smaller fish than the trawl fishery in KAH 1. Analyses by subarea in KAH 1 showed no fish under 40 cm were captured in the subareas. A higher proportion of males was captured as bycatch in the trawl fisheries in KAH 1 and 3 and in the subarea East Northland; however, this trend was not reflected in KAH 8. Purse seine fisheries in the Bay of Plenty and KAH 2 also captured a higher proportion of males than females.

The estimated scaled and cumulative proportions-at-age showed that catches in the purse seine fishery in KAH 1 were mostly of fish 3–10 years old (peak at ages 3–4), while slightly older fish were captured by the trawl fisheries (peak at age 6, Figures 5 and 6). Analyses by subarea for KAH 1 showed regional differences. No fish older than age 15 (or younger than age 4) were captured in East Northland; a wider range of ages was captured in the Bay of Plenty. Peaks in the age distribution of males for both fisheries operating in East Northland were at older ages than in the Bay of Plenty and much older for females (ages 12–13 versus age 8). The purse seine fishery and trawl fisheries in KAH 3 captured older fish than the same fisheries in KAH 1. Although scaled proportions-at-age for the trawl fishery in KAH 8 were similar to results for KAH 3, cumulative proportions-at-age showed trawl fisheries in KAH 3 captured a higher proportion of younger fish than in KAH 8.

Data were also split into kahawai target versus bycatch for the purse seine fishery in KAH 1 to determine if the composition of the catch differed between target and bycatch; similar analyses could not be completed for KAH 3 and 8 as the sampled catch came only from target fisheries. Length distributions showed kahawai (target catch) had a strong bimodal distribution, with modes at 33–37 cm and 47–53 cm (Figure 7). Kahawai taken as bycatch had a less definite second mode. Whereas target catch had a strong peak in the length distribution at 33–37 cm, bycatch had a strong peak at 50 cm. Target and non-target fisheries captured a similar age distribution of kahawai, but the distribution peaked at a slightly younger age in the target fishery (Figure 8). Cumulative proportions-at-length and age showed smaller, younger fish were captured in the target fishery (Figures 9 and 10). An equal proportion of each sex was captured in the target and bycatch fisheries.

Length distributions estimated from bycatch in the purse seine fishery were weakly bimodal; both sexes (and combined data) displayed a weak peak at 36 cm and a strong peak at 50 cm. Cumulative proportions at length showed males and females were captured at equal rates in the target and non-target fisheries; however, target fisheries caught a high proportion of the small fish (Figure 9).

The mean weighted c.v.s for numbers and age frequency distributions are given in Table 6. Overall, most analyses for the QMAs were close to the target MW c.v.s of 30%. Analysis of the target versus non-target purse seine fishery in KAH 1 resulted in extremely high MW c.v.s. The high c.v.s may be because only 2 landings were sampled from the target fishery versus 16 landings from the non-target fishery. The East Northland analysis also had high MW c.v.s, which again may be a reflection of the small amount of data from that fishery; data from 3 landings from the purse seine fishery and 1 from the trawl fishery were used. Fourteen landings were sampled from the Bay of Plenty.

Estimated scaled numbers-at-length and c.v.s. are given in Appendix B. Estimated scaled numbers-at-age and c.v.s are given in Appendix C. The age-length keys used to convert the scaled numbers-at-length distributions to numbers-at-age are given in Appendix D.

4. DISCUSSION

Mean weighted c.v.s for each fishstock were close to the target of 30%. However, estimating catch-at-length and at age for separate subareas or target/non-target fisheries resulted in very large MW c.v.s because of a lack of sampling. If finer divisions for each kahawai QMA are wanted in the future, shed sampling coverage will need to be improved. Sampling of Hauraki Gulf was nonexistent and sampling coverage of the East Northland purse seine fishery was very low. This was an exploratory, preliminary year for analysing commercial catches for kahawai, and some uncertainty over the sampling design did exist. This analysis highlighted areas where additional sampling needs to be completed and includes the KAH 2 trawl fishery, the KAH 8 purse seine fishery, and the set net fishery (all QMAs).

Analyses by fishstock showed that there are some difference in sizes and ages captured. The purse seine fishery in KAH 1 catches smaller (and younger) fish than in other QMAs, while the trawl fisheries in KAH 3 and KAH 8 capture more smaller (and younger) fish than the trawl fishery in KAH 1. The oldest fish were caught in KAH 3. Analyses by subarea showed no apparent differences in the size of fish captured in the Bay of Plenty or East Northland, but the Bay of Plenty fishery captured a larger range of ages than the East Northland fisheries. The catch composition did differ between target and bycatch for the purse seine fishery in KAH 1; smaller and younger fish were captured in the target fishery.

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personnel involved with the catch sampling programme, either by participating in the sampling programme directly or providing access to fish and landings data.

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Table 1. Kahawai landings (t) since 2000–01 by QMA and fishing year.

Fishing year	KAH 1	KAH 2	KAH 3	KAH 4	KAH 8	KAH 10	Total
2000–01	1 678	922	425	0	581	0	3 606
2001–02	1 326	857	156	0	489	0	2 831
2002–03	869	855	650	0	542	0	2 916
2003–04	1 641	806	33	0	342	0	2 822
2004–05	1 099	708	129	0	544	0	2 480
2005–06	873	531	233	0	345	0	1 982

Table 2. Total kahawai landings by fishing method between 1 January 2000 and 1 July 2006. Source: MFish catch-effort database. A zero indicates < 0.5 t or < 0.5%.

Fishing method	Estimated weight (t)	Percent of total catch
Purse seine	12 219	74
Bottom trawl	1 760	11
Set-net	1 189	7
Ring-net	561	3
Bottom longline	237	1
Bottom pair trawling	212	1
Inshore drift netting	79	0
Handlining	69	0
Beach-seine/drag netting	56	0
Trolling	26	0
Danish seining - single	10	0
Midwater trawl	3	0
Rock lobster potting	1	0
Trot lines	0	0
Surface/midwater longline	0	0
Pole and line	0	0
Lampara	0	0
Fyke netting	0	0
Drop/dahn lines	0	0
Crab potting	0	0
Cod potting	0	0
Unknown	2	0

Table 3: Kahawai catch (t) and percent total catch by fishing method and QMA over the period May 2005 – June 2006. Zero indicates a catch < 0.5 t or < 0.5% and – denotes zero. Catches from KAH 4 and 10 were not included because catches for most years were zero.

Fishing method	Catch	KAH 1 % Total catch	Catch	KAH 2 % Total catch	Catch	KAH 3 % Total catch	Catch	KAH 8 % Total catch
Purse seine	859	63	643	91	301	91	65	14
Set-net	206	15	9	1	4	1	76	16
Ring-net	83	6	–	–	–	–	23	5
Handlining	66	5	–	–	0	0	1	0
Bottom trawl	65	5	52	7	26	8	267	56
Bottom longline	59	4	0	0	0	0	3	1
Beach-seine/drag nets	10	1	–	–	0	0	–	–
Danish seining - single	5	0	0	0	1	0	0	0
Bottom trawl - pair	4	0	–		0	0	30	6
Trolling	0	0	0	0	0	0	3	1
Midwater trawl	–	–	0	0	1	0	1	0
Inshore drift netting	–	–	–	–	–	–	10	2
Total	1 358		705		332		478	

Table 4: Breakdown of kahawai sampling by fishery and sex for KAH 1, 2, 3, and 8, 1 May 2005 – 30 June 2006.

Purse seine	Number of fish measured			Catch		
	Male	Female	Unknown	Sampled (t)	Total (t)	% of total
KAH1	2 362	2 520	0	487	859	57
KAH2	523	506	0	391	643	61
KAH3	717	727	0	310	334	93
KAH8	0	0	0	0	0	0

	Otoliths collected			Otoliths aged		
	Male	Female	Unknown	Male	Female	Unknown
KAH1	380	541	0	313	432	0
KAH2	136	141	0	131	135	0
KAH3	193	253	0	93	100	0
KAH8	0	0	0	0	0	0

Trawl	Number of fish measured			Catch		
	Male	Female	Unknown	Sampled (t)	Total (t)	% of total
KAH1	340	218	1	7	69	10
KAH2	0	0	0	0	0	0
KAH3	244	229	0	1	26	4
KAH8	900	860	1	103	297	35

	Otoliths collected			Otoliths aged		
	Male	Female	Unknown	Male	Female	Unknown
KAH1	61	29	0	61	29	0
KAH2	0	0	0	0	0	0
KAH3	196	187	1	89	105	1
KAH8	161	162	1	128	106	1

Table 5: Readability scores for kahawai otoliths by readers; otoliths include only those read by both readers. See Methods for description of readability scores.

	Reader A Readability scores					Reader B Readability scores				
Band count	1	2	3	4	5	1	2	3	4	5
2		0	0	2						
3		0	39	28			7	33	2	0
4		2	71	29			3	61	2	0
5		0	52	16			2	59	2	0
6		4	26	8			7	51	2	0
7		0	18	13			2	31	5	1
8		2	17	12			4	34	11	0
9		1	23	9			4	29	9	0
10		3	18	7			3	16	13	0
11		2	15	4			1	23	5	0
12		2	14	2			2	22	8	0
13		0	11	0			0	13	2	0
14		0	11	2			0	11	1	0
15		0	17	1			2	5	2	0
16		1	5	2			1	2	3	0
17		1	3	0			0	1	0	0
18		0	3	0						
21		0	1	0						

Table 6: Mean-weighted coefficients of variation (%) for the scaled length- and age-frequency distributions calculated for KAH 1, 2, 3, and 8, subareas East Northland and Bay of Plenty, and target vs. non-target fisheries in KAH 1 by analysis stratum and sex. The analyses for each fishstock, subarea, and target vs. non-target fishery were carried out separately. Results are also pooled, c.v.s are combined for all strata from an analysis.

Length				Sex
Fishstock	Stratum	Males	Females	All fish
KAH 1	Purse seine	40.7	40.4	38.9
	Trawl	35.0	45.3	30.0
	– Pooled	37.8	38.7	36.6
	Purse seine – target	63.5	62.0	60.6
	Purse seine – non-target	30.8	29.3	27.8
	– Pooled (incl. trawl)	38.6	38.8	37.2
	East Northland – purse seine	47.5	40.9	39.0
	East Northland – trawl	30.1	48.5	26.6
	– Pooled	34.1	35.9	30.0
	Bay of Plenty	28.2	30.3	25.1
KAH2	Purse seine	27.9	30.1	24.7
KAH 3	Purse seine	35.4	33.4	30.6
	Trawl	46.8	48.8	39.7
	– Pooled	33.5	32.0	29.0
KAH 8	Purse seine	25.5	27.4	19.8

Age				Sex
Fishstock	Stratum	Males	Females	All fish
KAH 1	Purse seine	37.8	36.4	33.9
	Trawl	30.9	34.9	24.8
	– Pooled	36.0	35.3	32.4
	Purse seine – target	62.0	57.6	57.5
	Purse seine – non-target	27.9	26.7	23.1
	– Pooled (incl. trawl)	38.6	36.7	34.6
	East Northland – purse seine	62.7	84.0	61.6
	East Northland – trawl	58.8	81.2	53.7
	– Pooled	58.7	82.7	57.5
	Bay of Plenty	36.2	37.5	26.9
KAH2	Purse seine	35.1	36.2	26.1
KAH 3	Purse seine	37.7	34.8	28.9
	Trawl	43.1	40.2	32.9
	– Pooled	36.4	33.7	27.9
KAH 8	Purse seine	34.4	36.8	26.5

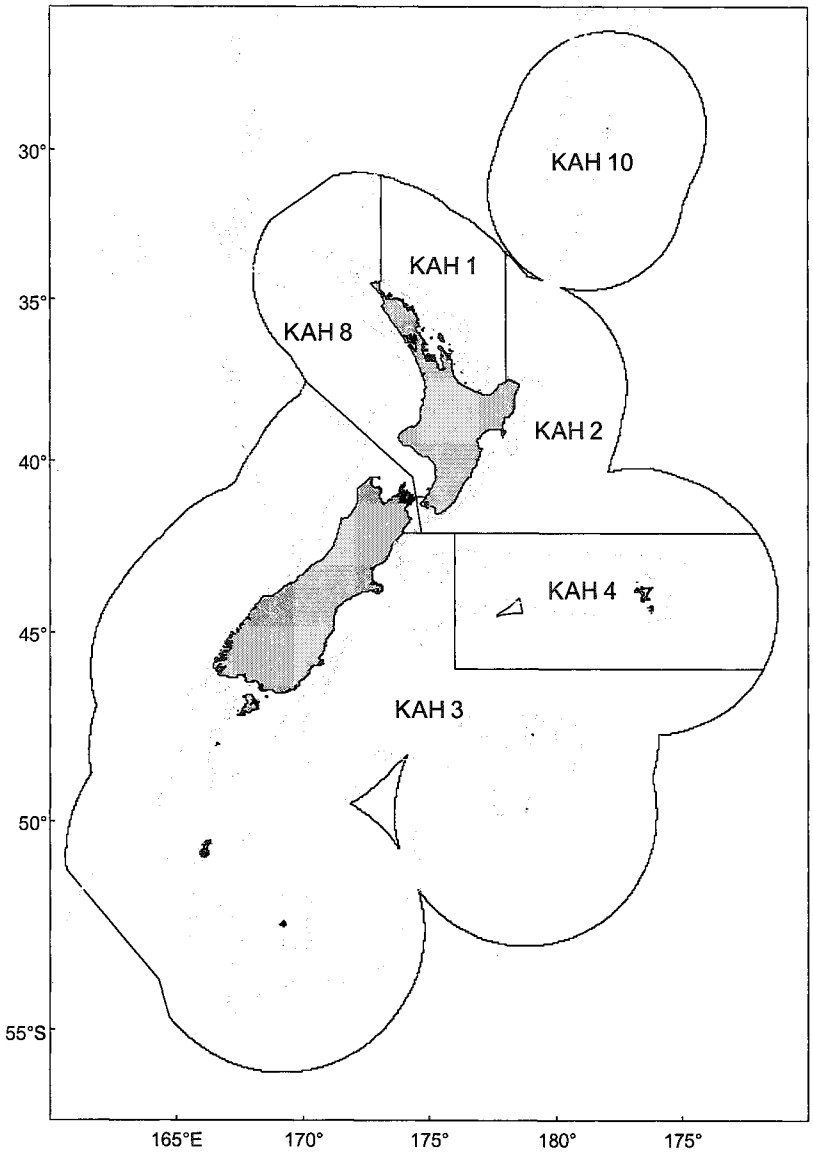

Figure 1. Quota Management Areas (QMAs) KAH 1, 2, 3, 4, 8, and 10 within the New Zealand EEZ. Bathymetry lines indicate 500 and 1000 m.

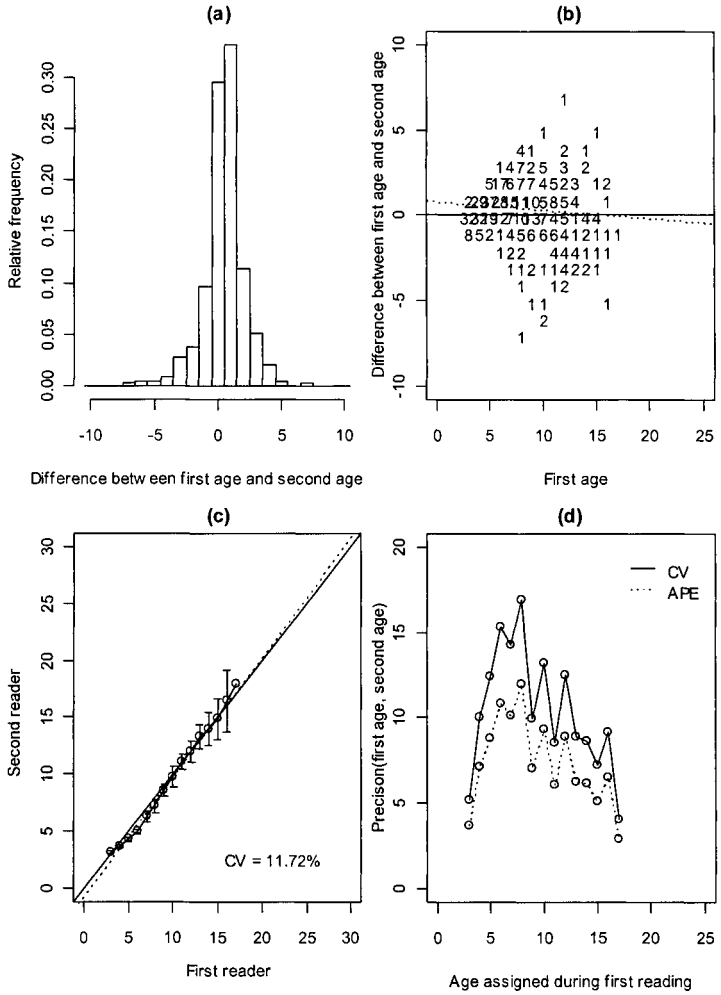

Figure 2: Results of the between-reader comparison test: (a) histograms of differences between readings of the same otolith; (b) differences between the first and second reading for a given age assigned during the first reading; (c) bias plots (error bars indicate $\pm$ 1 standard error); and (d) c.v. and APE profiles relative to the ages assigned during the first set of readings. The expected one-to-one (solid line) and actual relationship (dashed line) between the first and second ages are overlaid on (b) and (c).

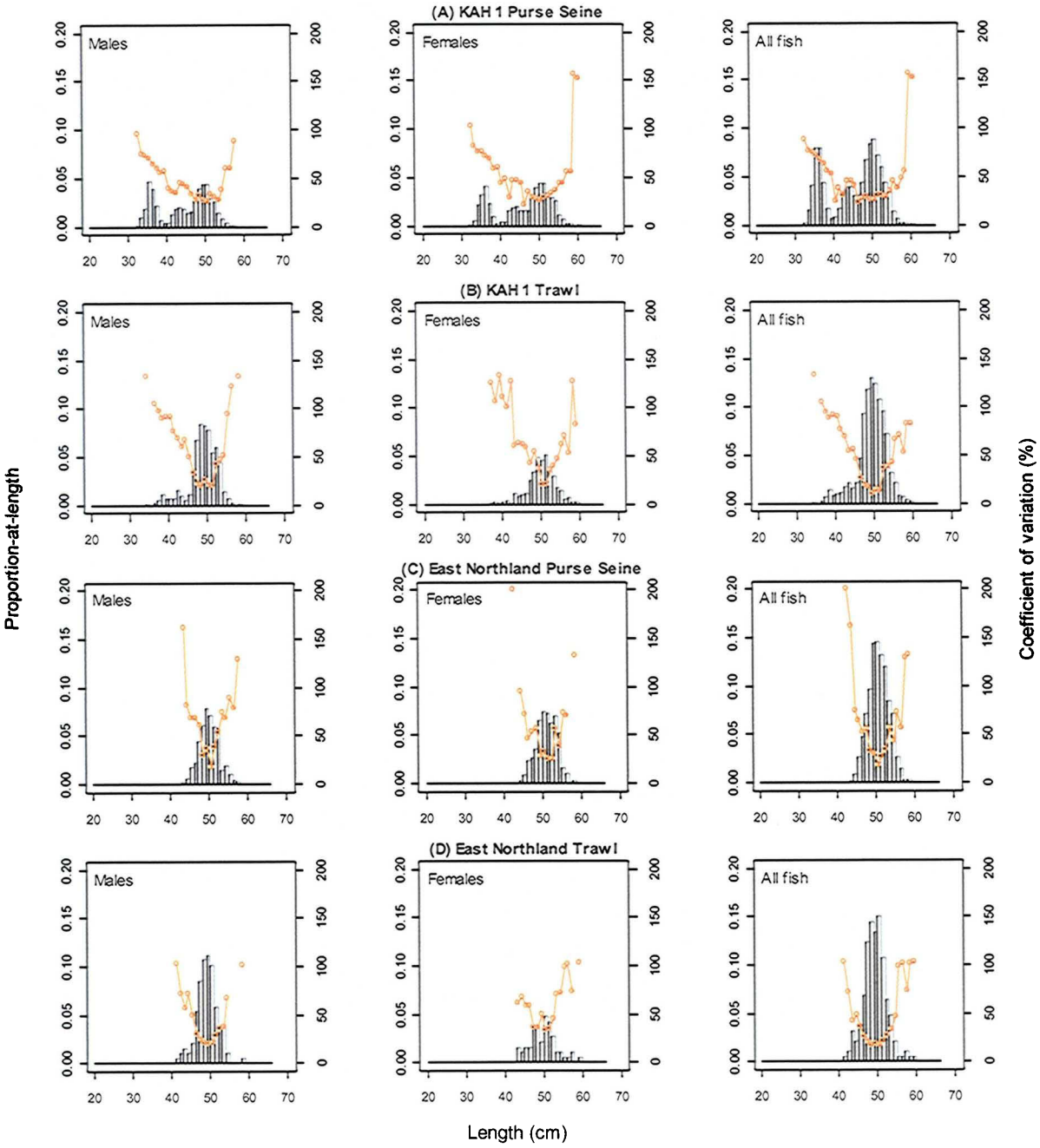

Figure 3: Estimated scaled proportions-at-length for male, female, and all fish combined for the KAH 1 purse seine and trawl fisheries, KAH 1 subareas: East Northland and Bay of Plenty, KAH 2 purse seine fishery, KAH 3 purse seine and trawl fisheries, and KAH 8 trawl fishery for the 2005–06 study period with the bootstrapped 95% coefficient of variation for each length class. Study period was May 2005 – June 2006.

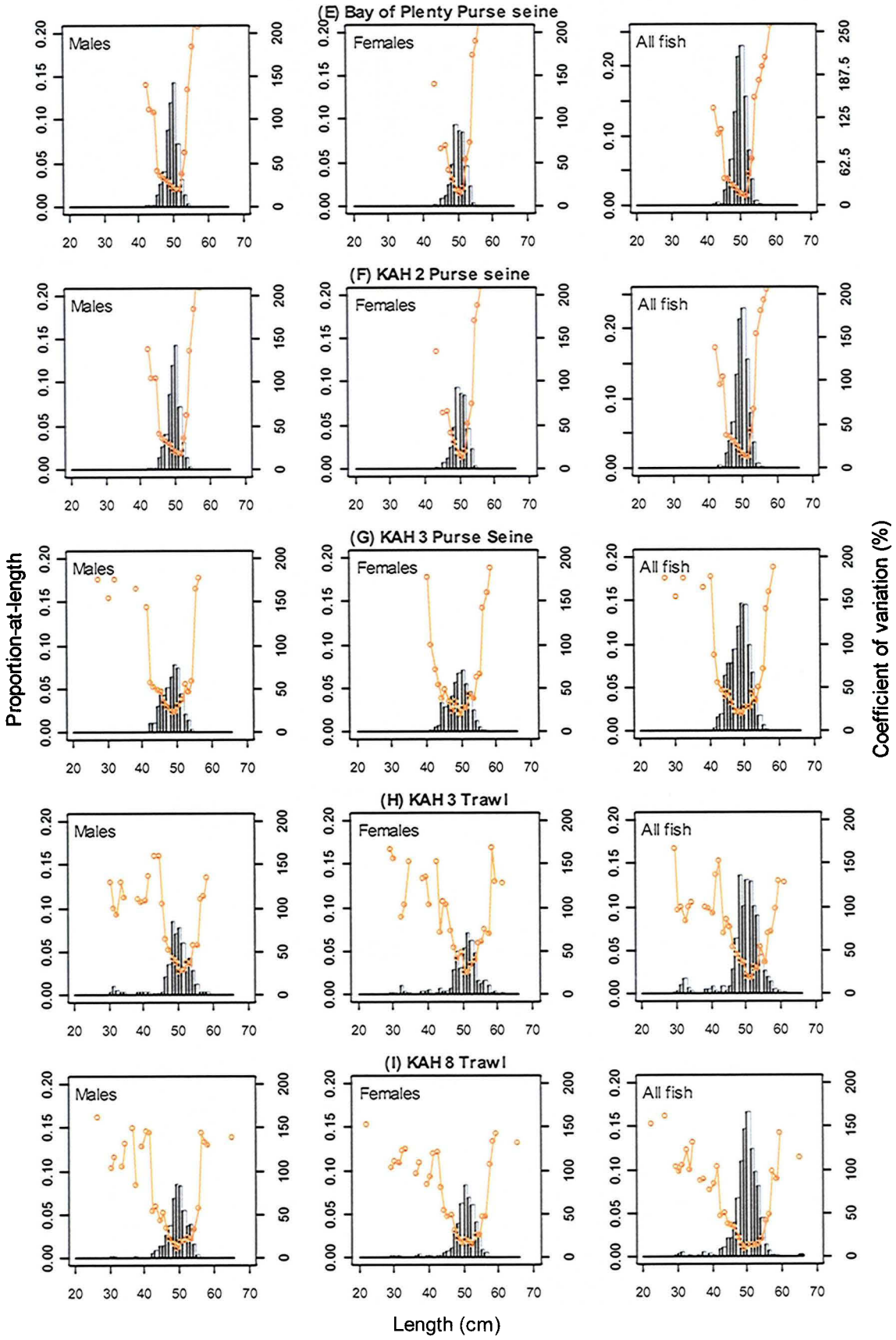

Figure 3: ***Continued.***

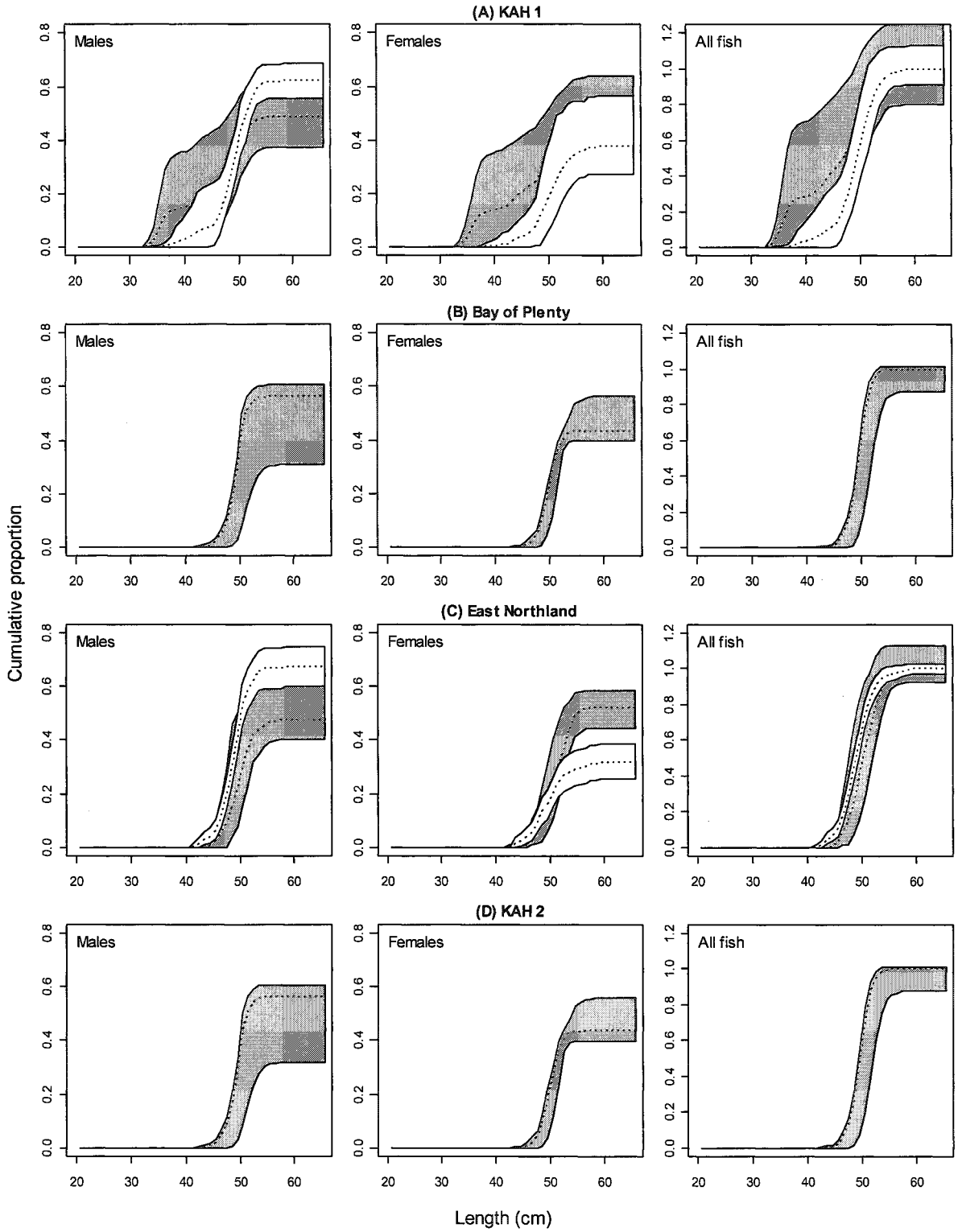

Figure 4: Cumulative proportions-at-length for KAH 1, 2, 3, and 8 and two subareas in KAH 1: Bay of Plenty and East Northland. The dashed lines are the cumulative proportions-at-length and the shaded regions are the bootstrapped 95% confidence regions. Grey shaded data are from the purse seine fisheries, while white denotes bottom trawl fisheries.

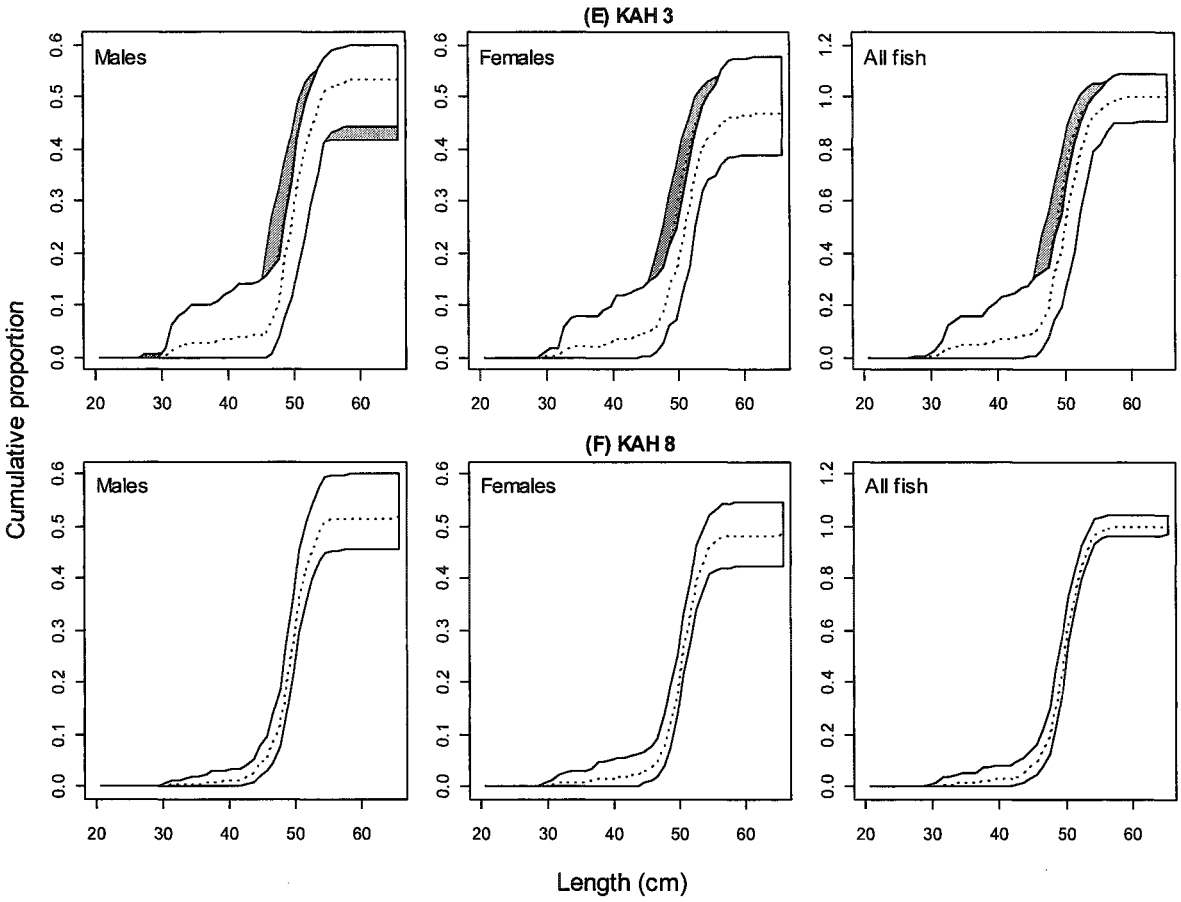

Figure 4: ***Continued.***

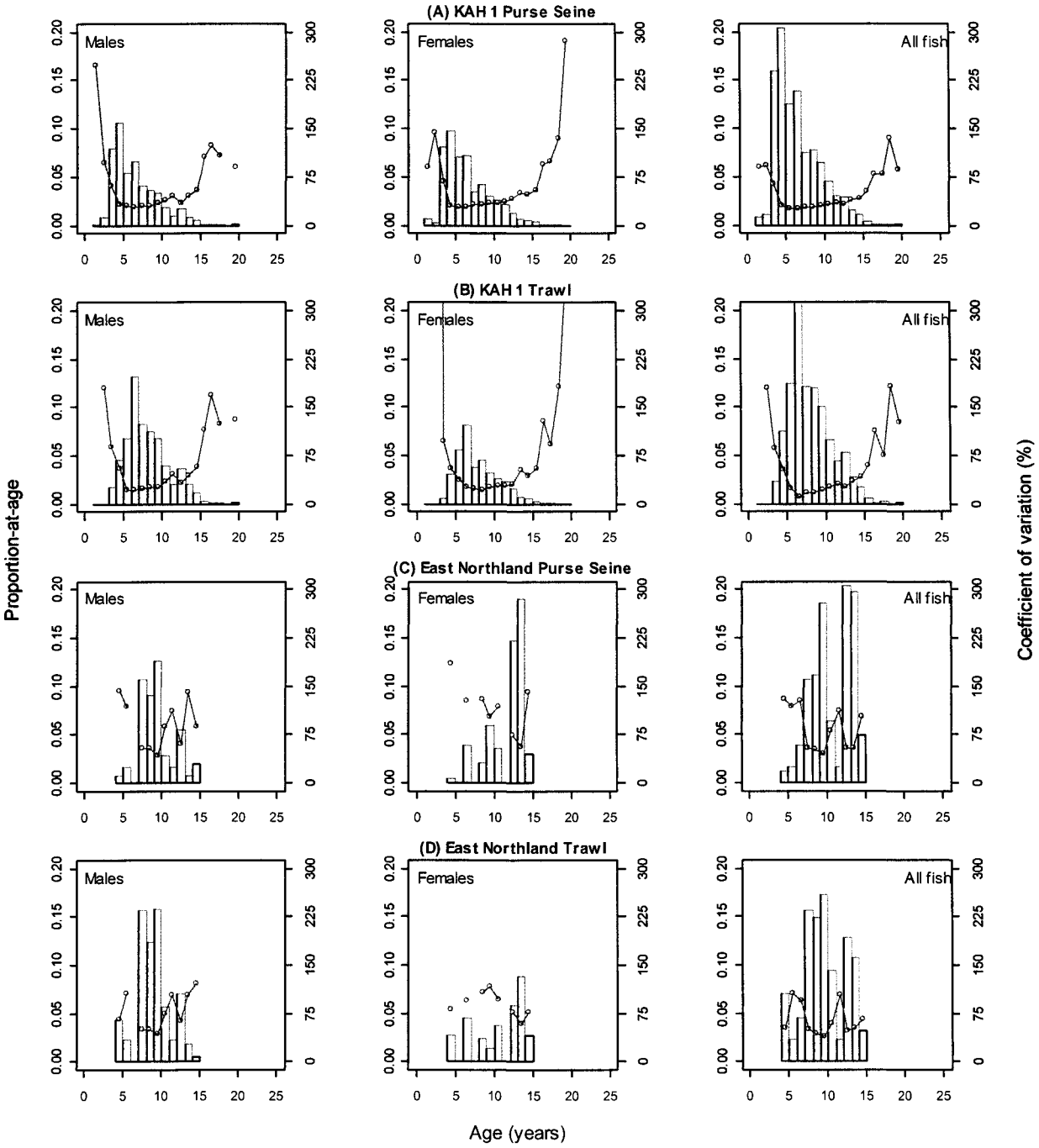

Figure 5: Estimated scaled proportions-at-age for male, female, and all fish combined for the KAH 1 purse seine and trawl fisheries, KAH 1 subareas: East Northland and Bay of Plenty, KAH 2 purse seine fishery, KAH 3 purse seine and trawl fisheries, and KAH 8 trawl fishery for the 2005–06 study period with the bootstrapped 95% coefficient of variation for each length class. Study period was May 2005 – June 2006.

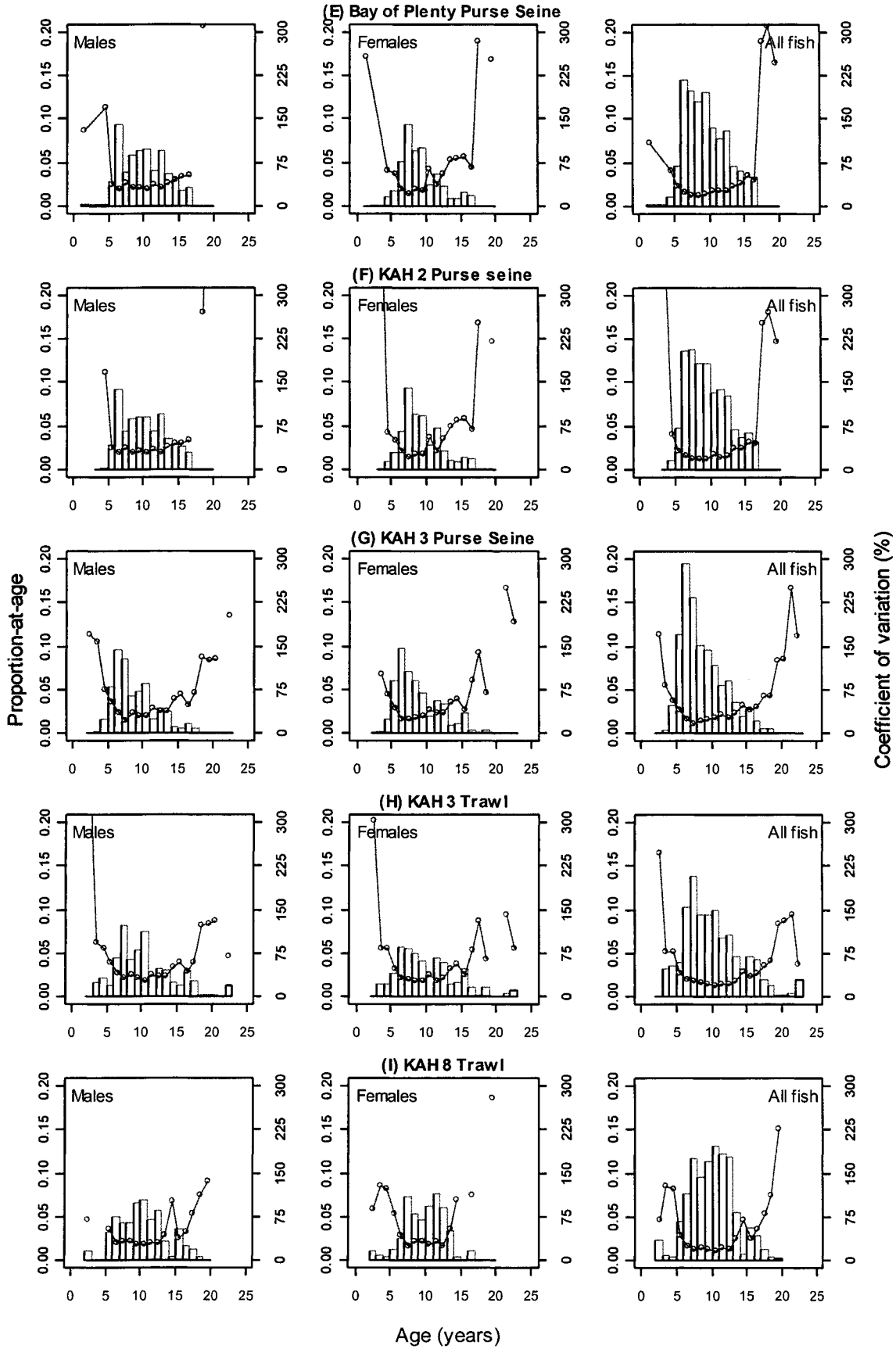

Figure 5: ***Continued.***

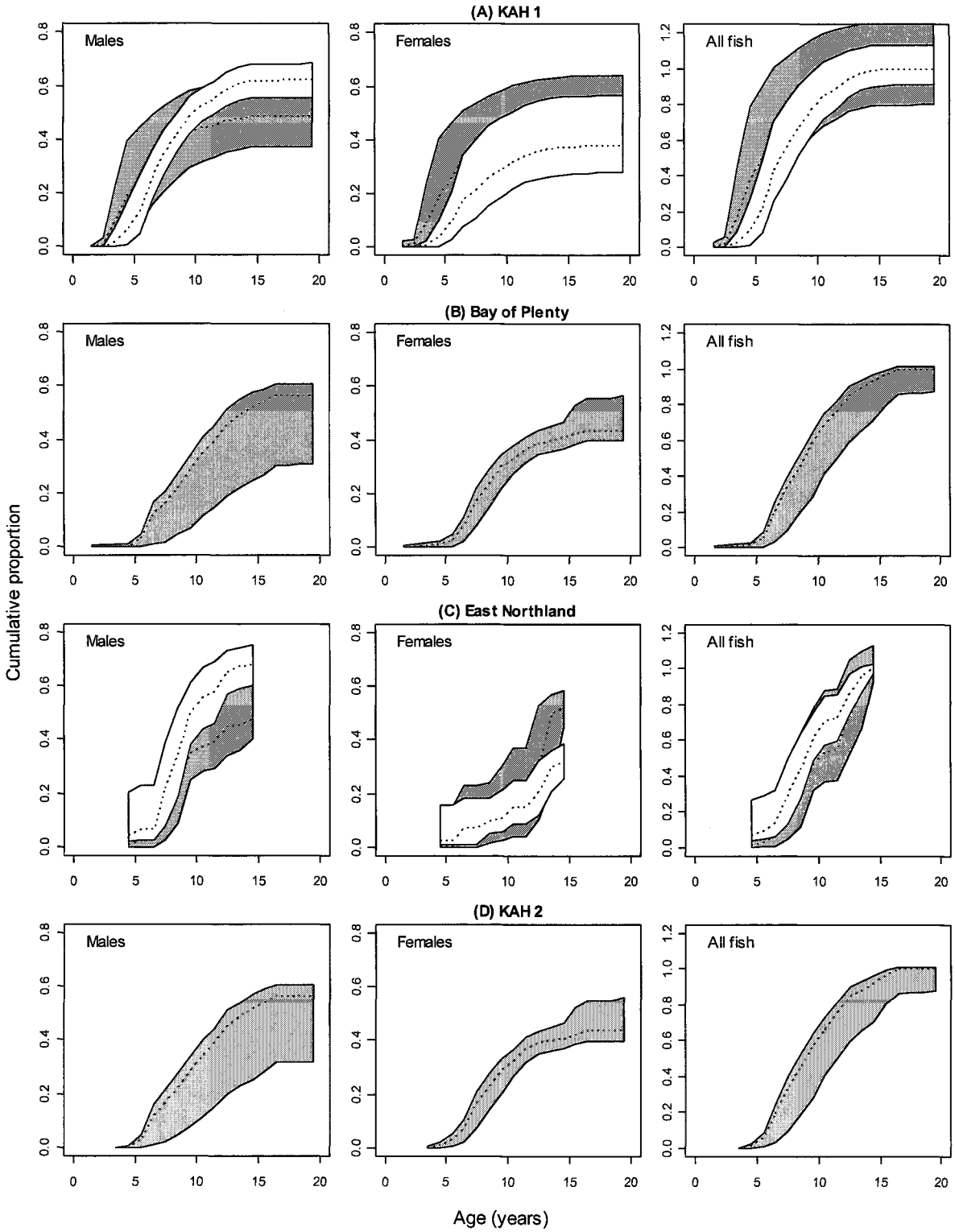

Figure 6: Cumulative proportions-at-age for KAH 1, 2, 3, and 8 and two subareas in KAH 1: Bay of Plenty and East Northland. The dashed lines are the cumulative proportions-at-length and the shaded regions are the bootstrapped 95% confidence regions. Grey shaded data are from the purse seine fisheries, while white denotes bottom trawl fisheries.

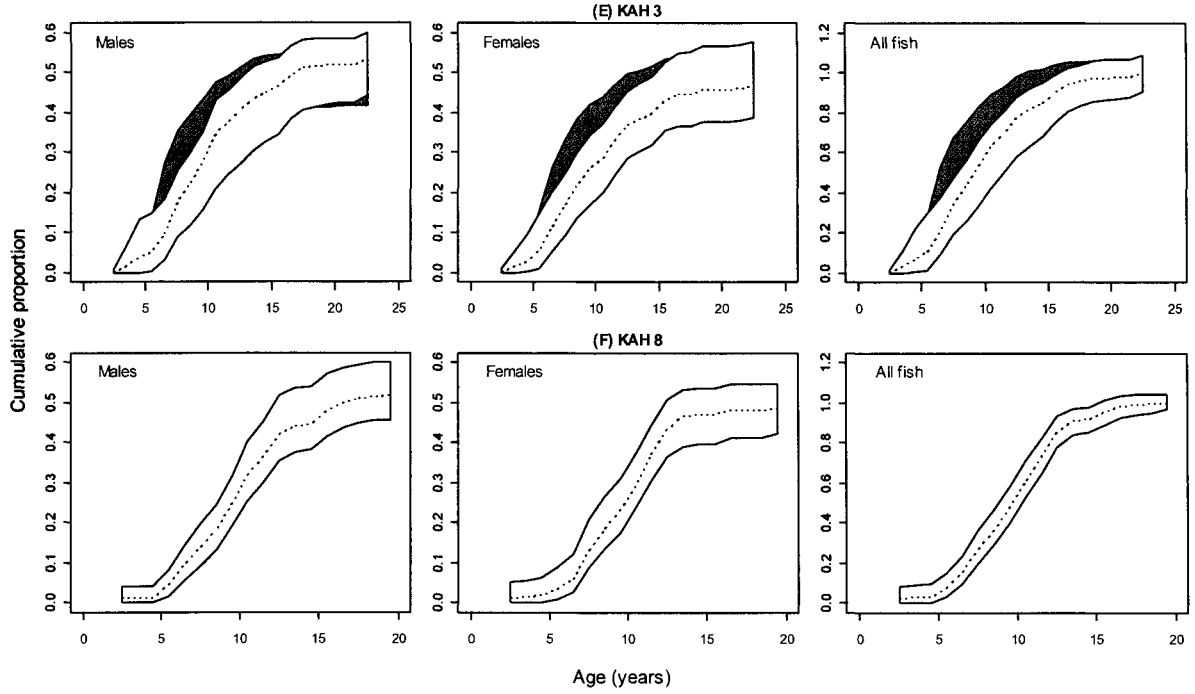

Figure 6: ***Continued.***

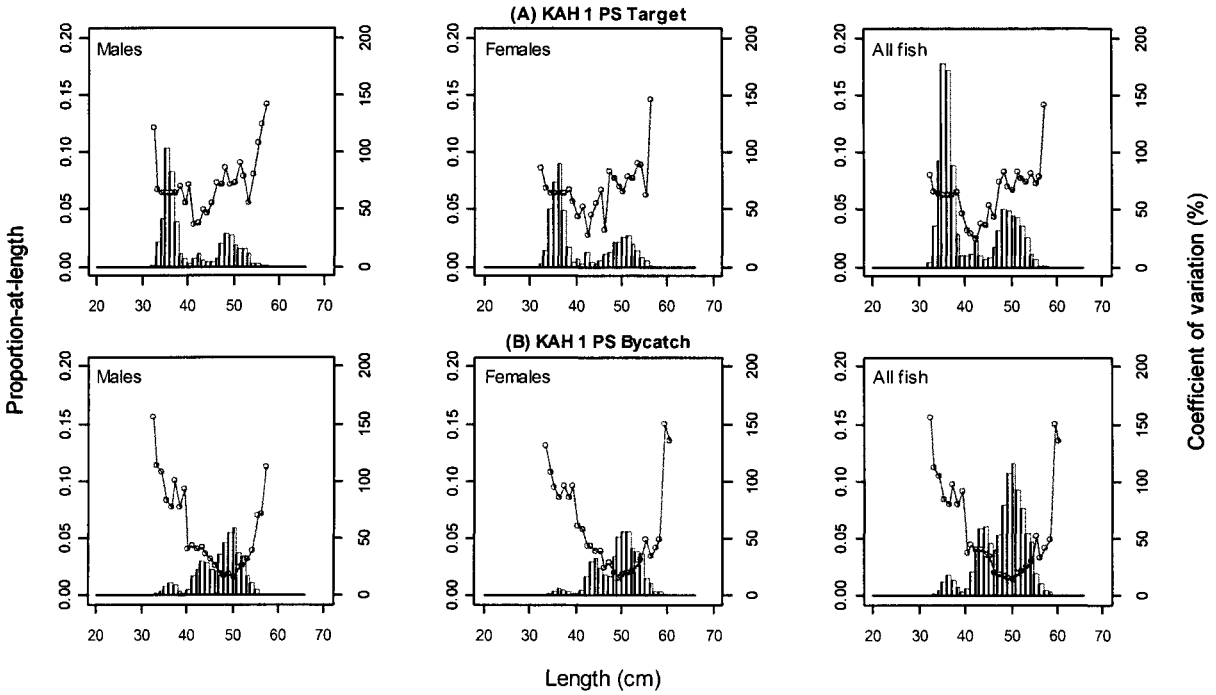

Figure 7: Estimated scaled proportions-at-length for male, female, and all fish combined for the KAH 1 target and bycatch purse seine fisheries with the bootstrapped 95% coefficient of variation for each length class. Study period was May 2005 – June 2006.

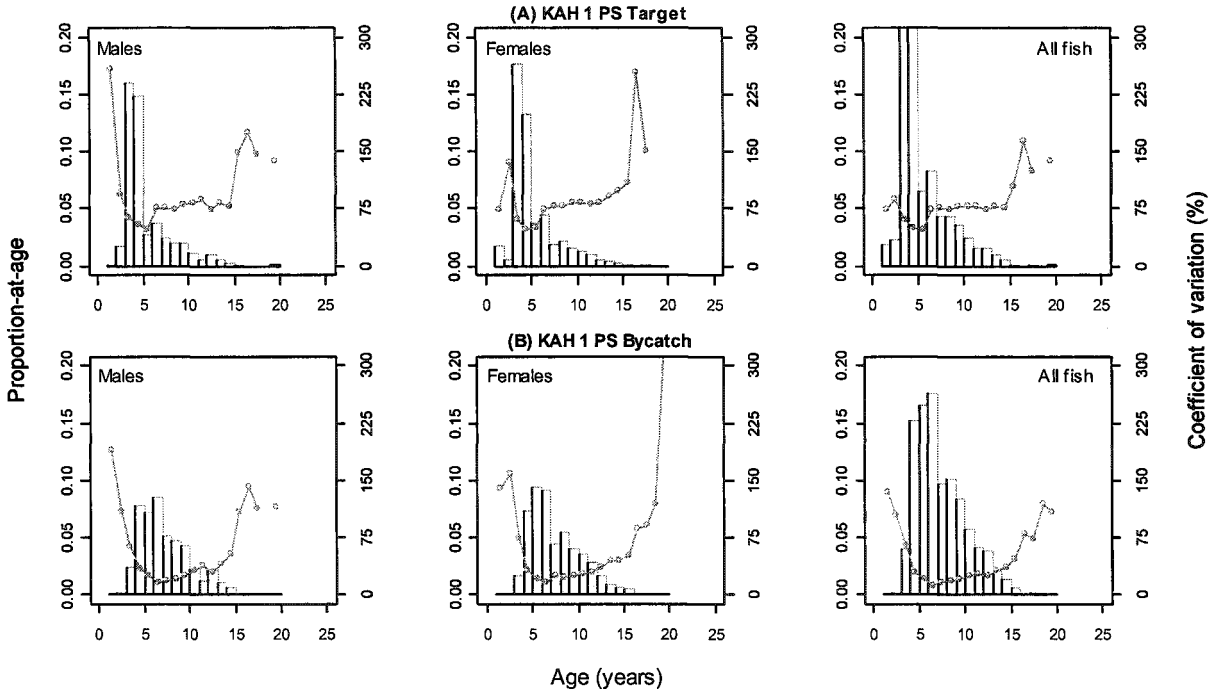

Figure 8: Estimated scaled proportions-at-age for male, female, and all fish combined for the KAH 1 target and bycatch purse seine fisheries with the bootstrapped 95% coefficient of variation for each length class. Study period was May 2005 – June 2006.

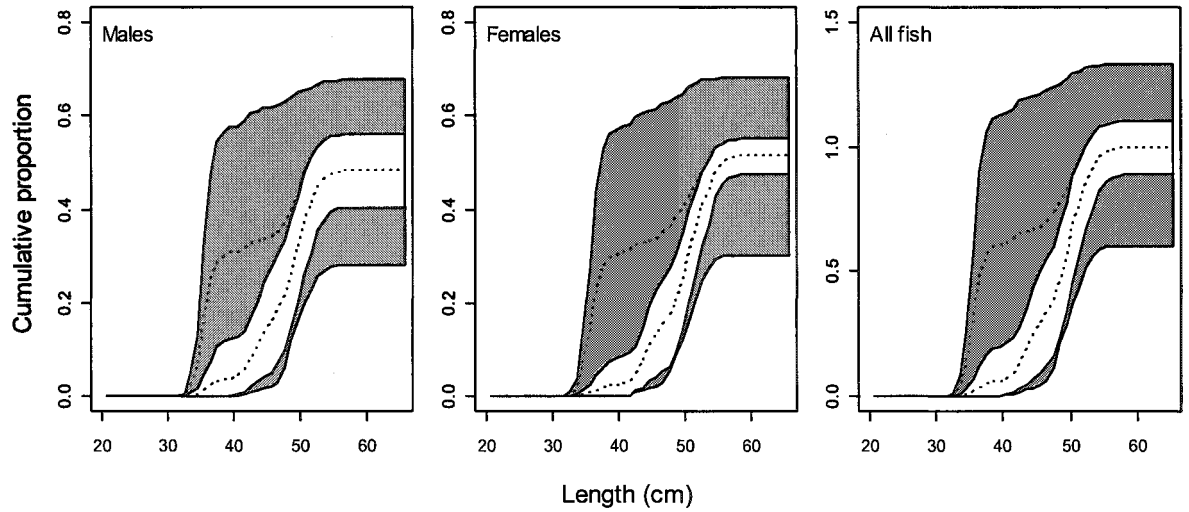

Figure 9: Cumulative proportions-at-length for the KAH 1 target and bycatch purse seine fisheries with bootstrapped 95% coefficient of variation for each length class. The dashed lines are the cumulative proportions-at-length and the shaded regions are the bootstrapped 95% confidence regions. Grey shaded data are from the kahawai target fisheries, while white denotes bycatch fisheries. Study period was May 2005 – June 2006.

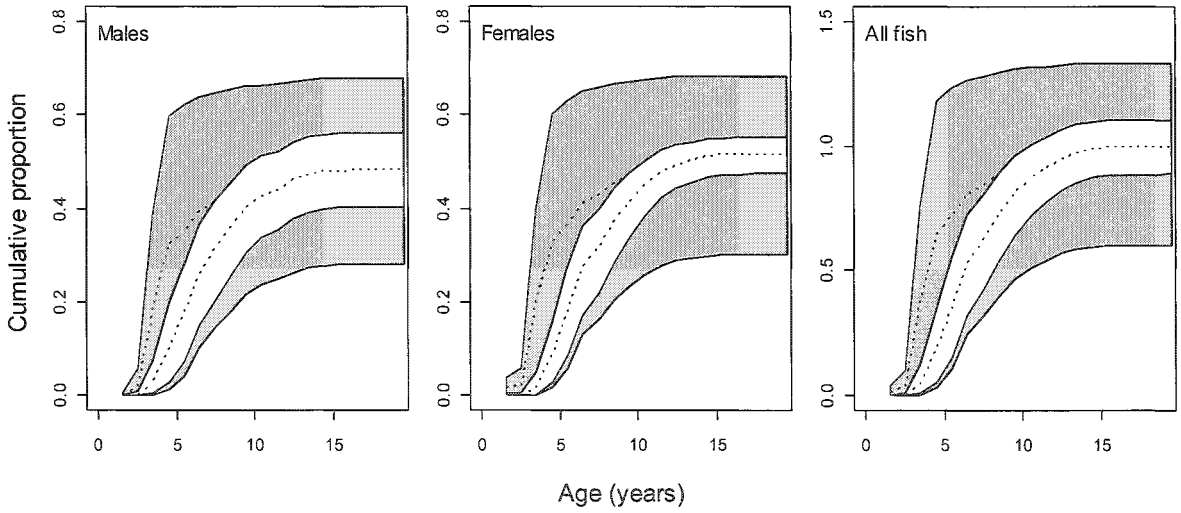

Figure 10: Cumulative proportions-at-age for the KAH 1 target and bycatch purse seine fisheries with bootstrapped 95% coefficient of variation for each length class. The dashed lines are the cumulative proportions-at-length and the shaded regions are the bootstrapped 95% confidence regions. Grey shaded data are from the kahawai target fisheries, while white denotes bycatch fisheries. Study period was May 2005 – June 2006.

Appendix A: Commercial landing points where kahawai were recorded between 1 January 2000 and 1 March 2005, recorded tonnage during that period by calendar year, and percentage of total landed weight to total landings at a landing point for all years represented; a zero indicates <0.5 t or < 0.5% and – denotes a zero.

	Calendar year							% Total Landings
Landing point	2000	2001	2002	2003	2004	2005	Totals	All years
TAURANGA	827	1 008	1 595	2 377	684	6	6 497	55
MT MAUNGANUI	345	388	0	607	205	0	1 544	13
ONEHUNGA	368	189	236	134	162	103	1 193	10
NELSON	552	93	151	17	22	0	836	7
90 MILE BEACH	0	0	–	0	–	–	0	<1
AHIPARA	18	22	7	7	3	0	57	<1
AKAROA	0	0	0	0	0	0	1	<1
AUCKLAND	72	58	16	42	40	5	232	2
AWANUI	0	0	9	4	0	0	13	<1
BOTTLE TOP	1	0	3	0	0	0	4	<1
CORNWALLIS	0	1	0	–	–	–	1	<1
COROMANDEL	8	2	2	3	0	–	15	<1
FRENCH BAY	0	8	5	0	0	0	14	<1
GISBORN	19	32	24	13	18	4	110	<1
GREY MOUTH	2	2	4	8	3	0	19	<1
HALF MOON BAY	3	4	9	9	4	0	29	<1
HAVELOCK	0	0	0	–	0	–	0	<1
HELENSVILLE	0	0	0	2	0	–	2	<1
HOODS LANDING	3	3	2	4	1	0	13	<1
HOUHORA	7	22	4	5	3	0	41	<1
HUIA RAMP	0	0	0	0	0	–	0	<1
IRON POT	1	0	0	0	0	0	1	<1
ISLAND BAY	4	4	1	0	0	0	9	<1
KAIAUA	1	0	4	0	–	–	5	<1
KAIKOURA	–	0	0	–	–	–	0	<1
KAIPARA	8	3	5	1	0	–	17	<1
KAWAKAWA BAY	28	23	26	32	13	0	121	<1
KAWHIA	3	1	0	0	0	0	4	<1
KERETA	–	–	0	1	0	–	1	<1
KOPU	0	0	0	0	0	–	0	<1
KUAOTUNU	4	0	0	0	–	–	4	<1
LEIGH	6	4	4	2	1	0	16	<1
LYTT	2	1	0	0	1	0	3	<1
LYTTELTON	14	11	6	11	4	0	47	<1
MANGANUI	0	0	0	0	0	–	0	<1
MANGAWHAI	0	20	0	0	35	–	55	<1
MANGERE	0	0	0	1	1	0	2	<1
MANGOUNI	25	20	8	8	5	0	66	<1
MARAETAI	0	0	0	0	0	–	0	<1
MARSDEN POINT	2	0	0	0	0	–	2	<1
MGI	0	–	0	0	0	–	0	<1
MOTUEKA	1	0	5	1	0	0	7	<1
NAPIER	16	13	21	14	20	2	86	<1
NEW PLYMOUTH	36	13	24	12	32	0	117	<1
NGARIMU BAY	0	0	0	0	0	–	0	<1
NGAWI	0	0	0	0	0	0	1	<1
NULL	0	0	0		0	0	0	<1
ONERAHI	0	0	1	1	0	0	2	<1
OPUA	0	2	2	1	0	–	5	<1
PAHI	1	1	0	1	1	–	4	<1
PARUA BAY	0	0	0	0	5	0	5	<1

Appendix A: ***Continued.***

	Calendar year							% Total Landings
Landing point	2000	2001	2002	2003	2004	2005	Totals	All years
PATEA	1	0	0	0	0	0	1	<1
PAUA	3	12	12	0	0	–	27	<1
PICTON	5	4	3	2	1	0	15	<1
PIPIROA	0	0	0	1	0	–	1	<1
POINT CURTIS	0	0	0	0	0	–	0	<1
PORT ALBERT	5	0	2	1	1	–	9	<1
PORT TARANAKI	0	4	2	0	0	0	7	<1
PORT UNDERWOOD	0	1	1	0	–	–	1	<1
PORT WAIKATO	6	16	11	30	3	0	66	<1
POURERERE BEACH	0	0	0	1	0	0	1	<1
PUKIUNU WHARF	0	–	–	–	–	–	0	<1
RAGLAN	15	9	14	2	1	0	42	<1
RUAWAI	0	1	0	1	0	–	2	<1
SANDSPIT	0	0	1	1	6	–	8	<1
SHELLY BEACH	16	5	12	8	9	0	52	<1
STABLES LANDING	1	0	1	0	0	–	2	<1
SUGAR LOAF	–	0	2	5	1	–	7	<1
TAKAPUNA	2	3	2	0	0	–	6	<1
TARAKOHE	2	4	1	1	1	0	8	<1
TARARU	0	0	0	0	–	–	0	<1
TAURAUNGA	–	–	–	27	–	–	27	<1
TE PURU	0	0	0	0	0	–	1	<1
TGA	0	0	1	0	1	–	1	<1
THAMES	11	32	14	1	0	–	58	<1
TIMARU	9	6	4	3	3	2	27	<1
TOTARA NORTH	1	2	1	0	1	–	5	<1
TUTUKAKA	10	3	4	3	3	0	23	<1
UNAHI	10	15	12	9	7	1	53	<1
VIADUCT AUCKLAND	0	0	1	0	0		1	<1
WAIAU PA	4	1	7	1	2	0	15	<1
WAIKOWHAI	0	0	0	0	0	0	1	<1
WAITANGI	1	0	0	0	0	–	1	<1
WAIUA PA	0	0	0	–	–	–	0	<1
WANGANUI	0	1	0	0	0	0	1	<1
WELLINGTON	15	25	11	14	7	0	71	<1
WESTPORT	2	0	4	1	1	0	8	<1
WEYMOUTH	28	16	29	5	9	0	88	<1
WHAKATANE	4	0	0	0	0	0	4	<1
WHANGAMATA	2	0	1	0	0	–	2	<1
WHANGAPOUA	–	–	0	–	0	–	0	<1
WHANGAREI	0	2	0	2	1	0	5	<1
WHANGAROA	0	0	1	0	0	–	1	<1
WHITIANGA	1	2	1	1	1	0	5	<1
Totals	2 531	2 111	2 327	3 438	1 324	123	11 855	100

Appendix B: Scaled length distributions

Table B1: Estimated scaled numbers-at-length (NAL), bootstrapped coefficients of variation (c.v.), and bootstrapped mean-weighted coefficients of variation (MWCV) calculated from the data for KAH 1, collected during May 2005 to June 2006, scaled to the total reported catch landed (over the same time period) by purse seines in KAH 1 (target and non-target fisheries combined).

	Male		Female		Total	
Length (cm)	NAL	c.v. (%)	NAL	c.v. (%)	NAL	c.v. (%)
32	312	103.8	694	105.8	1 007	92.6
33	5 577	81.3	3 402	85.8	8 979	81.6
34	10 772	78.9	12 612	82.7	23 384	80.3
35	26 937	77.4	18 685	80.3	45 623	78.3
36	22 859	72.3	23 260	77.8	46 119	74.7
37	12 039	68.2	13 224	76.5	25 263	71.3
38	4 066	62.7	5 362	66.4	9 428	63.2
39	2 101	64.9	1 650	63.1	3 751	58.3
40	2 214	37.5	2 378	54.4	4 592	32.9
41	7 255	36.3	2 554	48.5	9 809	37.1
42	10 409	35.0	8 738	32.2	19 147	32.1
43	11 510	42.9	11 082	45.3	22 592	43.2
44	10 753	40.8	11 932	45.4	22 686	42.3
45	8 380	36.9	9 297	41.3	17 677	37.8
46	8 896	27.1	8 971	21.3	17 867	19.1
47	16 877	18.0	8 742	28.0	25 619	19.5
48	22 501	22.6	16 488	20.0	38 989	20.3
49	25 338	16.8	22 912	15.9	48 249	15.1
50	24 905	16.8	25 585	15.9	50 489	14.7
51	16 290	23.4	25 564	18.6	41 855	19.4
52	15 297	20.8	19 182	19.3	34 480	18.7
53	8 545	20.8	16 366	23.7	24 911	19.9
54	4 418	30.7	14 615	27.3	19 033	25.5
55	2 107	55.6	6 190	39.0	8 297	40.4
56	556	62.5	3 635	35.8	4 191	31.0
57	350	82.8	1 324	45.9	1 674	40.3
58	–	–	1 109	51.5	1 109	51.5
59	–	–	3	141.0	3	141.0
60	–	–	77	143.1	77	143.1

Table B2: Estimated scaled numbers-at-length (NAL), bootstrapped coefficients of variation (c.v.), and bootstrapped mean-weighted coefficients of variation (MWCV) calculated from the data for KAH 1, collected during May 2005 to June 2006, scaled to the total reported catch landed (over the same time period) by purse seines in the target fishery.

	Male		Female		Total	
Length (cm)	NAL	c.v. (%)	NAL	c.v. (%)	NAL	c.v. (%)
32	343	122.0	1 029	89.0	1 371	83.8
33	7 543	72.5	4 800	73.4	12 343	71.0
34	14 400	70.6	17 486	70.4	31 887	69.7
35	35 658	69.8	25 715	70.4	61 373	69.6
36	28 458	69.9	30 858	70.0	59 316	69.5
37	13 372	70.7	17 143	70.0	30 515	69.5
38	4 114	75.4	5 829	73.8	9 943	72.1
39	2 247	66.2	1 219	67.1	3 466	59.1
40	723	60.9	2 437	56.3	3 160	43.6
41	2 627	48.4	1 066	51.2	3 693	39.9
42	3 656	52.7	4 379	42.1	8 035	42.7
43	1 979	35.9	1 599	42.4	3 578	27.2
44	1 409	53.9	1 066	53.0	2 475	40.2
45	1 256	45.8	1 826	44.1	3 082	32.3
46	2 396	47.9	3 730	30.2	6 127	21.8
47	6 846	44.7	4 297	57.9	11 142	47.6
48	10 151	62.7	7 263	52.2	17 414	57.3
49	9 432	44.7	7 379	42.0	16 811	41.9
50	6 656	45.9	9 015	37.7	15 670	39.4
51	5 474	67.9	9 506	53.5	14 981	57.7
52	5 400	53.1	7 073	51.7	12 473	50.5
53	3 995	31.1	4 904	68.0	8 899	47.2
54	1 103	58.0	2 814	64.5	3 917	57.0
55	760	88.3	1 636	43.0	2 396	47.9
56	343	126.7	190	127.8	533	77.9
57	190	123.6	–	–	190	123.6

Table B3: Estimated scaled numbers-at-length (NAL), bootstrapped coefficients of variation (c.v.), and bootstrapped mean-weighted coefficients of variation (MWCV) calculated from the data for KAH 1, collected during May 2005 to June 2006, scaled to the total reported catch landed (over the same time period) by purse seines as bycatch (non-target fishery).

	Male		Female		Total	
Length (cm)	NAL	c.v. (%)	NAL	c.v. (%)	NAL	c.v. (%)
32	64	159.0	–	–	64	159.0
33	382	116.3	127	133.6	510	114.2
34	828	109.8	637	110.0	1 465	107.6
35	2 258	85.3	1 046	97.9	3 304	87.8
36	2 872	80.2	1 913	88.9	4 785	82.7
37	2 370	103.2	1 300	98.8	3 670	100.4
38	1 014	80.8	1 123	88.9	2 137	82.7
39	459	95.6	651	98.7	1 110	94.0
40	1 357	42.4	577	62.8	1 934	40.0
41	4 310	44.9	1 442	59.5	5 753	46.1
42	6 244	42.0	4 547	45.0	10 791	41.9
43	8 000	43.8	7 865	44.8	15 865	43.3
44	7 707	39.3	8817	41.5	16 524	39.3
45	5 923	34.9	6 341	41.8	12 264	36.9
46	5 723	27.0	5 074	25.5	10 798	21.3
47	9 637	18.2	4 593	30.4	14 231	19.3
48	12 305	17.1	9 110	20.2	21 415	16.2
49	14 917	15.3	14 099	13.5	29 017	12.6
50	16 050	12.5	15 333	15.2	31 383	11.5
51	9 904	20.5	15 056	15.2	24 960	15.2
52	9 162	20.6	11 329	17.1	20 492	16.9
53	4 598	27.6	10266	22.3	14 864	21.2
54	2 888	35.6	9 998	26.1	12 887	25.3
55	1 253	66.4	3 999	45.9	5 252	48.8
56	255	70.0	2 757	30.7	3 012	29.3
57	174	108.6	1 041	39.6	1 215	37.9
58	–	–	872	46.6	872	46.6
59	–	–	2	148.8	2	148.8
60	–	–	60	133.9	60	133.9

Table B4: Estimated scaled numbers-at-length (NAL), bootstrapped coefficients of variation (c.v.), and bootstrapped mean-weighted coefficients of variation (MWCV) calculated from the data for KAH 1, collected during May 2005 to June 2006, scaled to the total reported catch landed (over the same time period) by trawls in KAH 1 (target and non-target fisheries combined).

	Male		Female		Total	
Length (cm)	NAL	c.v. (%)	NAL	c.v. (%)	NAL	c.v. (%)
32	–	–	–	–	–	–
33	–	–	–	–	–	–
34	54	132.0	–	–	54	132.0
35	–	–	–	–	–	–
36	108	110.3	–	–	108	110.3
37	217	101.3	54	133.3	271	98.1
38	433	91.8	108	108.8	541	90.6
39	271	96.5	54	132.0	325	95.9
40	271	97.4	108	112.5	379	94.4
41	281	76.7	162	102.8	444	78.0
42	617	71.0	54	140.1	671	72.3
43	356	63.6	465	62.4	821	56.1
44	238	70.9	346	67.5	583	59.2
45	455	50.9	356	66.4	811	48.3
46	1 338	32.9	465	61.7	1 803	27.8
47	2 580	19.9	920	46.2	3 500	19.4
48	3 178	18.1	1 265	56.4	4 442	19.6
49	3 114	23.4	1 817	41.3	4 931	12.1
50	2 971	19.0	1 707	24.2	4 677	14.3
51	2 081	18.4	1 927	22.7	4 072	12.7
52	2 312	35.9	1 334	31.4	3 645	30.9
53	1 654	42.3	1 106	38.0	2 760	34.2
54	536	46.8	679	44.1	1 215	37.2
55	265	86.4	560	57.3	825	59.3
56	88	123.1	241	73.7	329	71.3
57	–	–	272	55.7	272	55.7
58	65	131.4	88	114.9	153	74.0
59	–	–	119	87.2	119	87.2
60	–	–	–	–	–	–

Table B5: Estimated scaled numbers-at-length (NAL), bootstrapped coefficients of variation (c.v.), and bootstrapped mean-weighted coefficients of variation (MWCV) calculated from the data for KAH 1, collected during May 2005 to June 2006, scaled to the total reported catch landed in KAH 1, all strata combined. Purse seine fishery is not subdivided into target and bycatch.

	Male		Female		Total	
Length (cm)	NAL	c.v. (%)	NAL	c.v. (%)	NAL	c.v. (%)
32	312	103.8	694	105.8	1 007	92.6
33	5 577	81.3	3 402	85.8	8 979	81.6
34	10 826	78.4	12 612	82.7	23 438	80.1
35	26 937	77.4	18 685	80.3	45 623	78.3
36	22 967	71.9	23 260	77.8	46 227	74.5
37	12 256	67.0	13 278	76.1	25 534	70.5
38	4 499	56.8	5 471	65.0	9 970	59.6
39	2 372	58.0	1 704	60.8	4 076	53.7
40	2 485	34.6	2 487	51.9	4 971	30.8
41	7 536	34.8	2 716	45.5	10 253	35.3
42	11 025	33.0	8 792	32.0	19 817	30.9
43	11 867	41.6	11 546	43.4	23 413	41.7
44	10 991	39.9	12 278	44.1	23 269	41.2
45	8 835	35.2	9 653	39.8	18 489	36.2
46	10 235	24.0	9 436	20.3	19 670	17.5
47	19 457	15.9	9 661	25.8	29 119	17.3
48	25 679	20.0	17 752	19.0	43 431	18.4
49	28 452	15.2	24 728	15.1	53 180	13.8
50	27 875	15.2	27 291	15.1	55 167	13.6
51	18 371	20.8	27 491	17.4	45 927	17.6
52	17 609	18.2	20 516	18.1	38 125	17.0
53	10 198	18.5	17 472	22.1	27 670	18.0
54	4 954	27.6	15 293	26.2	20 248	24.0
55	2 372	49.9	6 750	35.9	9 121	37.0
56	644	57.3	3 876	33.9	4 520	29.3
57	350	82.8	1 596	39.5	1 946	35.9
58	65	131.4	1 197	48.2	1 262	46.2
59	–	–	121	85.0	121	85.0
60	–	–	77	143.1	77	143.1

Table B6: Estimated scaled numbers-at-length (NAL), bootstrapped coefficients of variation (c.v.), and bootstrapped mean-weighted coefficients of variation (MWCV) calculated from the data for KAH 1, subarea East Northland, collected during May 2005 to June 2006, scaled to the total reported catch landed by purse seines in East Northland.

	Male		Female		Total	
Length (cm)	NAL	c.v. (%)	NAL	c.v. (%)	NAL	c.v. (%)
42	–	–	38	212.7	38	212.7
43	76	170.7	–	–	76	170.7
44	275	86.7	138	100.1	413	79.5
45	826	74.3	375	75.7	1 201	68.7
46	1 002	73.6	1 072	50.9	2 074	58.6
47	1 951	65.3	1 171	56.8	3 122	59.2
48	2 710	34.3	1 569	59.4	4 279	37.9
49	3 499	41.4	2 856	32.0	6 354	34.1
50	3 117	18.2	3 269	35.0	6 386	19.7
51	2 612	35.8	3 209	23.3	5 822	24.0
52	2 536	49.8	2 742	22.1	5 278	29.9
53	690	71.6	3 050	52.5	3 739	52.7
54	835	66.4	2 329	35.4	3 164	39.2
55	491	87.9	713	69.8	1 203	69.9
56	222	77.4	467	66.9	689	54.3
57	123	127.7	–	–	123	127.7
58	–	–	123	131.1	123	131.1
59	–	–	–	–	–	–

Table B7: Estimated scaled numbers-at-length (NAL), bootstrapped coefficients of variation (c.v.), and bootstrapped mean-weighted coefficients of variation (MWCV) calculated from the data for KAH 1, subarea East Northland, collected during May 2005 to June 2006, scaled to the total reported catch landed by trawls in East Northland.

	Male		Female		Total	
Length (cm)	NAL	c.v. (%)	NAL	c.v. (%)	NAL	c.v. (%)
41	89	102.9	–	–	89	102.9
42	178	72.5	–	–	178	72.5
43	267	56.6	267	61.2	534	42.0
44	178	71.5	178	67.4	356	48.8
45	356	49.3	267	58.1	622	36.7
46	889	31.3	267	58.0	1 156	26.9
47	1 423	24.4	622	36.7	2 045	20.2
48	1 779	21.3	622	36.7	2 401	17.7
49	1 867	20.1	356	49.3	2 223	18.5
50	1 690	21.4	800	32.5	2 490	16.9
51	978	29.0	711	35.4	1 779	21.4
52	622	36.8	445	45.4	1 067	27.2
53	622	37.6	178	70.6	800	33.0
54	178	66.8	178	71.5	356	45.8
55	–	–	89	99.1	89	99.1
56	–	–	89	101.0	89	101.0
57	–	–	178	72.4	178	72.4
58	89	101.9	–	–	89	101.9
59	–	–	89	102.5	89	102.5

Table B8: Estimated scaled numbers-at-length (NAL), bootstrapped coefficients of variation (c.v.), and bootstrapped mean-weighted coefficients of variation (MWCV) calculated from the data for KAH 1, subarea East Northland, collected during May 2005 to June 2006, scaled to the total reported catch landed, all strata combined.

	Male		Female		Total	
Length (cm)	NAL	c.v. (%)	NAL	c.v. (%)	NAL	c.v. (%)
41	89	102.9	–	–	89	102.9
42	178	72.5	38	212.7	216	75.3
43	343	64.1	267	61.2	610	45.2
44	453	60.9	316	59.7	769	49.4
45	1 182	55.7	642	52.7	1 824	49.0
46	1 891	43.5	1 338	43.5	3 230	40.2
47	3 374	41.2	1 793	39.8	5 167	38.2
48	4 488	22.8	2 191	44.7	6 680	25.5
49	5 366	27.9	3 211	29.1	8 577	25.8
50	4 806	14.2	4 070	28.7	8 876	14.9
51	3 590	26.5	3 921	20.0	7 600	18.7
52	3 158	40.3	3 187	20.4	6 345	25.2
53	1 312	41.2	3 227	49.7	4 539	43.3
54	1 013	55.0	2 507	33.2	3 520	35.2
55	491	87.9	802	62.3	1 292	64.7
56	222	77.4	556	57.8	778	49.1
57	123	127.7	178	72.4	300	66.3
58	89	101.9	123	131.1	212	85.3
59	–	–	89	102.5	89	102.5

Table B9: Estimated scaled numbers-at-length (NAL), bootstrapped coefficients of variation (c.v.), and bootstrapped mean-weighted coefficients of variation (MWCV) calculated from the data for KAH 1, subarea Bay of Plenty, collected during May 2005 to June 2006, scaled to the total reported catch landed by purse seines.

	Male		Female		Total	
Length (cm)	NAL	c.v. (%)	NAL	c.v. (%)	NAL	c.v. (%)
42	230	138.6	–	–	230	138.6
43	466	111.2	233	139.5	699	101.9
44	466	108.4	–	–	466	108.4
45	2 547	40.4	1 395	66.0	3 942	37.9
46	4 635	35.4	2 095	69.0	6 729	37.9
47	6 952	31.3	4 162	41.0	11 114	29.8
48	14 872	29.5	8 183	30.7	23 055	25.0
49	20 423	23.5	15 954	18.8	36 377	19.7
50	24 196	21.3	14 742	14.3	38 938	16.3
51	12 324	18.6	14 445	16.8	26 769	10.7
52	5 486	31.8	7 933	46.7	13 420	38.3
53	2 431	55.5	3 976	64.6	6 406	58.9
54	547	123.2	681	160.5	1 228	143.1
55	118	170.8	144	176.2	262	167.3
56	26	227.1	105	198.9	131	185.1
57	65	192.6	39	259.5	105	198.3
58	–	–	39	242.3	39	242.3

Table B10: Estimated scaled numbers-at-length (NAL), bootstrapped coefficients of variation (c.v.), and bootstrapped mean-weighted coefficients of variation (MWCV) calculated from the data for KAH 2, collected during May 2005 to June 2006, scaled to the total reported catch landed by purse seines in KAH 2.

	Male		Female		Total	
Length (cm)	NAL	c.v. (%)	NAL	c.v. (%)	NAL	c.v. (%)
42	465	136.6	–	–	465	136.6
43	944	103.3	472	134.8	1 417	95.4
44	944	104.0	–	–	944	104.0
45	5 160	41.2	2 827	64.5	7 987	37.6
46	9 390	35.4	4 243	65.1	13 633	36.2
47	14 084	33.0	8 431	40.6	22 516	30.1
48	30 128	29.5	16 578	31.4	46 707	25.3
49	41 375	23.1	32 322	19.8	73 696	19.6
50	49 018	21.0	29 866	13.5	78 885	15.5
51	24 967	17.6	29 263	16.7	54 231	10.4
52	11 115	31.3	16 072	45.0	27 186	37.1
53	4 924	55.5	8 054	65.8	12 978	59.6
54	1 109	125.5	1 380	157.4	2 488	142.5
55	239	171.6	292	174.7	531	167.6
56	53	217.3	212	194.8	265	180.5
57	133	195.3	79	235.1	212	191.5
58	–	–	79	212.2	79	212.2

Table B11: Estimated scaled numbers-at-length (NAL), bootstrapped coefficients of variation (c.v.), and bootstrapped mean-weighted coefficients of variation (MWCV) calculated from the data for KAH 3, collected during May 2005 to June 2006, scaled to the total reported catch landed by purse seines in KAH 3.

	Male		Female		Total	
Length (cm)	NAL	c.v. (%)	NAL	c.v. (%)	NAL	c.v. (%)
27	94	172.0	–	–	94	172.0
28	–	–	–	–	–	–
29	–	–	–	–	–	–
30	188	149.7	–	–	188	149.7
31	–	–	–	–	–	–
32	94	171.1	–	–	94	171.1
33	–	–	–	–	–	–
34	–	–	–	–	–	–
35	–	–	–	–	–	–
36	–	–	–	–	–	–
37	–	–	–	–	–	–
38	94	161.2	–	–	94	161.2
39	–	–	–	–	–	–
40	–	–	16	172.0	16	172.0
41	120	141.4	457	101.2	577	87.5
42	1 726	59.3	937	73.3	2 663	57.7
43	1 992	54.1	1301	55.1	3 293	47.7
44	5 144	49.9	5888	40.3	11 032	41.8
45	8 392	48.2	4791	51.2	13 182	47.5
46	7 434	36.8	5763	35.7	13 197	34.1
47	8 868	30.3	7016	24.4	15 883	24.0
48	10 749	22.7	9766	35.0	20 514	21.9
49	13 327	23.5	1 1586	18.9	24 913	19.4
50	12 687	27.4	1 2117	23.7	24 804	23.6
51	7 616	34.0	9266	23.6	16 881	22.6
52	3 667	49.9	7937	38.6	11 604	39.5
53	2 438	43.7	4231	34.2	6 668	30.4
54	789	57.0	2285	58.2	3 075	46.2
55	117	158.0	1105	62.8	1 222	68.0
56	58	172.7	292	138.6	351	136.2
57	–	–	117	155.0	117	155.0
58	–	–	58	180.0	58	180.0

Table B12: Estimated scaled numbers-at-length (NAL), bootstrapped coefficients of variation (c.v.), and bootstrapped mean-weighted coefficients of variation (MWCV) calculated from the data for KAH 3, collected during May 2005 to June 2006, scaled to the total reported catch landed by trawls in KAH 3.

	Male		Female		Total	
Length (cm)	NAL	c.v. (%)	NAL	c.v. (%)	NAL	c.v. (%)
27	–	–	–	–	–	–
28	–	–	–	–	–	–
29	–	–	22	169.1	22	169.1
30	43	131.2	22	156.3	65	98.5
31	151	103.1	–	–	151	103.1
32	86	95.8	151	91.2	238	86.9
33	43	131.5	65	105.8	108	102.1
34	43	113.7	22	154.9	65	106.4
35	–	–	–	–	–	–
36	–	–	–	–	–	–
37	–	–	–	–	–	–
38	43	113.3	43	135.3	86	102.2
39	43	108.4	43	136.8	86	100.3
40	43	111.3	86	104.5	130	95.4
41	43	138.9	–	–	43	138.9
42	–	–	22	154.4	22	154.4
43	22	161.5	100	72.7	122	70.2
44	22	160.9	44	106.3	65	86.8
45	65	107.6	66	103.3	131	78.1
46	294	65.0	101	73.3	395	54.2
47	491	51.5	390	53.1	881	44.9
48	1 162	40.8	692	41.6	1 853	37.2
49	961	37.1	417	49.1	1 378	35.3
50	1 053	26.7	739	25.7	1 792	20.9
51	812	26.9	958	24.3	1 770	16.6
52	525	36.5	841	32.5	1 365	29.1
53	576	32.5	667	38.9	1 244	27.1
54	384	53.3	225	57.6	610	50.1
55	180	54.7	183	62.2	363	35.9
56	44	107.7	229	70.8	273	65.6
57	64	109.7	146	68.5	210	68.6
58	57	133.9	21	153.4	78	93.8

Table B13: Estimated scaled numbers-at-length (NAL), bootstrapped coefficients of variation (c.v.), and bootstrapped mean-weighted coefficients of variation (MWCV) calculated from the data for KAH 3, collected during May 2005 to June 2006, scaled to the total reported catch landed in KAH 3, all strata combined.

	Male		Female		Total	
Length (cm)	NAL	c.v. (%)	NAL	c.v. (%)	NAL	c.v. (%)
27	94	172.0	–	–	94	172.0
28	–	–	–	–	–	–
29	–	–	22	169.1	22	169.1
30	231	127.6	22	156.3	253	118.3
31	151	103.1	–	–	151	103.1
32	181	101.6	151	91.2	332	79.0
33	43	131.5	65	105.8	108	102.1
34	43	113.7	22	154.9	65	106.4
35	–	–	–	–	–	–
36	–	–	–	–	–	–
37	–	–	–	–	–	–
38	137	113.1	43	135.3	181	94.9
39	43	108.4	43	136.8	86	100.3
40	43	111.3	102	90.8	145	85.9
41	164	110.9	457	101.2	621	82.3
42	1 726	59.3	959	71.7	2 684	57.2
43	2 013	53.6	1 401	51.7	3 415	46.1
44	5 166	49.6	5 932	40.0	11 098	41.5
45	8 456	47.8	4 857	50.4	13 313	46.9
46	7 728	35.5	5 864	35.2	13 591	33.2
47	9 358	28.8	7 406	23.4	16 764	23.0
48	11 910	20.9	10 457	32.9	22 368	20.3
49	14 288	22.1	12 003	18.4	26 291	18.5
50	13 740	25.5	12 856	22.4	26 596	22.2
51	8 428	31.1	10 223	21.5	18 651	20.6
52	4 192	44.0	8 778	35.2	12 970	35.6
53	3 014	36.0	4 898	30.1	7 912	26.1
54	1 173	41.3	2 511	53.2	3 684	39.4
55	297	73.6	1 288	55.3	1 585	54.0
56	102	109.5	522	84.0	624	82.4
57	64	109.7	263	79.8	327	72.1
58	57	133.9	79	135.4	136	99.4

Table B14: Estimated scaled numbers-at-length (NAL), bootstrapped coefficients of variation (c.v.), and bootstrapped mean-weighted coefficients of variation (MWCV) calculated from the data for KAH 8, collected during May 2005 to June 2006, scaled to the total reported catch landed by trawls in KAH 8.

	Male		Female		Total	
Length (cm)	NAL	c.v. (%)	NAL	c.v. (%)	NAL	c.v. (%)
22	–	–	43	154.2	43	154.2
23	–	–	–	–	–	–
24	–	–	–	–	–	–
25	–	–	–	–	–	–
26	43	162.1	–	–	43	162.1
27	–	–	–	–	–	–
28	–	–	–	–	–	–
29	–	–	245	104.9	245	104.9
30	245	103.6	303	111.2	548	98.2
31	303	116.7	505	108.8	808	105.7
32	–	–	202	123.3	202	123.3
33	144	106.0	202	125.5	346	101.4
34	202	133.2	–	–	202	133.2
35	–	–	–	–	–	–
36	101	150.8	261	97.0	362	88.3
37	463	84.7	606	109.1	1 069	90.3
38	–	–	–	–	–	–
39	160	128.3	362	85.0	522	77.2
40	101	146.6	261	92.0	362	84.7
41	143	145	58	119.2	200	103.1
42	1 002	53.3	381	122.0	1 383	47.9
43	1 468	59.6	247	80.5	1 715	51.5
44	2 451	43.9	1 003	54.8	3 454	38.7
45	2 267	52.4	1 150	46.9	3 417	37.8
46	4 381	36.2	1 833	50.2	6 214	35.8
47	5 859	23.3	4 977	31.7	10 836	22.6
48	10 917	17.4	6 373	23.5	17 290	14.0
49	13 549	11.6	9 790	15.2	23 339	9.8
50	13 084	18.0	13 184	19.5	26 269	11.6
51	8 801	19.0	10 968	17.7	19 769	12.3
52	5 926	22.3	9 559	15.4	15 486	12.6
53	6 344	21.0	6 420	24.5	12 822	14.3
54	2 629	31.7	4 517	24.7	7 146	19.2
55	696	57.3	1 590	45.0	2 286	40.4
56	101	144.3	995	47.0	1 096	48.5
57	104	134.7	158	107.7	263	98.5
58	115	131.0	160	132.7	275	89.4
59	–	–	10	143.0	10	143.0
60	–	–	–	–	–	–
61	–	–	–	–	–	–
62	–	–	–	–	–	–
63	–	–	–	–	–	–
64	–	–	–	–	–	–
65	160	137.8	160	130.3	320	113.8

Appendix C: Scaled age distributions

Table C1: Estimated scaled numbers-at-age (NAA), bootstrapped coefficients of variation (c.v.), and bootstrapped mean-weighted coefficients of variation (MWCV) calculated from the data for KAH 1, collected during May 2005 to June 2006, scaled to the total reported catch landed by purse seines in KAH 1 (target and non-target fisheries combined). Age 1 is a minus group and age 19 is a plus group.

	Male		Female		Total	
Age (years)	NAA	c.v. (%)	NAA	c.v. (%)	NAA	c.v. (%)
1	312	263.3	4 096	96.7	4 408	96.5
2	4 751	104.9	1 292	153.3	6 044	100.7
3	45 630	71.7	46 489	78.2	92 119	73.9
4	61 329	44.0	56 145	40.9	117 474	41.2
5	31 258	24.0	40 794	22.0	72 052	20.6
6	37 932	18.2	41 676	19.4	79 608	16.2
7	23 605	20.8	19 684	24.4	43 289	18.2
8	20 895	21.3	23 945	23.1	44 840	18.3
9	19 512	24.5	17 644	25.0	37 155	21.0
10	10 665	30.5	14 988	25.4	25 653	22.4
11	5 686	37.8	12 095	27.2	17 781	24.8
12	10 086	27.3	6 908	33.4	16 993	22.9
13	5 109	39.1	4 115	45.1	9 224	31.2
14	3 126	49.5	2 934	42.6	6 061	34.3
15	567	102.5	1 795	48.8	2 361	45.7
16	176	119.9	315	90.1	490	73.9
17	276	104.0	533	94.8	809	73.4
18	–	–	185	125.8	185	125.8
19	350	84.9	–	–	350	81.2

Table C2: Estimated scaled numbers-at-age (NAA), bootstrapped coefficients of variation (c.v.), and bootstrapped mean-weighted coefficients of variation (MWCV) calculated from the data for KAH 1, collected during May 2005 to June 2006, scaled to the total reported catch landed by purse seines in the target fishery. Age 1 is a minus group and age 19 is a plus group.

	Male		Female		Total	
Age (years)	NAA	c.v. (%)	NAA	c.v. (%)	NAA	c.v. (%)
1	343	256.5	5 829	78.8	6 172	78.8
2	6 151	98.7	1 714	142.0	7 865	91.5
3	55 104	71.0	60 633	68.9	115 738	69.0
4	51 021	64.9	45 578	61.5	96 599	61.7
5	9 529	22.2	12 875	23.8	22 404	19.3
6	13 097	49.7	15 469	46.1	28 566	46.3
7	8 269	49.8	6 543	52.4	14 812	48.3
8	7 101	46.0	7 649	51.2	14 750	46.2
9	6 798	54.9	5 590	56.3	12 388	53.1
10	3 977	56.3	4 390	56.9	8 367	53.3
11	1 984	62.8	3 495	54.6	5 479	53.3
12	3 533	49.6	1 972	58.1	5 505	47.2
13	2 048	58.2	1 187	69.3	3 235	53.2
14	1 054	56.5	807	74.9	1 861	51.3
15	200	124.4	384	87.1	584	80.8
16	63	153.3	7	226.5	70	143.2
17	69	124.5	136	129.0	205	101.4
18	–	–	–	–	–	–
19	190	122.6	–	–	190	122.6

Table C3: Estimated scaled numbers-at-age (NAA), bootstrapped coefficients of variation (c.v.), and bootstrapped mean-weighted coefficients of variation (MWCV) calculated from the data for KAH 1, collected during May 2005 to June 2006, scaled to the total reported catch landed by purse seines as bycatch (non-target fishery). Age 1 is a minus group and age 19 is a plus group.

	Male		Female		Total	
Age (years)	NAA	c.v. (%)	NAA	c.v. (%)	NAA	c.v. (%)
1	64	190.2	127	142.7	191	137.0
2	472	111.7	106	163.3	578	107.5
3	6 636	67.1	4 377	77.6	11 014	69.2
4	21 146	37.4	19 959	34.7	41 106	34.4
5	19 521	27.0	25 243	24.1	44 764	23.2
6	22 875	14.8	24 560	16.3	47 435	12.0
7	14 172	16.9	12 005	22.2	26 177	13.9
8	12 661	18.4	14 768	20.1	27 430	14.6
9	11 734	21.4	10 906	21.4	22 641	16.8
10	6 275	28.5	9 455	23.9	15 731	20.3
11	3 418	35.5	7 655	25.4	11 073	23.5
12	6 056	26.9	4 385	32.3	10 440	21.5
13	2 931	38.5	2 605	43.3	5 536	29.4
14	1 899	51.2	1 879	41.7	3 778	34.3
15	339	104.9	1 207	47.6	1 547	44.5
16	104	136.6	244	84.1	348	76.6
17	181	111.0	346	87.7	527	70.7
18	–	–	145	115.7	145	115.7
19	174	110.4	–	–	174	105.6

Table C4: Estimated scaled numbers-at-age (NAA), bootstrapped coefficients of variation (c.v.), and bootstrapped mean-weighted coefficients of variation (MWCV) calculated from the data for KAH 1, collected during May 2005 to June 2006, scaled to the total reported catch landed by trawls in KAH 1 (target and non-target fisheries combined). Age 1 is a minus group and age 19 is a plus group.

	Male		Female		Total	
Age (years)	NAA	c.v. (%)	NAA	c.v. (%)	NAA	c.v. (%)
1	–	–	–	–	–	–
2	8	202.6	–	–	8	202.6
3	675	95.8	226	99.6	902	91.5
4	1 696	59.6	1 150	58.1	2 846	56.6
5	2 563	24.2	2 135	42.1	4 698	28.8
6	4 942	18.6	3 081	32.1	8 023	13.2
7	3 137	22.9	1 425	28.5	4 562	14.8
8	2 828	24.5	1 715	22.3	4 542	15.5
9	2 573	24.0	1 223	23.8	3 796	18.1
10	1 480	31.9	1 002	26.6	2 482	22.4
11	799	44.0	881	24.7	1 680	26.7
12	1 401	32.5	621	31.1	2 022	24.6
13	755	42.2	293	53.2	1 049	33.2
14	418	54.4	240	44.0	658	39.2
15	86	114.7	129	55.0	215	60.4
16	22	163.9	23	138.1	45	118.3
17	34	117.7	47	83.8	80	69.5
18	–	–	15	188.6	15	188.6
19	65	131.2	–	–	65	128.7

Table C5: Estimated scaled numbers-at-age (NAA), bootstrapped coefficients of variation (c.v.), and bootstrapped mean-weighted coefficients of variation (MWCV) calculated from the data for KAH 1, collected during May 2005 to June 2006, scaled to the total reported catch landed in KAH 1, all strata combined (purse seine fishery not subdivided into target and bycatch). Age 1 is a minus group and age 19 is a plus group.

	Male		Female		Total	
Age (years)	NAA	c.v. (%)	NAA	c.v. (%)	NAA	c.v. (%)
1	312	263.3	4 096	96.7	4 408	96.5
2	4 760	104.8	1 292	153.3	6 052	100.6
3	46 306	70.6	46 716	77.7	93 021	73.1
4	63 025	42.9	57 295	40.2	120 320	40.2
5	33 820	22.8	42 929	21.3	76 750	19.6
6	42 874	17.0	44 757	18.9	87 631	15.1
7	26 742	19.9	21 109	23.8	47 850	17.3
8	23 723	20.4	25 660	22.4	49 383	17.3
9	22 084	23.3	18 867	24.4	40 951	19.9
10	12 145	29.6	15 990	24.6	28 135	21.5
11	6 485	36.6	12 976	26.3	19 461	23.8
12	11 487	26.6	7 528	32.1	19 015	21.9
13	5 865	38.3	4 408	44.8	10 273	30.6
14	3 544	49.0	3 174	41.7	6 719	33.8
15	652	101.7	1 924	47.8	2 576	45.0
16	198	116.7	338	87.9	536	71.8
17	310	102.9	579	93.1	889	71.9
18	–	–	200	122.8	200	122.8
19	414	78.0	–	–	414	74.1

Table C6: Estimated scaled numbers-at-age (NAA), bootstrapped coefficients of variation (c.v.), and bootstrapped mean-weighted coefficients of variation (MWCV) calculated from the data for KAH 1, subarea East Northland, collected during May 2005 to June 2006, scaled to the total reported catch landed by purse seines in East Northland. Age 4 is a minus group and age 14 is a plus group.

	Male		Female		Total	
Age (years)	NAA	c.v. (%)	NAA	c.v. (%)	NAA	c.v. (%)
4	352	149.3	176	190.4	528	134.6
5	700	120.3	–	–	700	120.3
6	–	–	1 707	128.8	1 707	128.8
7	4 737	54.6	–	–	4 737	54.6
8	4 018	55.3	911	132.3	4 929	54.0
9	5 557	42.2	2 612	100.6	8 169	43.1
10	1 266	89.3	1 569	120.4	2 835	82.3
11	700	113.4	–	–	700	113.4
12	2 456	61.8	6 482	72.3	8 938	53.0
13	345	138.2	8 360	56.0	8 705	53.0
14	835	83.8	1 303	138.1	2 138	100.9

Table C7: Estimated scaled numbers-at-age (NAA), bootstrapped coefficients of variation (c.v.), and bootstrapped mean-weighted coefficients of variation (MWCV) calculated from the data for KAH 1, subarea East Northland, collected during May 2005 to June 2006, scaled to the total reported catch landed by trawls in East Northland. Age 4 is a minus group and age 14 is a plus group.

	Male		Female		Total	
Age (years)	NAA	c.v. (%)	NAA	c.v. (%)	NAA	c.v. (%)
4	711	65.8	445	80.4	1 156	52.4
5	373	105.7	–	–	373	105.7
6	–	–	756	95.6	756	95.6
7	2 579	50.8	–	–	2 579	50.8
8	2 051	50.0	400	108.5	2 451	44.5
9	2 609	42.7	245	116.9	2 853	39.8
10	934	75.6	622	96.5	1 556	59.8
11	373	103.9	–	–	373	103.9
12	1 174	64.3	956	75.5	2 130	48.5
13	311	104.0	1 467	59.1	1 779	51.6
14	89	120.2	445	77.2	534	65.0

Table C8: Estimated scaled numbers-at-age (NAA), bootstrapped coefficients of variation (c.v.), and bootstrapped mean-weighted coefficients of variation (MWCV) calculated from the data for KAH 1, subarea East Northland, collected during May 2005 to June 2006, scaled to the total reported catch landed in East Northland, all strata combined Age 4 is a minus group and age 14 is a plus group.

	Male		Female		Total	
Age (years)	NAA	c.v. (%)	NAA	c.v. (%)	NAA	c.v. (%)
4	1 063	98.1	621	141.1	1 684	91.7
5	1 073	111.1	–	–	1 073	111.1
6	–	–	2 463	115.2	2 463	115.2
7	7 316	51.0	–	–	7 316	51.0
8	6 069	50.7	1 311	120.8	7 380	47.8
9	8 165	40.2	2 857	100.4	11 022	39.4
10	2 200	80.0	2 191	111.6	4 391	72.0
11	1 073	106.7	–	–	1 073	106.7
12	3 630	60.3	7 438	71.7	11 068	50.0
13	656	110.5	9 827	55.5	10 483	51.6
14	924	81.2	1 747	122.6	2 671	90.9

Table C9: Estimated scaled numbers-at-age (NAA), bootstrapped coefficients of variation (c.v.), and bootstrapped mean-weighted coefficients of variation (MWCV) calculated from the data for KAH 1, subarea Bay of Plenty, collected during May 2005 to June 2006, scaled to the total reported catch landed by purse seines in the Bay of Plenty. Age 1 is a minus group and age 19 is a plus group.

	Male		Female		Total	
Age (years)	NAA	c.v. (%)	NAA	c.v. (%)	NAA	c.v. (%)
1	230	130.0	–	–	230	109.8
2	233	169.9	1 699	61.2	1 932	60.4
3	4 867	37.1	3 080	55.8	7 947	35.4
4	16 038	30.0	8 584	29.6	24 622	24.7
5	6 590	39.8	16 026	22.5	22 616	20.9
6	9 845	33.8	10 668	27.4	20 514	20.3
7	10 789	32.9	11 538	26.4	22 327	20.9
8	11 221	30.5	4 175	58.8	15 396	25.2
9	7 037	38.1	6 217	35.7	13 253	25.6
10	10 767	32.0	4 040	52.9	14 808	24.9
11	6 271	39.1	1 528	75.7	7 799	34.4
12	5 312	46.5	1 546	77.4	6 859	39.3
13	2 961	51.1	2 715	77.3	5 676	47.9
14	3 591	50.5	2 203	64.1	5 794	41.1
15	–	–	29	267.6	29	267.6
16	33	291.0	–	–	33	291.0
17	–	–	78	236.4	78	230.1
18	230	130.0	–	–	230	109.8
19	233	169.9	1 699	61.2	1 932	60.4

Table C10: Estimated scaled numbers-at-age (NAA), bootstrapped coefficients of variation (c.v.), and bootstrapped mean-weighted coefficients of variation (MWCV) calculated from the data for KAH 2, collected during May 2005 to June 2006, scaled to the total reported catch landed by purse seines in KAH 2. Age 3 is a minus group and age 19 is a plus group.

	Male		Female		Total	
Age (years)	NAA	c.v. (%)	NAA	c.v. (%)	NAA	c.v. (%)
3	–	–	–	–	–	–
4	472	166	3 179	64.0	3 651	62.5
5	9 700	36.4	6 519	50.4	16 219	33.9
6	31 391	30.3	15 556	31.7	46 946	25.4
7	15 259	38.3	32 260	21.7	47 519	21.3
8	20 312	31.5	21 892	26.0	42 204	19.8
9	20 736	32.3	21 301	26.8	42 037	20.1
10	20 585	30.5	9 666	50.8	30 251	24.4
11	15 501	35.2	16 224	30.6	31 725	22.2
12	22 004	30.3	7 500	48.7	29 504	23.8
13	12 214	39.3	3 490	70.7	15 704	35.2
14	9 883	44.8	2 952	79.3	12 834	37.4
15	9 242	45.0	5 187	79.8	14 429	43.3
16	6 684	49.0	4 229	67.0	10 913	41.9
17	–	–	58	237.9	58	237.9
18	66	254.1	–	–	66	254.1
19	–	–	159	207.3	159	205.7

Table C11: Estimated scaled numbers-at-age (NAA), bootstrapped coefficients of variation (c.v.), and bootstrapped mean-weighted coefficients of variation (MWCV) calculated from the data for KAH 3, collected during May 2005 to June 2006, scaled to the total reported catch landed by purse seines in KAH 3. Age 2 is a minus group and age 22 is a plus group.

	Male		Female		Total	
Age (years)	NAA	c.v. (%)	NAA	c.v. (%)	NAA	c.v. (%)
2	94	168.7	–	–	94	168.7
3	259	151.5	501	102.7	760	81.1
4	2 816	77.5	2 805	69.4	5 621	58.7
5	8 990	54.8	10 371	46.3	19 361	44.0
6	16 345	37.1	16 660	26.5	33 004	26.9
7	14 508	23.1	12 020	24.3	26 528	17.4
8	7 183	33.9	10 153	26.1	17 336	21.7
9	8 299	29.8	7 857	28.7	16 156	21.7
10	9 753	27.2	3 498	39.4	13 251	23.4
11	2 915	41.6	6 394	32.4	9 309	27.9
12	4 773	37.1	5 663	32.4	10 436	25.7
13	4 329	37.4	1 633	50.8	5 963	31.9
14	1 345	55.6	1 913	54.5	3 258	44.5
15	881	64.7	3 894	38.5	4 776	35.6
16	1 962	45.3	567	88.2	2 529	42.6
17	868	65.3	138	134.1	1 006	60.3
18	72	129.7	762	68.2	834	63.6
19	72	123.9	–	–	72	123.9
20	72	126.5	–	–	72	126.5
21	–	–	39	245	39	245.0
22	58	193.7	58	183.4	117	160.6

Table C12: Estimated scaled numbers-at-age (NAA), bootstrapped coefficients of variation (c.v.), and bootstrapped mean-weighted coefficients of variation (MWCV) calculated from the data for KAH 3, collected during May 2005 to June 2006, scaled to the total reported catch landed by trawls in KAH 3. Age 22 is a plus group.

	Male		Female		Total	
Age (years)	NAA	c.v. (%)	NAA	c.v. (%)	NAA	c.v. (%)
2	–	–	–	–	–	–
3	227	96.5	209	87.3	436	80.4
4	299	87.3	191	85.2	490	80.0
5	174	61.6	366	50.8	540	43.5
6	608	42.0	785	32.0	1 393	30.3
7	1 122	32.8	757	28.7	1 878	26.1
8	588	39.0	683	27.5	1 271	25.0
9	721	33.1	555	27.4	1 277	22.8
10	1 011	26.6	347	37.1	1 359	19.6
11	325	37.6	602	25.6	927	21.0
12	436	36.1	529	30.7	965	21.7
13	422	34.7	203	47.6	625	27.1
14	212	48.3	229	55.6	441	39.6
15	182	56.8	448	36.1	630	32.3
16	415	40.8	158	78.6	573	38.9
17	237	58.2	23	133.7	260	52.8
18	35	121.4	140	64.5	175	59.7
19	35	121.4	–	–	35	121.4
20	35	127.1	–	–	35	127.1
21	–	–	49	139.9	49	139.9
22	165	66.4	100	79.9	265	53.4

Table C13: Estimated scaled numbers-at-age (NAA), bootstrapped coefficients of variation (c.v.), and bootstrapped mean-weighted coefficients of variation (MWCV) calculated from the data for KAH 3, collected during May 2005 to June 2006, scaled to the total reported catch landed in KAH 3, all strata combined. Age 2 is a minus group and age 22 is a plus group.

	Male		Female		Total	
Age (years)	NAA	c.v. (%)	NAA	c.v. (%)	NAA	c.v. (%)
2	94	166.3	0	303.9	94	155.0
3	486	94.4	710	78.9	1 196	59.4
4	3 115	70.9	2 997	65.2	6 111	54.5
5	9 165	54.1	10 736	45.0	19 901	42.9
6	16 953	36.2	17 444	26.0	34 397	26.2
7	15 630	22.6	12 776	23.8	28 406	17.0
8	7 771	33.3	10 836	25.6	18 607	21.3
9	9 020	29.1	8 413	28.0	17 433	21.2
10	10 765	26.2	3 845	38.0	14 610	22.4
11	3 240	40.0	6 996	31.0	10 236	26.6
12	5 209	36.2	6 192	31.2	11 401	24.7
13	4 752	36.2	1 836	48.0	6 588	30.6
14	1 556	52.0	2 142	51.7	3 698	41.5
15	1 064	59.3	4 342	36.4	5 406	33.1
16	2 377	41.2	726	76.7	3 102	38.2
17	1 106	57.9	161	127.4	1 267	53.5
18	107	115.1	902	63.5	1 009	58.3
19	107	112.3	–	–	107	112.3
20	107	116.3	–	–	107	116.3
21	–	–	88	149.8	88	149.8
22	223	80.7	159	90.4	382	68.6

Table C14: Estimated scaled numbers-at-age (NAA), bootstrapped coefficients of variation (c.v.), and bootstrapped mean-weighted coefficients of variation (MWCV) calculated from the data for KAH 8, collected during May 2005 to June 2006, scaled to the total reported catch landed by trawls in KAH 8. Age 2 is a minus groups and age 19 is a plus group

	Male		Female		Total	
Age (years)	NAA	c.v. (%)	NAA	c.v. (%)	NAA	c.v. (%)
2	1 906	69.8	1 761	90.7	3 667	72.3
3	–	–	917	130.1	917	130.1
4	–	–	658	123.2	658	123.2
5	5 224	53.8	1 916	79.6	7 140	44.1
6	8 019	30.3	4 128	43.5	12 147	26.0
7	6 824	32.2	11 618	24.3	18 443	19.5
8	6 727	31.9	8 512	32.1	15 239	22.5
9	10 541	26.7	7 394	31.1	17 935	19.0
10	10 912	26.6	9 935	26.5	20 847	17.4
11	7 433	29.9	12 014	32.9	19 447	22.2
12	9 103	29.9	9 629	24.6	18 732	19.3
13	3 388	43.2	5 302	53.0	8 690	36.7
14	550	100.2	683	102.9	1 233	68.9
15	5 780	37.0	–	–	5 838	36.7
16	2 608	48.6	1 895	111	4 503	54.6
17	1 927	79.3	–	–	1 927	79.3
18	658	110.5	–	–	658	110.5
19	160	136.1	160	280.4	320	225.4

Appendix D: Age-length keys

Table D1: Age-length key used to convert the scaled length distributions to age distributions; data were collected May 2005 – June 2006 in KAH 1. Each row gives the proportion at age of each length class. The total number of observations in each length class is also provided.

Males	Age (years)																		
Length (cm)	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	>19	Total
<32	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
33	-	0.5	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4
34	-	0.8	0.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5
35	0.11	0.56	0.33	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	18
36	0.08	0.54	0.38	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	13
37	-	-	1.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2
38	-	1.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2
39	-	-	1.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2
40	-	0.29	0.29	0.43	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7
41	-	-	0.54	0.46	-	-	-	-	-	-	-	-	-	-	-	-	-	-	13
42	-	-	0.47	0.53	-	-	-	-	-	-	-	-	-	-	-	-	-	-	15
43	-	0.13	0.53	0.33	-	-	-	-	-	-	-	-	-	-	-	-	-	-	15
44	-	0.07	0.4	0.27	0.2	0.07	-	-	-	-	-	-	-	-	-	-	-	-	15
45	-	-	0.42	0.33	0.08	0.08	0.08	-	-	-	-	-	-	-	-	-	-	-	12
46	-	-	0.04	0.04	0.46	0.38	0.04	0.04	-	-	-	-	-	-	-	-	-	-	24
47	-	-	-	0.22	0.48	0.17	0.04	-	0.04	-	0.04	-	-	-	-	-	-	-	23
48	-	-	0.03	0.10	0.34	0.17	0.10	0.07	0.07	-	0.07	0.03	-	-	-	-	-	-	29
49	-	-	-	0.10	0.17	0.23	0.10	0.2	0.07	0.03	0.03	0.07	-	-	-	-	-	-	30
50	-	-	-	-	0.27	0.08	0.27	0.12	0.04	-	0.15	-	0.08	-	-	-	-	-	26
51	-	-	-	0.15	0.10	0.05	0.10	0.35	0.15	0.05	-	0.05	-	-	-	-	-	-	20
52	-	-	-	0.04	0.15	0.19	0.07	0.15	0.11	0.22	0.04	-	-	0.04	-	-	-	-	27
53	-	-	-	-	-	0.05	0.36	0.09	0.09	-	0.18	0.18	0.05	-	-	-	-	-	22
54	-	-	-	-	-	-	0.38	0.12	0.06	0.06	0.19	0.06	0.06	-	-	0.06	-	-	16
55	-	-	-	-	0.17	0.08	-	0.17	0.17	0.17	0.08	-	0.08	-	0.08	-	-	-	12
56	-	-	-	-	-	-	-	-	0.33	-	-	-	0.67	-	-	-	-	-	3
>57	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0

Table D1: ***Continued.***

Females	Age (years)																		
Length (cm)	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	>19	Total
>33	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
34	-	1.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4
35	-	0.64	0.36	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	14
36	0.06	0.44	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	18
37	-	0.43	0.57	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7
38	-	0.50	0.50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2
39	-	-	1.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
40	-	1.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3
41	-	0.12	0.75	0.12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8
42	-	-	0.56	0.44	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9
43	-	0.04	0.61	0.35	-	-	-	-	-	-	-	-	-	-	-	-	-	-	23
44	-	-	0.5	0.42	0.08	-	-	-	-	-	-	-	-	-	-	-	-	-	12
45	-	-	0.2	0.55	0.15	0.05	0.05	-	-	-	-	-	-	-	-	-	-	-	20
46	-	-	0.17	0.67	0.17	-	-	-	-	-	-	-	-	-	-	-	-	-	6
47	-	-	0.11	0.11	0.44	0.11	0.11	0.11	-	-	-	-	-	-	-	-	-	-	9
48	-	-	0.05	0.26	0.47	0.05	-	0.05	0.05	0.05	-	-	-	-	-	-	-	-	19
49	-	-	-	0.22	0.33	0.22	0.17	-	-	-	-	0.06	-	-	-	-	-	-	18
50	-	-	0.05	0.10	0.3	0.10	0.15	0.10	0.10	0.05	0.05	-	-	-	-	-	-	-	20
51	-	-	-	0.08	0.32	0.08	0.21	0.05	0.05	0.08	0.05	0.03	0.05	-	-	-	-	-	38
52	-	-	-	0.09	0.12	0.15	0.15	0.24	0.06	0.09	0.03	0.06	0.03	-	-	-	-	-	34
53	-	-	-	-	0.03	0.19	0.11	0.17	0.28	0.08	0.06	-	-	0.06	-	0.03	-	-	36
54	-	-	-	-	-	0.09	0.20	0.22	0.19	0.17	0.07	0.04	-	0.02	-	-	-	-	54
55	-	-	-	-	-	0.02	0.19	0.12	0.17	0.24	0.19	-	0.05	0.02	-	-	-	-	42
56	-	-	-	-	-	0.04	0.14	0.14	0.18	0.11	0.11	0.04	0.11	0.11	0.04	-	-	-	28
57	-	-	-	-	-	0.06	0.12	0.12	0.06	0.29	0.12	-	0.12	0.06	-	0.06	-	-	17
58	-	-	-	-	-	-	-	-	-	0.17	-	0.33	0.17	-	0.17	-	0.17	-	6
59	-	-	-	-	-	-	-	-	-	-	1.00	-	-	-	-	-	-	-	1
60	-	-	-	-	-	-	-	-	1.00	-	-	-	-	-	-	-	-	-	1
>61	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0

Table D2: Age-length key used to convert the scaled length distributions to age distributions; data were collected May 2005 – June 2006 in KAH 2. Each row gives the proportion at age of each length class. The total number of observations in each length class is also provided.

Males	Age (years)																	
Length (cm)	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	>19	Total
<36	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
37	0.50	0.50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2
38	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
39	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
40	-	0.50	0.50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2
41	-	-	1.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2
42	-	-	1.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2
43	-	-	1.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4
44	-	0.50	-	0.50	-	-	-	-	-	-	-	-	-	-	-	-	-	2
45	-	-	1.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7
46	-	-	0.33	0.25	0.33	0.08	-	-	-	-	-	-	-	-	-	-	-	12
47	-	-	-	0.25	0.25	0.25	0.17	-	-	0.08	-	-	-	-	-	-	-	12
48	-	-	-	0.56	0.11	0.06	0.11	-	0.06	0.11	-	-	-	-	-	-	-	18
49	-	-	-	0.18	0.06	0.06	0.24	0.06	0.06	0.12	0.12	0.06	0.06	-	-	-	-	17
50	-	-	-	-	0.05	0.14	0.05	0.24	0.14	0.14	0.05	0.10	0.05	0.05	-	-	-	21
51	-	-	-	-	-	0.18	0.06	0.18	0.12	0.18	0.12	0.06	0.06	0.06	-	-	-	17
52	-	-	-	0.09	-	-	0.09	0.18	0.09	-	0.09	0.09	0.18	0.18	-	-	-	11
53	-	-	-	-	0.10	0.10	0.10	-	-	0.20	0.20	-	0.20	0.10	-	-	-	10
54	-	-	-	-	-	-	-	-	0.40	0.20	-	0.20	-	0.20	-	-	-	5
55	-	-	-	-	-	-	-	-	-	-	0.33	0.33	-	0.33	-	-	-	3
56	-	-	-	-	-	-	-	1.00	-	-	-	-	-	-	-	-	-	1
57	-	-	-	-	-	-	-	-	-	-	-	-	-	0.50	-	0.50	-	2
>58	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0

Table D2: ***Continued.***

Females	Age (years)																	
Length (cm)	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	>19	Total
<39	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
40	-	-	1.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
41	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
42	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
43	-	-	1.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
44	-	-	-	0.50	0.50	-	-	-	-	-	-	-	-	-	-	-	-	2
45	-	0.40	0.40	0.20	-	-	-	-	-	-	-	-	-	-	-	-	-	5
46	-	0.10	0.20	0.20	0.3	0.20	-	-	-	-	-	-	-	-	-	-	-	10
47	-	0.08	0.15	0.31	0.23	0.08	0.08	-	0.08	-	-	-	-	-	-	-	-	13
48	-	0.06	0.06	0.29	0.47	0.06	0.06	-	-	-	-	-	-	-	-	-	-	17
49	-	-	0.06	0.11	0.33	0.28	0.22	-	-	-	-	-	-	-	-	-	-	18
50	-	-	-	-	0.18	0.12	0.24	0.12	0.24	0.06	-	-	-	0.06	-	-	-	17
51	-	-	-	0.11	0.16	0.11	0.11	0.05	0.21	0.11	0.05	0.05	0.05	-	-	-	-	19
52	-	-	-	-	-	0.23	0.08	0.15	0.08	0.08	0.08	0.08	0.08	0.15	-	-	-	13
53	-	-	-	-	0.07	-	0.14	0.21	0.14	0.14	0.07	-	0.21	-	-	-	-	14
54	-	-	-	-	-	0.10	-	0.30	-	0.20	0.10	-	0.30	-	-	-	-	10
55	-	-	-	-	-	-	-	-	-	-	-	0.6	0.20	-	0.20	-	-	5
56	-	-	-	-	-	-	-	-	-	-	-	-	1.00	-	-	-	-	1
>57	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0

Table D3: Age-length key used to convert the scaled length distributions to age distributions; data were collected May 2005 – June 2006 in KAH 3. Each row gives the proportion at age of each length class. The total number of observations in each length class is also provided.

Males	Age (years)																				
Length (cm)	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	>22	Total
<29	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
30	1.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2
31	0.50	0.50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6
32	0.75	0.25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4
33	0.50	0.50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2
34	0.50	0.50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2
35	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
36	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
37	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
38	-	1.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2
39	-	0.50	0.50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2
40	-	1.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2
41	-	1.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2
42	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
43	-	-	1.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
44	-	0.33	0.33	0.33	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3
45	-	-	0.29	0.57	0.14	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7
46	-	-	0.17	0.50	0.17	-	0.08	-	0.08	-	-	-	-	-	-	-	-	-	-	-	12
47	-	-	-	0.40	0.30	0.20	0.10	-	-	-	-	-	-	-	-	-	-	-	-	-	10
48	-	-	-	0.06	0.38	0.12	0.12	0.25	-	0.06	-	-	-	-	-	-	-	-	-	-	16
49	-	-	0.06	0.12	0.12	0.18	0.18	0.12	-	0.12	0.12	-	-	-	-	-	-	-	-	-	17
50	-	-	-	-	0.15	0.08	0.15	0.27	0.04	0.12	0.15	-	-	0.04	-	-	-	-	-	-	26
51	-	-	-	0.04	0.22	0.04	0.04	0.13	0.13	0.09	0.04	0.09	0.04	0.09	0.04	-	-	-	-	-	23
52	-	-	-	-	0.06	0.11	0.17	0.17	0.11	0.11	0.06	0.11	0.06	-	0.06	-	-	-	-	-	18
53	-	-	-	-	-	-	0.08	0.17	0.17	-	0.08	0.08	0.08	0.25	0.08	-	-	-	-	-	12
54	-	-	-	-	-	-	-	0.09	-	-	0.09	0.09	0.18	0.18	0.09	0.09	0.09	0.09	-	-	11
55	-	-	-	-	-	-	-	-	-	-	-	-	-	0.50	0.50	-	-	-	-	-	2
>56	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0

Table D3: ***Continued.***

Females	Age (years)																				
Length (cm)	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	>22	Total
<28	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
29	1.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
30	1.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
31	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
32	0.60	0.40	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5
33	0.40	0.60	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5
34	1.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
35	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
36	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
37	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
38	-	-	1.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2
39	-	0.50	0.50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2
40	-	0.50	0.50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4
41	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
42	-	-	1.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
43	-	-	1.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3
44	-	0.33	0.50	0.17	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6
45	-	-	0.50	0.50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2
46	-	0.12	0.25	0.38	0.25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8
47	0.07	-	0.14	0.36	0.43	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	14
48	-	-	-	0.31	0.31	0.15	0.08	0.08	-	0.08	-	-	-	-	-	-	-	-	-	-	13
49	-	-	-	0.14	0.14	0.29	0.21	-	0.07	0.14	-	-	-	-	-	-	-	-	-	-	14
50	-	-	-	0.22	0.06	0.22	0.22	0.06	0.11	-	-	0.06	0.06	-	-	-	-	-	-	-	18
51	-	-	-	0.14	0.09	0.14	0.09	0.05	0.18	0.09	-	-	0.14	0.05	-	0.05	-	-	-	-	22
52	-	-	-	-	0.14	0.14	-	0.03	0.21	0.17	0.10	0.10	0.10	-	-	-	-	-	-	-	29
53	-	-	-	-	0.07	0.04	0.14	0.18	0.18	0.11	0.14	-	0.07	-	-	0.07	-	-	-	-	28
54	-	-	-	-	-	-	0.09	0.27	-	0.18	0.09	0.09	0.27	-	-	-	-	-	-	-	11
55	-	-	-	-	-	0.12	0.25	-	0.12	0.12	-	0.12	0.12	-	0.12	-	-	-	-	-	8
56	-	-	-	-	-	-	-	-	-	-	-	0.25	0.25	0.50	-	-	-	-	-	-	4
57	-	-	-	-	-	-	-	-	-	0.33	-	-	-	-	-	0.33	-	-	0.33	-	3
>58	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0

Table D4: Age-length key used to convert the scaled length distributions to age distributions; data were collected May 2005 – June 2006 in KAH 8. Each row gives the proportion at age of each length class. The total number of observations in each length class is also provided.

Males	Age (years)																	
Length (cm)	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	Total
<41	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
42	-	-	1.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
43	-	-	0.50	-	-	-	-	-	0.50	-	-	-	-	-	-	-	-	2
44	-	-	1.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
45	-	-	-	0.50	-	-	0.50	-	-	-	-	-	-	-	-	-	-	2
46	-	-	0.12	0.12	-	0.12	0.25	0.12	0.25	-	-	-	-	-	-	-	-	8
47	-	-	0.08	0.25	0.08	0.08	0.17	0.17	-	0.17	-	-	-	-	-	-	-	12
48	-	-	-	0.09	0.27	0.09	0.09	0.18	-	0.27	-	-	-	-	-	-	-	11
49	-	-	-	0.15	0.15	0.12	0.12	0.08	0.15	0.15	0.08	-	-	-	-	-	-	26
50	-	-	-	0.10	0.05	0.14	0.14	0.24	0.14	0.10	0.10	-	-	-	-	-	-	21
51	-	-	-	0.06	0.06	0.06	0.25	0.06	0.19	0.06	0.12	0.06	-	0.06	-	-	-	16
52	-	-	-	-	-	0.11	0.11	0.22	-	-	-	-	0.22	0.11	0.11	0.11	-	9
53	-	-	-	-	-	-	-	0.20	-	0.20	-	-	0.40	-	0.20	-	-	5
54	-	-	-	-	-	-	-	-	-	-	-	-	0.60	0.40	-	-	-	5
55	-	-	-	-	-	-	-	-	-	-	-	-	0.50	0.50	-	-	-	2
56	-	-	-	-	1.00	-	-	-	-	-	-	-	-	-	-	-	-	1
57	-	-	-	-	-	-	0.50	0.50	-	-	-	-	-	-	-	-	-	2
58	-	-	-	-	-	0.50	-	0.50	-	-	-	-	-	-	-	-	-	2
59	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
60	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
61	-	-	-	-	-	-	-	-	-	-	-	1.00	-	-	-	-	-	1
>62	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0

Table D4: ***Continued.***

Females	Age(years)																	
Length (cm)	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	Total
<36	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
37	1.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
38	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
39	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
40	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
41	-	-	1.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
42	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
43	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
44	-	0.50	-	-	0.50	-	-	-	-	-	-	-	-	-	-	-	-	2
45	-	-	-	0.50	0.50	-	-	-	-	-	-	-	-	-	-	-	-	2
46	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
47	-	-	0.08	0.25	0.25	-	-	0.08	0.17	0.17	-	-	-	-	-	-	-	12
48	-	-	-	0.09	0.36	0.18	0.18	0.09	0.09	-	-	-	-	-	-	-	-	11
49	-	-	-	0.06	0.22	0.33	-	0.17	0.17	0.06	-	-	-	-	-	-	-	18
50	-	-	-	-	0.08	0.08	0.31	0.31	0.08	0.08	0.08	-	-	-	-	-	-	13
51	-	-	0.05	0.05	0.14	0.05	0.14	0.23	0.05	0.27	0.05	-	-	-	-	-	-	22
52	-	-	-	-	0.14	0.07	0.07	0.07	0.14	0.43	-	0.07	-	-	-	-	-	14
53	-	-	-	-	-	0.20	-	-	0.20	-	0.40	-	-	0.20	-	-	-	5
54	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
55	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
56	-	-	-	-	-	-	-	-	1.00	-	-	-	-	-	-	-	-	1
57	-	-	1.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
58	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
59	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
60	-	-	-	-	1.00	-	-	-	-	-	-	-	-	-	-	-	-	1
>61	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0