Length and age composition of recreational landings
of kahawai in KAH 1 in 2000–01, 2001–02, and 2002–03

Bruce Hartill
Helena Armiger
Robert Tasker
Crispin Middleton
David Fisher

Length and age composition of recreational landings of kahawai in KAH 1 in 2000–01, 2001–02, and 2002–03

Bruce Hartill[1]
Helena Armiger[1]
Robert Tasker[1]
Crispin Middleton[1]
David Fisher[2]

[1]NIWA
P O Box 109695
Auckland

[2]NIWA
Private Bag 14901
Wellington

Citation:
Hartill, B.; Armiger, H.; Tasker, R.; Middleton, C.; Fisher, D. (2007).
Length and age composition of recreational landings of kahawai
in KAH 1 in 2000–01, 2001–02, and 2002–03.
New Zealand Fisheries Assessment Report 2007/6. 38 p.

EXECUTIVE SUMMARY

Catch sampling programmes are commonly used to monitor fisheries and to provide data for stock assessments. Usually, commercial landings are targeted, but in some instances recreational landings provide a better description of changes in population dynamics. In the early 1990s, commercial purse-seine and single trawl landings were sampled but the resultant age distributions were multimodal and differed greatly from year to year. This is because kahawai school by size, and commercial catches are often taken from only one or two schools, each with a narrow size distribution. These landings, therefore, describe only a limited number of schools, from a limited spatial extent, and do not reflect the composition of the wider kahawai population. In contrast, a recreational fishery comprises thousands of trips, which sample a greater number of schools at a much lower level of intensity and is, therefore, more likely to be informative. Resultant length frequency distributions tend to be more unimodal, with any secondary peaks probably reflecting strong year classes rather than the influence of individual schools. There is no minimum legal size for kahawai, and recreational fishers therefore tend to land a greater size range of kahawai, in addition to providing a broader description of the population in the area fished. This report summarises the results of three years of sampling of recreational kahawai landings in 2000–01, 2001–02, and 2002–03, from three regions in KAH 1: East Northland, Hauraki Gulf, and the Bay of Plenty.

It has been recommended that 400–500 kahawai be aged to provide a reasonable approximation of a population's age structure. Recreational fishers were generally willing to let NIWA staff remove the heads of their landed kahawai, and adequate age sample sizes were obtained in all three regions. It is also recommended that approximately 1500 kahawai length measurements are required to provide a description of the less common length classes in a regional length frequency distribution. This target was not achieved in any of the three regions, as levels of sampling effort were based on historical boat ramp data, and there appears to have been a subsequent decrease in the number of kahawai landed per hour of interviewing. It is not clear whether this decrease is due to a reduction in overall fishing effort and/or reduced kahawai catch rates by recreational fishers. Anecdotal evidence suggests that kahawai catch rates have fallen in recent years. Although fewer kahawai have been measured than intended, analytically derived mean weighted coefficients of variation (c.v.s) indicate the length and age compositions of the regional populations have been estimated with reasonable precision (less than 0.2).

Ramp-specific age distributions were spatially and temporally variable, which probably reflects the heterogeneous distribution of a species which schools by size, and hence age. Clearer and more consistent patterns emerge, however, when data are combined at a regional level, especially across years. The Hauraki Gulf catch distribution largely comprised relatively small, younger fish, with the East Northland region having a broader length distribution dominated by fish of less than 7 years of age, while the Bay of Plenty catch distribution was mainly comprised of larger fish, reflecting a broader underlying age distribution. These length and age distributions are broadly consistent with those derived from boat ramp survey data from the early 1990s.

A broadening of age distributions and increased numbers of kahawai encountered by boat ramp interviewers in the second half of each annual survey suggests a possible onshore movement of sexually mature kahawai following spawning in deeper waters. The timing of these behaviours is probably influenced by prevailing environmental conditions that vary from year to year. There is some evidence of a trend of increasing fish size with distance offshore in East Northland and the Bay of Plenty.

1. INTRODUCTION

Random sampling of kahawai (*Arripis trutta*) populations for length and age is problematic given the species' size-specific schooling behaviour. For example, amalgamated length frequencies collected from commercial purse-seine landings in 1990–91 and 1991–92 were multimodal, and McKenzie & Trusewich (1996) concluded that this was probably an artefact of the way the purse-seine fleet operated, rather than an intrinsic feature of the Bay of Plenty population. Comprehensive sampling of commercial catches can be used to characterise commercial extraction, but these samples cannot be considered indicative of the underlying population length and age structure as the fishery operates non-randomly in space and time.

Recreational fishers, however, are thought to fish kahawai in a more random manner than the commercial fishery (Bradford 2000). Recreational fishers catch, and tend to land, a wider size range of fish than that taken by the main commercial fisheries (Bradford 1999). A time series of recreational catch-at-age estimates should, therefore, provide a better description of the underlying population age composition, given the manner in which fishers interact with kahawai in KAH 1. This report summarises the results of the first three years of recreational catch sampling carried out in KAH 1. The objective of this study (KAH2000/01 – Monitoring the length and age composition of recreational landings of kahawai) was:

> To conduct the sampling and determine the length and age composition of the recreational landings of kahawai in KAH 1 during the fishing years 2000–01, 2001–02 and 2002–03.

2. METHODS

2.1 Previous boat ramp surveys

In 1990–91 a survey was conducted to collect baseline information on harvest rates by recreational fishers interviewed at boat ramps throughout the Auckland Fisheries Management Area (AFMA) (Sylvester 1993). Most interviewing occurred on weekends between Boxing Day 1990 and June 1991. The main objective of a further survey in 1994 was to verify aspects of a concurrent recreational fisher diary survey. The length compositions of recreational catches measured during boat ramp interviews were compared with those reported by diarists. These boat ramp data were also used in conjunction with an aerial survey to estimate harvest from the Hauraki Gulf, which was compared with that derived from the diary programme (Sylvester 1994). In 1996 a nationwide boat ramp survey was carried out to estimate the mean weights of fish species caught by recreational fishers (Hartill et al. 1998). These mean weights were used in conjunction with estimates of the numbers of fish taken, derived from a telephone diary survey, to provide estimates of the national recreational harvest of key species (Bradford 1998a).

Although kahawai length frequency data are available from these boat ramp interviews, the underlying survey designs differed both spatially and temporally, and no age data were collected concurrently. Nonetheless, in a review of data collected from these surveys, Bradford (2000) suggested that sufficient kahawai were landed by recreational fishers to support a length and age catch sampling programme in KAH 1.

2.2 Sample design

The sample design for the 2000–01, 2001–02, and 2002–03 surveys was based on data collected from boat ramp surveys conducted in 1991, 1994, and 1996. Kahawai length data from these surveys suggested that there were substantive regional differences in the length frequency compositions of kahawai caught by recreational fishers in East Northland, the Hauraki Gulf, and Bay of Plenty (Hartill et al. 1998, Bradford 1999). Separate recreational boat ramp surveys were therefore conducted in each

4

of these regions (Figure 1), with concurrent collection of length and age samples from recreational landings of kahawai.

Sampling of recreational catches was restricted to a four-month season, 1 January to 30 April 2001, which corresponds approximately to the peak of the recreational fishing season, when kahawai landings were likely to be highest. Restriction of sampling to a four-month season was also desirable as a longer collection period would have increased the likelihood of growth distorting an age-length-key. Further, as otolith ring deposition occurs during the onset of winter (Stevens & Kalish 1998), collection of otoliths in early winter should be avoided, as ambiguous structures on the edge of the otolith may result in ageing error.

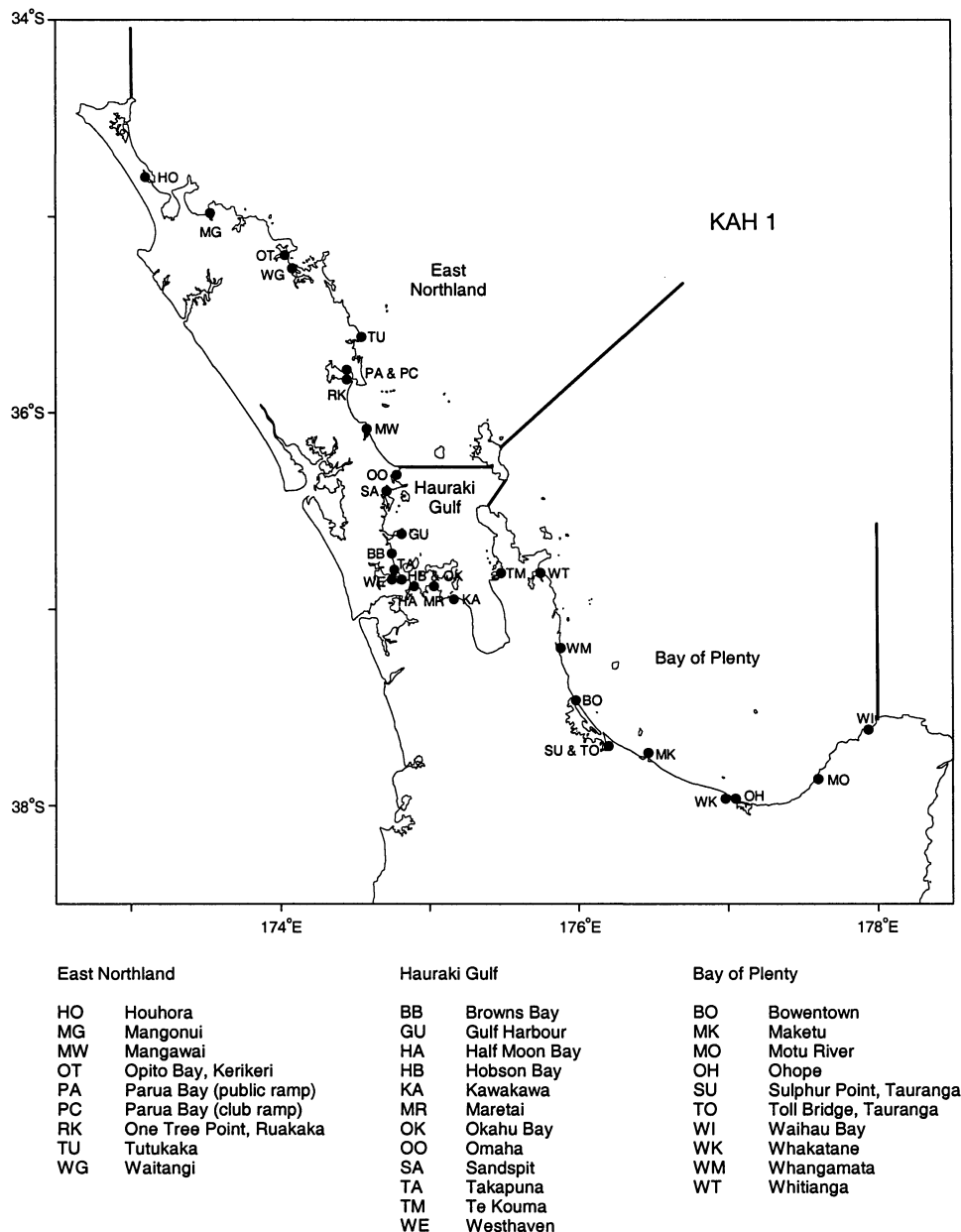| East Northland		Hauraki Gulf		Bay of Plenty	
HO	Houhora	BB	Browns Bay	BO	Bowentown
MG	Mangonui	GU	Gulf Harbour	MK	Maketu
MW	Mangawai	HA	Half Moon Bay	MO	Motu River
OT	Opito Bay, Kerikeri	HB	Hobson Bay	OH	Ohope
PA	Parua Bay (public ramp)	KA	Kawakawa	SU	Sulphur Point, Tauranga
PC	Parua Bay (club ramp)	MR	Maretai	TO	Toll Bridge, Tauranga
RK	One Tree Point, Ruakaka	OK	Okahu Bay	WI	Waihau Bay
TU	Tutukaka	OO	Omaha	WK	Whakatane
WG	Waitangi	SA	Sandspit	WM	Whangamata
		TA	Takapuna	WT	Whitianga
		TM	Te Kouma		
		WE	Westhaven		

Figure 1: Location of boat ramp interview sites.

Sampling took place solely on weekends and holidays when most recreational fishing usually occurs. Results from the 1996 boat ramp survey demonstrated that for the most commonly caught species, there were no substantive differences between length frequencies of fish caught during weekdays and weekends (Hartill et al. 1998).

5

Bradford (2000) recommended that 400–500 kahawai should be aged to give a reasonable approximation of the relationship between length and age and, hence, a population's age structure. A further recommendation from this study was that as many fish as possible, preferably 1500 (E. Bradford pers comm.), should be measured to provide a reliable length frequency distribution. The timing and intensity of recreational landings of kahawai is, however, difficult to predict given interannual variability in fishing effort and the spatially dynamic nature of kahawai schooling behaviour. A reasonable intensity of sampling effort was therefore required in space and time to intercept appreciable landings of kahawai when they occurred. The sample design used in 2000–01, 2001–02 and 2002–03 was based on the number of kahawai landed and measured per hour at selected key ramps, during weekends and holidays during the 1991, 1994, and 1996 boat ramp surveys (Table 1). Regional estimates of the average of the number of fish landed per hour of interviewing given in Table 1 are weighted averages across survey years, where the relative weighting was based on the number of interview hours (i.e., sampling effort) taking place on weekends or statutory holidays.

Table 1: Sample design used to estimate how many hours of boat ramp interviewing would be required to obtain measurements of 1500 kahawai in 2000–01, 2001–02, and 2002–03. Estimates were based on the average number of kahawai landed by recreational fishers per hour, on weekends and statutory holidays, during the 1991, 1994, and 1996 boat ramp surveys.

Region	Average no. of fish landed/interview h	Number of ramps	Session length (h)	Number of sessions	Estimated number of kahawai measured
East Northland	1.3	7	6	28	1 558
Hauraki Gulf	1.1	11	6	21	1 553
Bay of Islands	3.5	9	4	12	1 498

Sampling sessions at each ramp were randomly assigned to weekend/holiday days between 1 January and 30 April. If an interviewer found that there were strong onshore winds or local competitions on any of these dates, sampling took place on the next available weekend/holiday day. Interviews followed the format of those in 1991, 1994, and 1996 to ensure that the data were collected in a consistent manner. When more than one vessel approached a ramp simultaneously, a vessel was chosen randomly before landing. When fishers landing kahawai were encountered, all fish, including kahawai, were measured. During interview sessions, recreational fishers who had not caught kahawai were also interviewed when this did not interfere with the interviewing of other fishers landing kahawai. These incidental data were stored but not checked for errors or entered into the database, as this was not an objective of this study. However, these data may prove useful in the future, and there was no additional cost in their collection.

For ageing, kahawai were selected at random from each vessel's catch, from which no more than four fish were taken. As age samples were collected randomly, the length distribution of the age sample should broadly reflect the length distribution of the landed catch. Kahawai otoliths are fragile and time consuming to extract and interviewers therefore asked permission to cut the head off at the gills. Generally, over 90% of recreational fishers permitted the interviewer to remove heads from their kahawai. These heads were retained by the interviewer together with a record of the fish's length, and a code linking the head to other data collected during the interview. Otoliths were extracted from these heads at a later date. Kahawai were not sexed, as there is no apparent sexual dimorphism in growth rates (Bradford 1998b).

2.3 Ageing of kahawai otoliths

Kahawai otoliths were prepared using the thin section method described by Stevens & Kalish (1998). Each otolith was marked across an intended sectioning plane passing through the nucleus. Each otolith was then imbedded in a disposable epoxy mould with three other otoliths so that their nuclei were at

the same level. Once the resin hardened, a thin transverse section was cut out of each epoxy block with a Struers Accutom-2 low speed saw. One side of this section was then ground, polished, and mounted polished side down on a slide using 5-minute epoxy resin. After at least 1 hour, each slide was ground with a series of progressively finer carborundum papers (400, 1200, and 4000 grit) to a thickness of 250 to 350 μm depending on ring increment clarity. A suspension of 1.0 μm alumina powder (Linde A) was used for the final polish.

To improve clarity, a thin layer of immersion oil was brushed over each slide and reading took place under transmitted light. Three readers were used to interpret the thin sectioned otoliths and disagreements in interpretation were resolved using a method similar to that used for snapper (Davies & Walsh 1995), which was as follows.

- Each reader independently read all otoliths collected from a region.
- Disagreements between the three reader's initial age estimates were identified and where one or more readers failed to agree in their initial interpretation of an otolith, those readers reread the otolith with no knowledge of any prior age estimates.
- Remaining disagreements were resolved by discussing images of otoliths projected on to a video screen until a consensus was reached.
- If no consensus could be reached, the otolith was discarded from the dataset.

Very few otoliths were discarded, and when this occurred, both otoliths were usually deformed and, hence, unreadable.

2.4 Data analysis

Proportional catch-at-length and catch-at-age distributions and analytical variance estimates were calculated for each region using a FORTRAN program developed for a snapper market sampling programme (Davies & Walsh 1995). Vessels landing kahawai were regarded as individual strata, which were weighted on the basis of the number of kahawai landed. The distribution of fish at age within length classes (an age-length key) was derived for each region, and used to translate the regional length distributions into estimates of recreational catch-at-age. Proportional catch-at-age estimates were calculated for the range of age classes recruited, with the maximum age being an aggregate of all age classes greater than 19 years. Recreational catch-at-age and length frequency distributions and their associated variances were presented in the form of histograms and tables. Age data were collected in a random manner with respect to length, and von Bertalanffy growth curves were therefore fitted to unscaled regional length and age data iteratively, by least squares regression. Growth curves were compared visually.

For each region, catch-at-age distributions were derived for each ramp, and for each of the four months sampled using the same analytical approach used to derive regional distributions. Regional, and not ramp (or month) specific, age-length-keys were used to derive these age distributions, as the number of kahawai aged from each ramp (or month) was considered insufficient to describe the underlying length-age relationship. This assumes that the location of a ramp (or time of sampling, given the four-month sampling period) has little influence on the relationship between length and age within a region. Spatial and temporal trends in the underlying age composition of the regional kahawai populations fished by recreational fishers were then inferred from these histograms. Coefficients of variation (c.v.s) were not calculated for these distributions due to the low sample sizes of the component strata. Comparisons were made between ramps rather than the location at which they were caught, because in most areas there is little overlap between the areas fished from two or more ramps.

During the 2001–02 and 2002–03 sampling seasons recreational fishers were asked to estimate how far offshore they had fished. This information was used to plot the relationship between the size of fish caught, month of capture, and distance offshore.

3. RESULTS

3.1 The 2000–01 sampling season

A network of interviewers was established at 28 key boat ramps in East Northland, the Hauraki Gulf, and the Bay of Plenty (Figure 1). Sampling ceased at Houhora in early February due to consistently few recreational vessels using the ramp and the low numbers of kahawai consequently measured. Interviewing activity was transferred to a second ramp at Parua Bay, in Whangarei Harbour, where fishing activity was far greater. In East Northland and the Hauraki Gulf, the number of kahawai landed per hour in 2001 (Table 2a) was less than predicted from previous surveys (see Table 1). At the Whakatane ramp, two of the interview sessions took place during a competition. Before the competition started, fishers were advised that a spot prize was offered for kahawai and that all kahawai should therefore be landed. Proportional length frequencies created with, and without, length data from this competition were compared and found to be similar. No other competitions were sampled in 2001.

Table 2a: Summary statistics by region of the number of interview sessions, hours surveyed, vessels with measurable kahawai, kahawai measured, kahawai measured per hour, and kahawai aged in 2000–01.

Region	Ramp	Number of sessions	Number of hours	Boats with measurable kahawai	Kahawai measured	Kahawai measured per hour	Kahawai aged
East Northland	Houhora	11	66	5	10	0.2	10
	Mangonui	26	150	92	302	2.0	79
	Opito Bay	24	145	62	226	1.6	73
	Waitangi	26	144	78	201	1.4	79
	Tutukaka	24	144	42	95	0.7	88
	Parua Bay (public)	27	163	62	121	0.7	71
	Parua Bay (club)	20	118	86	169	1.4	49
	One Tree Point	13	73	11	30	0.4	25
	Mangawai	25	126	36	82	0.7	43
	Total	196	1129	474	1236	1.1	517
Hauraki Gulf	Omaha	18	109	18	26	0.2	23
	Gulf Harbour	22	121	47	81	0.7	71
	Browns Bay	12	72	10	16	0.2	14
	Takapuna	20	114	40	93	0.8	49
	Westhaven	15	103	15	23	0.2	22
	Hobson Bay	20	114	17	30	0.3	30
	Okahu Bay	10	47	7	10	0.2	0
	Half Moon Bay	29	173	132	260	1.5	98
	Maretai	19	97	60	170	1.8	103
	Kawakawa Bay	26	120	63	139	1.2	52
	Te Kouma	21	103	26	44	0.4	38
	Total	212	1174	435	892	0.8	500
Bay of Plenty	Whitianga	10	40	8	24	0.6	16
	Bowentown	12	48	30	86	1.8	60
	Sulphur Point	13	52	49	107	2.1	94
	Toll Bridge	4	16	0	0	0.0	0
	Maketu	10	13	18	50	3.8	38
	Whakatane	3	11	68	315	*28.6	54
	Ohope	17	69	43	164	2.4	81
	Motu River	11	28	29	185	6.6	0
	Waihau Bay	20	42	49	173	4.1	114
	Total	100	319	294	1104	3.5	457

* Two of these sampling events took place during a competition

3.2 The 2001–02 sampling season

The boat ramps used and sampling design employed in 2001–02 was based largely upon that used in 2000–01. In the Hauraki Gulf, sampling effort at one ramp, Hobson Bay, was transferred to Halfmoon Bay where vessel traffic volumes necessitated the employment of two interviewers, and effort at Omaha was transferred to the nearby Sandspit boat ramp. In the Bay of Plenty, sampling effort at Toll Bridge, Tauranga, was transferred to Whangamata where landings of kahawai were thought to be higher. These changes in sampling locality are unlikely to introduce between–year variability for two reasons. Firstly, few kahawai were encountered at the ramps concerned, and secondly, as sampling effort was shifted to a nearby ramp, those fishers encountered would have fished similar areas. The number of kahawai landed per hour was less than that observed in the 1991, 1994, and 1996 surveys (Table 2b); however, sufficient kahawai were sampled to describe regional catch-at-length and catch-at-age distributions.

Table 2b: Summary statistics by region of the number of interview sessions, hours surveyed, vessels with measurable kahawai, kahawai measured, kahawai measured per hour, and kahawai aged in 2001–02.

Region	Ramp	Number of sessions	Number of hours	Boats with measurable kahawai	Kahawai measured	Kahawai measured per hour	Kahawai aged
East Northland	Mangonui	23	138	78	290	2.1	23
	Opito Bay	23	138	94	238	1.7	105
	Waitangi	24	141	65	203	1.4	92
	Tutukaka	24	145	52	107	0.7	70
	Parua Bay (public)	27	146	54	106	0.7	64
	Parua Bay (club)	27	146	100	252	1.7	102
	One Tree Point	24	143	22	62	0.4	26
	Mangawai	27	113	26	60	0.5	44
	Total	199	1110	491	1318	1.2	526
Hauraki Gulf	Sandspit	15	90	8	11	0.1	10
	Gulf Harbour	18	98	19	43	0.4	33
	Browns Bay	7	40	3	10	0.3	4
	Takapuna	24	138	62	130	0.9	80
	Westhaven	15	91	26	65	0.7	46
	Okahu Bay	20	114	12	23	0.2	16
	Half Moon Bay*	38	219	97	231	1.1	143
	Maretai	20	120	26	56	0.5	25
	Kawakawa Bay	27	120	48	91	0.8	60
	Te Kouma	20	108	38	126	1.2	83
	Total	204	1138	339	786	0.7	500
Bay of Plenty	Whitianga	14	55	25	66	1.2	62
	Whangamata	17	59	16	49	0.8	36
	Bowentown	14	56	49	98	1.8	75
	Sulphur Point	16	60	64	140	2.3	74
	Maketu	13	48	15	16	0.3	8
	Whakatane	16	54	164	588	28.6	79
	Ohope	20	53	27	99	1.9	64
	Motu River	11	17	37	245	14.4	17
	Waihau Bay	20	72	60	175	2.4	80
	Total	141	474	457	1476	3.1	495

* Two interviewers used at this ramp, due to high volumes of traffic

3.3 The 2002–03 sampling season

The ramps sampled, and the target number of hours of surveyed, were the same as those outlined in the 2001–02 survey (Tables 2c and 2d). The number of kahawai measured per hour of interviewing at East Northland and Hauraki Gulf ramps was generally similar to that in 2000–01 and 2001–02, but in the Bay of Plenty, there has been a noticeable decline in the rate of kahawai landings since 2000–01. The number of kahawai landed per hour in all three regions were lower than those observed in boat ramp surveys conducted in the early to mid 1990s (see Table 1). Nonetheless, sufficient kahawai were measured and aged from each region to characterise catch-at-length and catch-at-age distributions.

Table 2c: Summary statistics by region of the number of interview sessions, hours surveyed, vessels with measurable kahawai, kahawai measured, kahawai measured per hour, and kahawai aged in 2002–03.

Region	Ramp	Number of sessions	Number of hours	Boats with measurable kahawai	Kahawai measured	Kahawai measured per hour	Kahawai aged
East Northland	Mangonui	21	125	100	266	2.1	112
	Opito Bay	27	162	90	299	1.8	83
	Waitangi	32	175	93	281	1.6	94
	Tutukaka	22	116	22	37	0.3	31
	Parua Bay (public)	20	118	39	114	1.0	85
	Parua Bay (club)	23	133	71	137	1.0	79
	One Tree Point	16	94	3	11	0.1	7
	Mangawai	25	127	18	26	0.2	13
	Total	186	1 049	436	1 171	1.1	504
Hauraki Gulf	Sandspit	20	120	17	49	0.4	28
	Gulf Harbour	20	120	34	47	0.4	27
	Browns Bay	20	117	9	31	0.3	31
	Takapuna	22	116	30	67	0.6	62
	Westhaven	20	120	26	46	0.4	43
	Okahu Bay	20	120	11	16	0.1	11
	Half Moon Bay*	41	231	116	254	1.1	166
	Maretai	20	120	22	41	0.3	24
	Kawakawa Bay	32	144	119	311	2.2	118
	Te Kouma	16	92	11	18	0.2	17
	Total	231	1 301	395	880	0.7	527
Bay of Plenty	Whitianga	16	64	25	86	1.3	57
	Whangamata	14	54	5	21	0.4	7
	Bowentown	13	52	17	47	0.9	40
	Sulphur Point	16	64	44	118	1.8	52
	Maketu	14	56	49	106	1.9	48
	Whakatane	13	57	129	377	6.6	160
	Ohope	17	64	32	79	1.2	69
	Motu River	4	19	33	228	12.3	0
	Waihau Bay	13	33	23	71	2.2	44
	Total	120	462	357	1 133	2.5	477

* Two interviewers used at this ramp, due to high volumes of traffic

10

3.4 Length and age distributions

East Northland

In all three years the length distributions of East Northland recreational kahawai landings were broad, with a mode of three year olds (predominantly 30 to 40 cm; Appendix 3) generally evident (Figure 2). Age distributions were dominated by 3 to 7 year old fish, which accounted for 77–80% of all fish landed. There was little change in the average age of fish landed between years (5.4–5.5 years). Cursory examination of proportional year class strengths through time suggests that kahawai do not approach full recruitment to the East Northland recreational fishery until about 4 years of age (mostly over 35 cm), after which the abundance of each year class is usually less than that which follows. Length and age distributions were both described with reasonable precision, with c.v.s of 0.17–0.18 (Appendix 1) and 0.12–0.13 (Appendix 2) respectively.

Figure 2: Length and age distributions (histograms) and c.v.s (solid line) of recreational landings of kahawai in East Northland in 2000–01, 2001–02, and 2002–03.

11

No latitudinal trends were evident in catch-at-age from East Northland ramps (Figure 3). With the exception of Ruakaka and Parua Bay (club ramp), there were no strong between-year differences, and any differences probably reflect variability caused by the low sample sizes. Some temporal changes are evident when monthly age distributions (across all ramps) are compared (Figure 4). In all years, three-year-old fish were more predominant in January landings, with 4 to 6 year old fish becoming more prevalent in the later months. The consistent nature of this temporal pattern suggests that changes in the age composition of recreational landings may be due to a mechanism such as onshore movement of schools of older fish in later months. Further evidence for such a mechanism is seen in the marked increase in the number of kahawai encountered by interviewers in March and April (Figure 4).
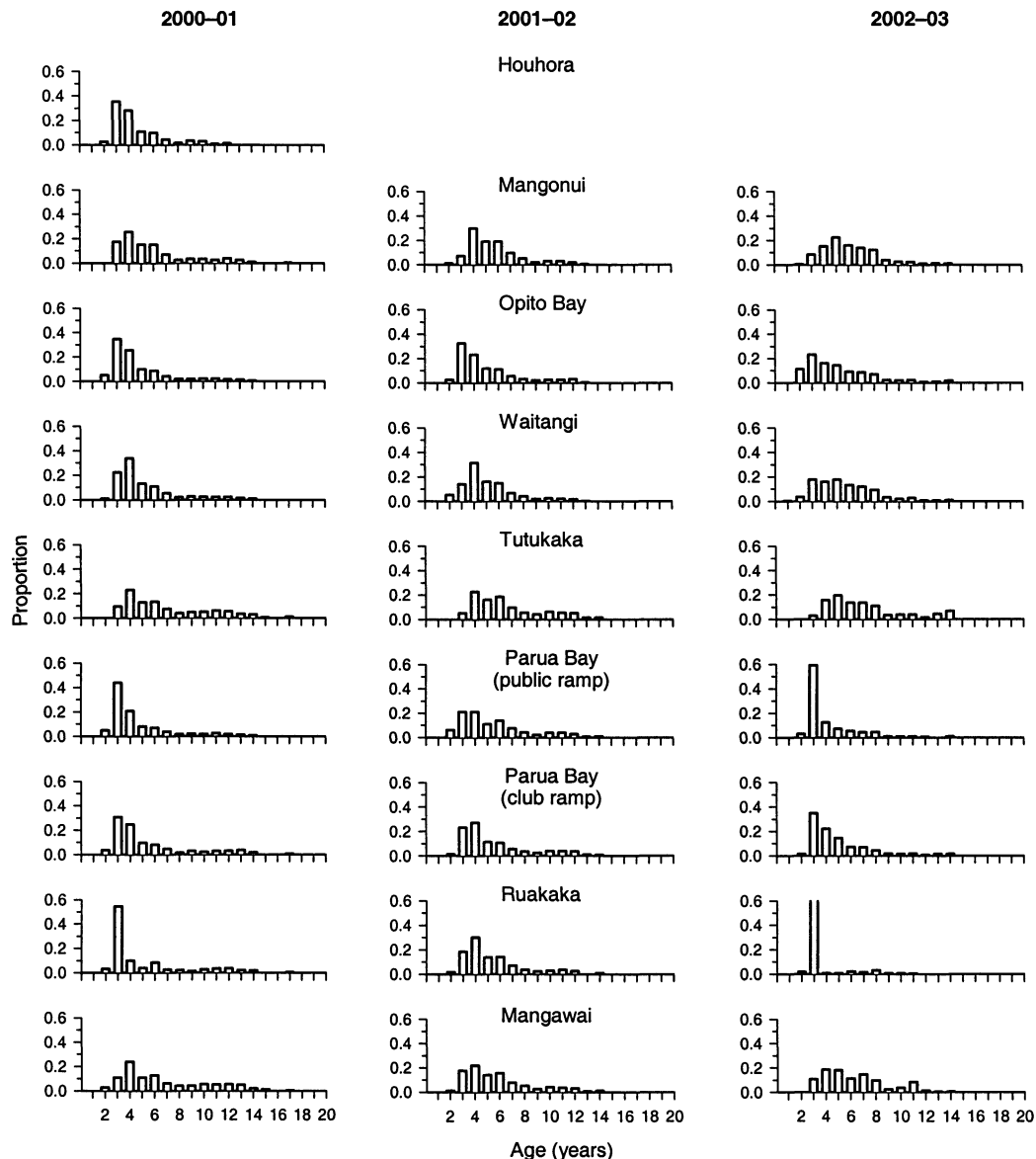
Figure 3: Age distributions by ramp in East Northland in 2000–01, 2001–02, and 2002–03 (see Tables 2a, 2b, & 2c for sample sizes).

12
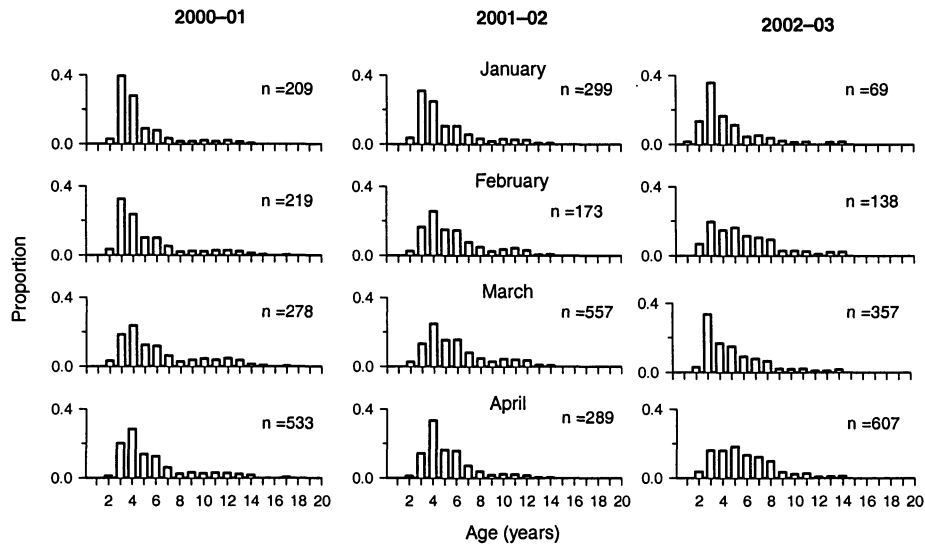
Figure 4: Age distributions by month in East Northland in 2000–01, 2001–02, and 2002–03. The number of fish measured is given for each month.
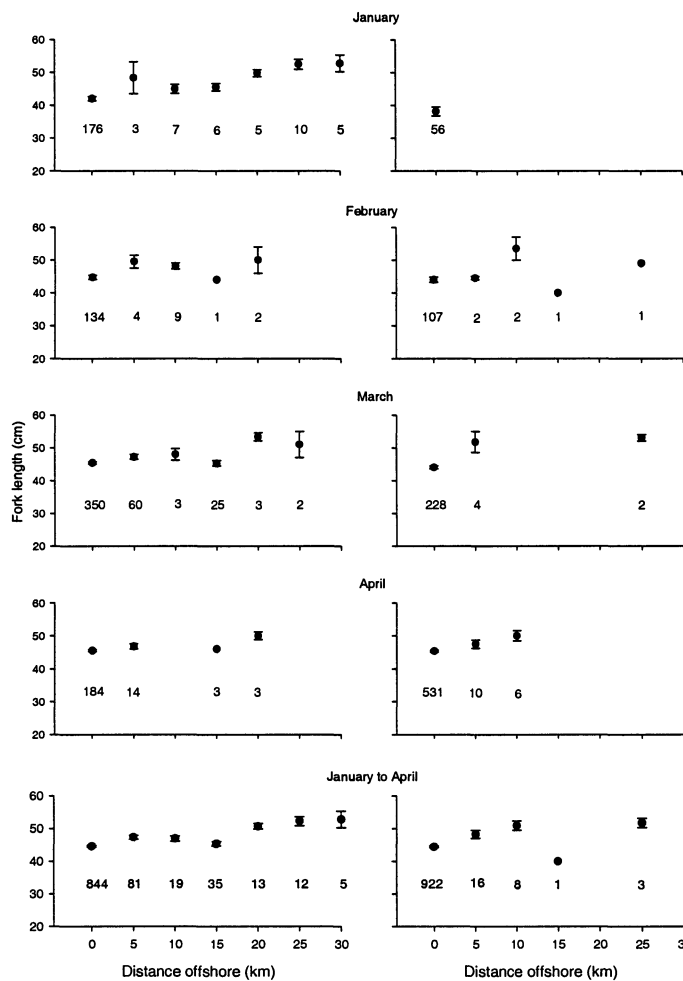
Figure 5: Average size of kahawai caught in relation to distance offshore (in 5 km bins) by month in East Northland in 2001–02 and 2002–03. Error bars denote standard errors and numbers denote number of kahawai measured.

13

Estimates of the distance offshore at which kahawai were caught were available for 1009 fish measured in 2001–02 and 950 fish in 2002–03 (Figure 5). Of these, 84% and 97% respectively, were caught less than 5 km offshore, with most of the remainder caught within 10 km of the shore. Despite the limited number of offshore observations, there is some indication that the average size of kahawai increases with increasing distance offshore.

Hauraki Gulf

Marked differences in annual length compositions of Hauraki Gulf landings reflect the relative strengths of underlying component age classes (Figure 6). Landings in 2000–01, and to a lesser extent 2002–03, were strongly dominated by the 3 year old age class, evident as a length mode peaking at about 35 cm. In 2001–02, a 3 year old age class was once again dominant, but to a far lesser extent than in the previous year, and the resulting length distribution was more multimodal. The Hauraki Gulf fishery is, however, the most poorly described of the three regions sampled, as the number of kahawai landed per hour of interviewing has declined steadily since the early 1990s, resulting in reduced length and age sample sizes (Tables 1, 2a, 2b, and 2c). Length compositions were estimated with mean weighted c.v.s ranging from 0.22 to 0.25. The age distributions were more precisely described with mean weighted c.v.s of 0.11 to 0.13 (Appendices 1 and 2), which is probably due to the high abundance of a single age class.
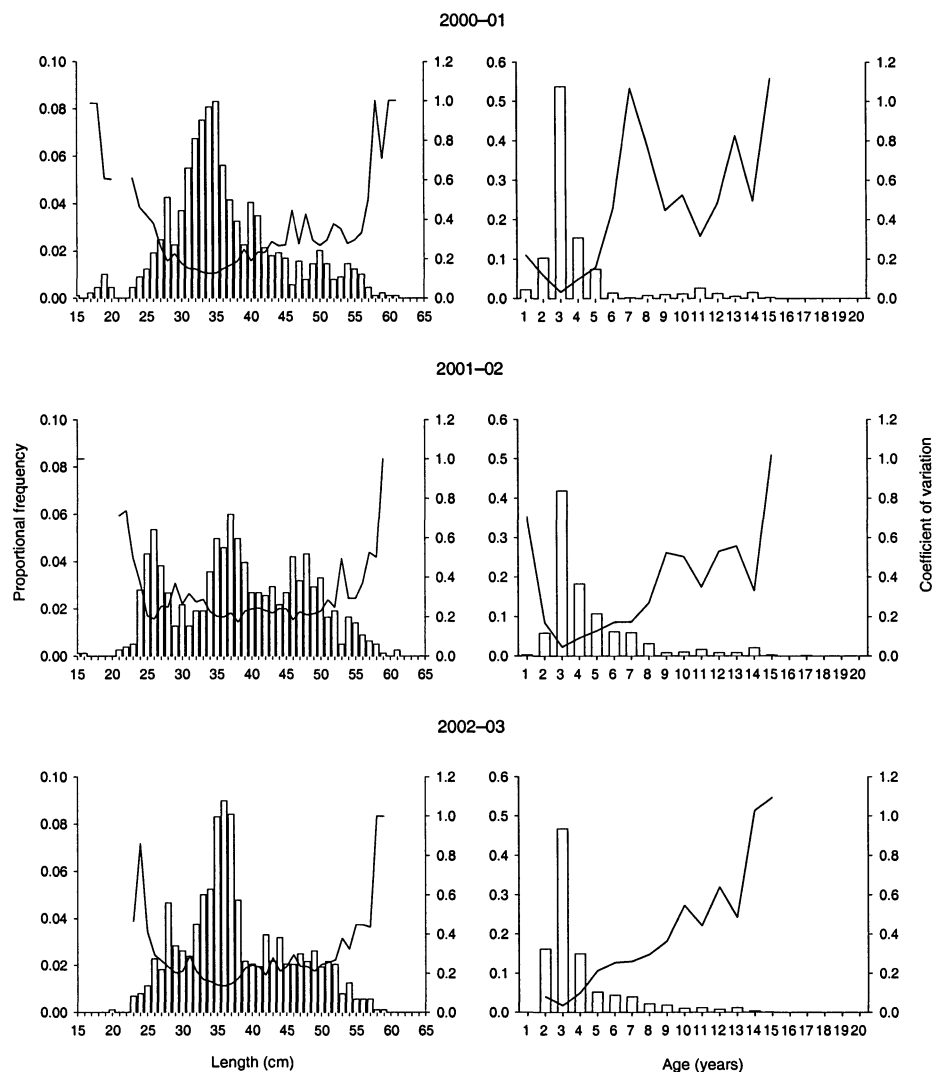
Figure 6: Length and age distributions (histograms) and c.v.s (solid line) of recreational landings of kahawai in the Hauraki Gulf in 2000–01, 2001–02, and 2002–03.

14

The predominance of 3 to 5 year old kahawai suggests that the Hauraki Gulf may act as a nursery area. Further, this is the only region in which 1 year old fish were landed in any number. The presence of small kahawai in Hauraki Gulf landings may also reflect region-specific differences in fisher behaviour and the methods they employ. Lower catch rates in the Hauraki Gulf may increase the probability that small fish are landed by fishers compared to other regions.
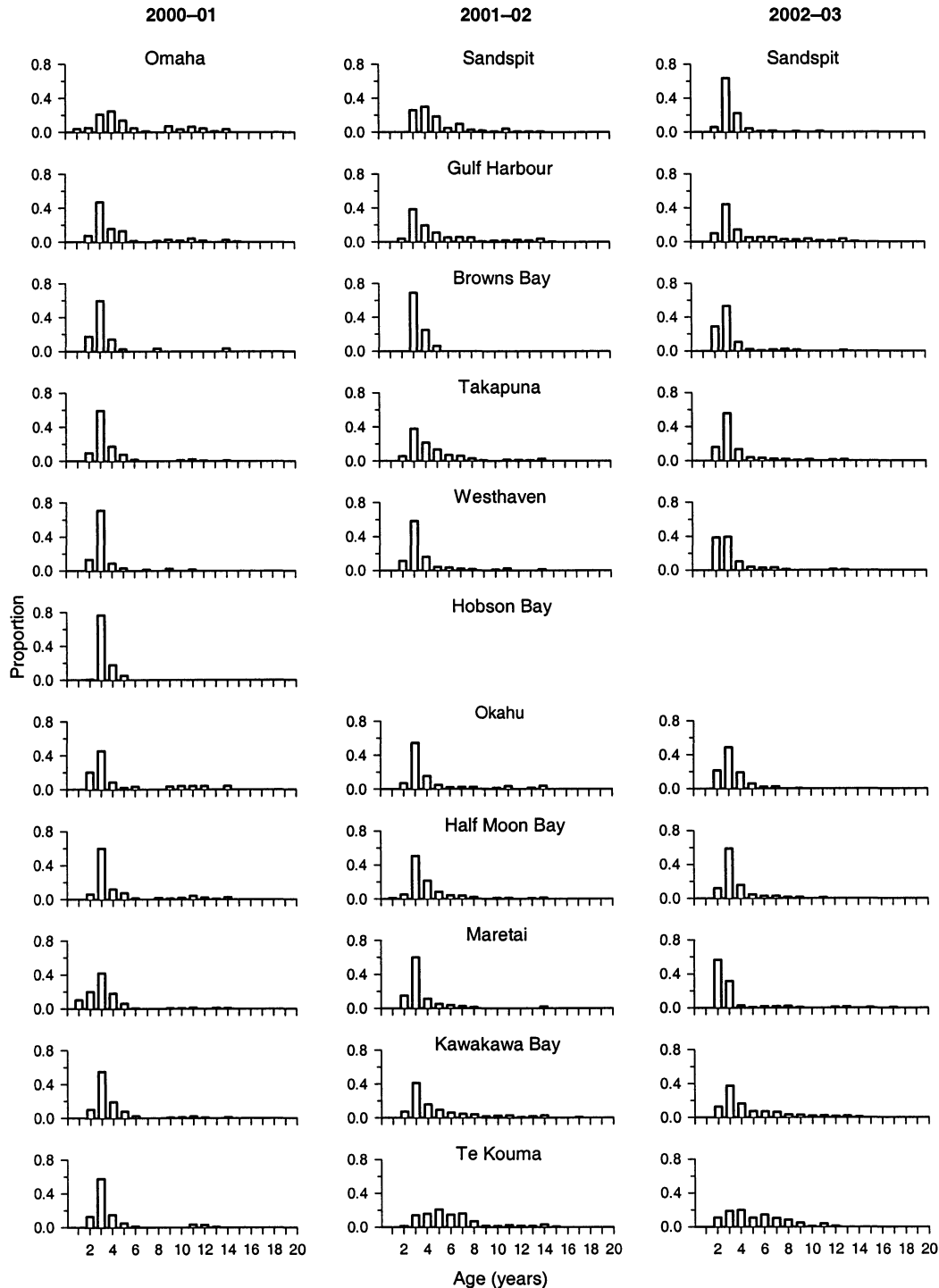
Figure 7: Age distributions by ramp in the Hauraki Gulf in 2000–01, 2001–02, and 2002–03 (see Tables 2a, 2b, & 2c for sample sizes).

15

Ramp-specific age distributions were characteristically dominated by 3 year olds, except for Te Kouma in later years (Figure 7). Those ramps at the head of the Hauraki Gulf showed a greater similarity to neighbouring ramps in East Northland and the Bay of Plenty (see Figures 3 and 10). In contrast to the other two regions, ramp-specific age distributions in the Hauraki Gulf show marked differences between years, although this may be due to variability arising from the small sample sizes obtained (Tables 2a, 2b, and 2c), and movements by kahawai schools in relation of variable climatic conditions. Cursory examination of monthly age distributions through time suggests that the age structure became increasingly broad as the sampling season progressed (Figure 8). In the last two years, there is some suggestion of an increase in the number of kahawai landed by recreational fishers in later months.
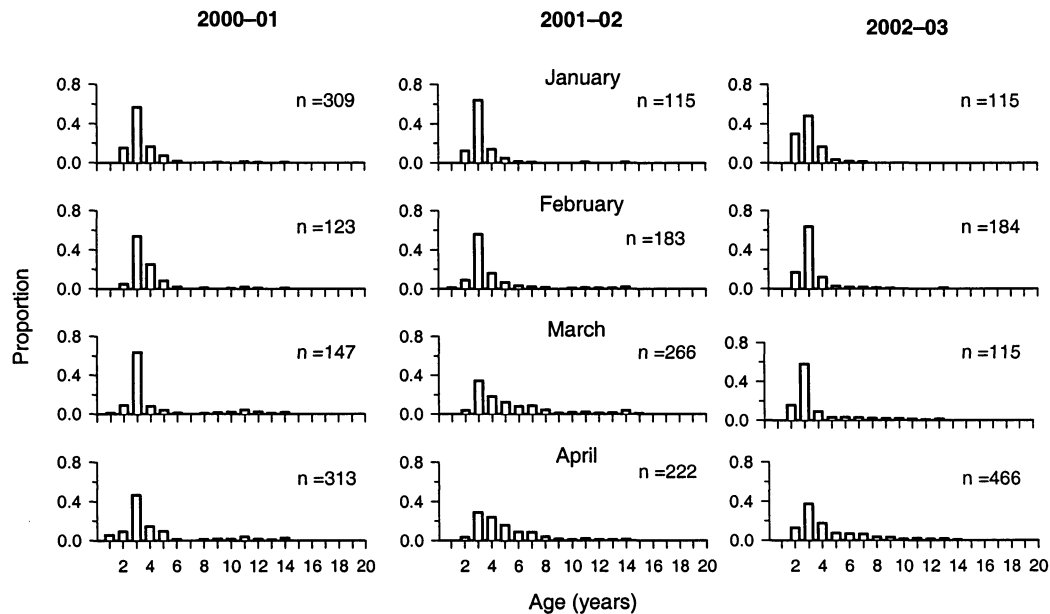
Figure 8: Age distributions by month in the Hauraki Gulf in 2000–01, 2001–02, and 2002–03. The number of fish measured is given for each month.

The relationship between the abundance and size of kahawai landed with respect to distance offshore was not assessed, as the shape of the coastline and abundance of islands makes any such interpretation difficult.

Bay of Plenty

Bay of Plenty length distributions were characteristically dominated by fish in the larger length classes with a peak at about 50 cm (Figure 9). In 2000–01 the Bay of Plenty age distribution was more broadly distributed than elsewhere, with over 44% of the kahawai landed being 7 years or older. As the relatively strong 8 to 11 year old age classes (in 2000–01) declined in the later two years, the average age of kahawai has also declined, from 6.6 to 5.8 years of age. While kahawai catch rates in the Bay of Plenty are relatively high, compared to elsewhere, the number of kahawai landed per hour of interviewing has declined markedly over the survey period, which may indicate a decline in local abundance (Tables 2a, 2b, and 2c). The precision of annual length and age compositions ranged from 0.14 to 0.18 (Appendices 1 and 2).
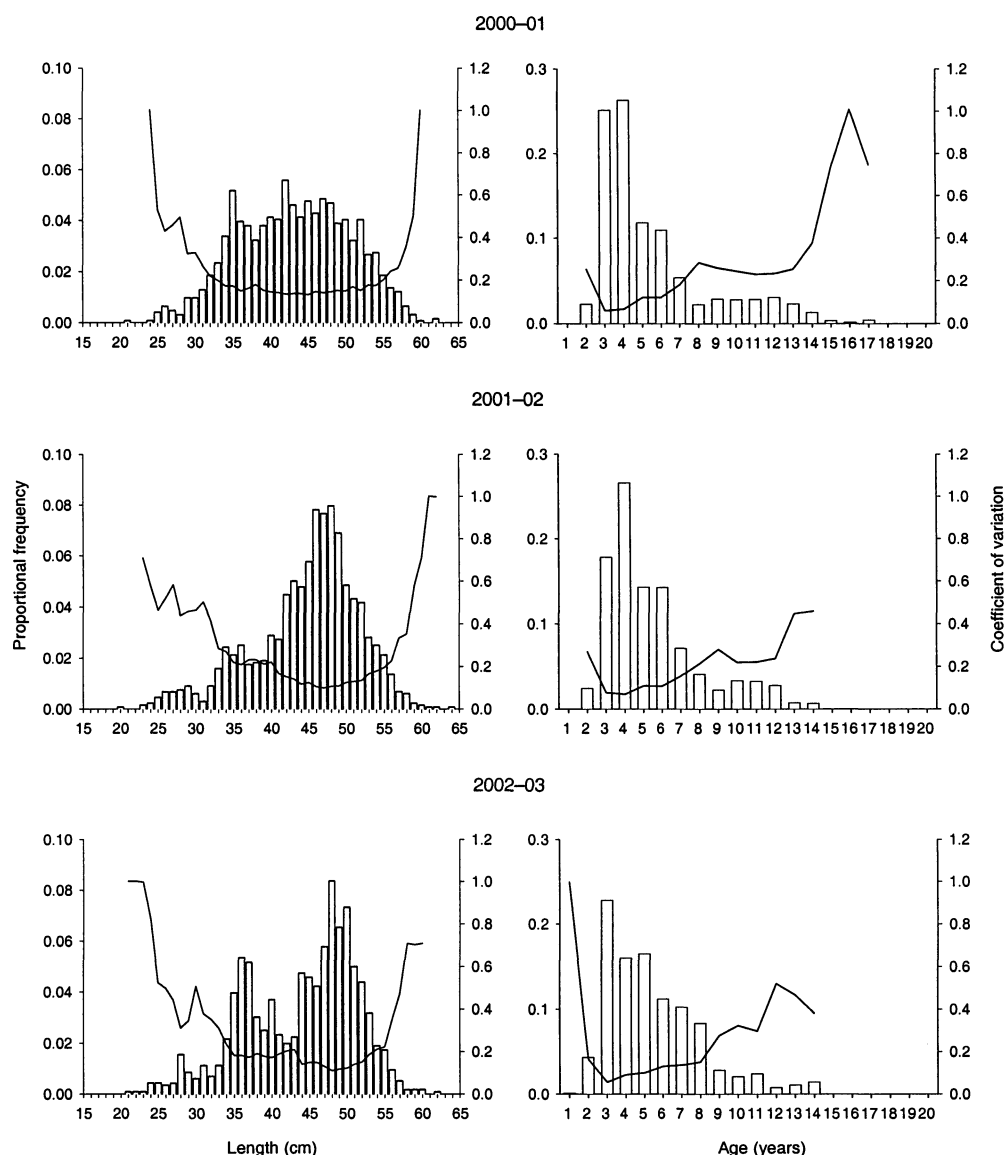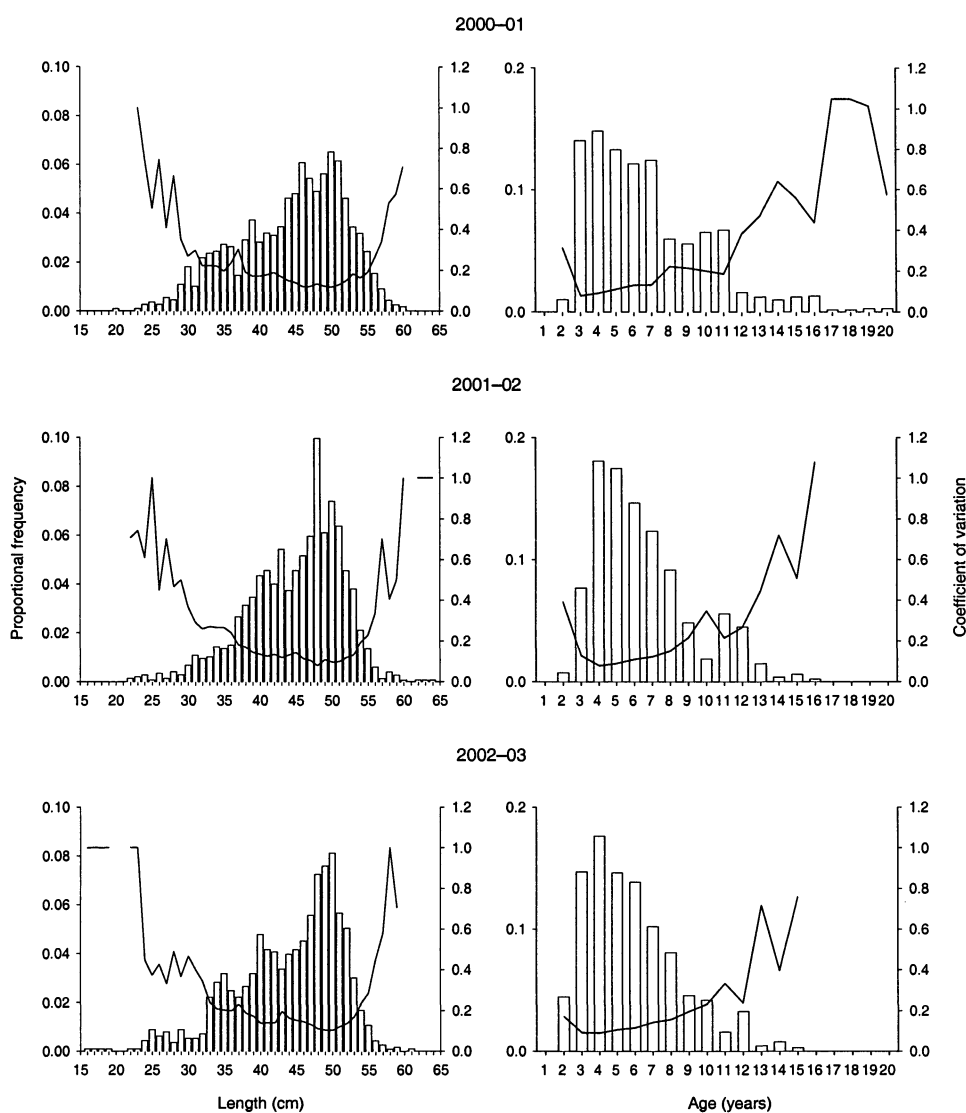

Figure 9: Length and age distributions (histograms) and c.v.s (solid line) of recreational landings of kahawai in the Bay of Plenty in 2000–01, 2001–02, and 2002–03.
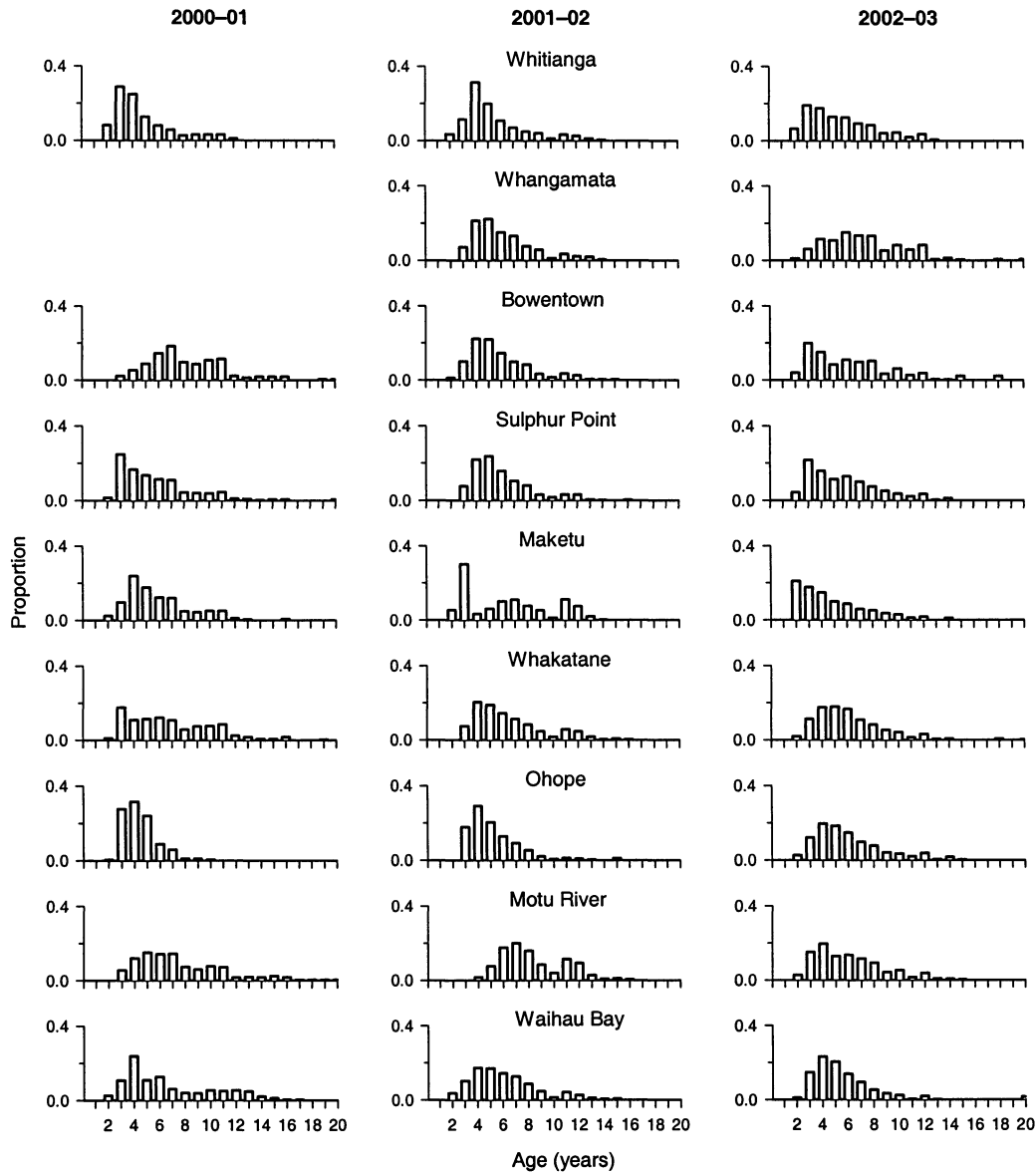
Figure 10: Age distributions by ramp in the Bay of Plenty in 2000–01, 2001–02, and 2002–03 (see Tables 2a, 2b, & 2c for sample sizes).

No clear temporal or spatial trends are evident in ramp-specific age distributions (Figure 10). The age distribution of kahawai landed at neighbouring ramps often differed markedly during the same survey year, possibly reflecting different degrees of mobility by the local fishing community, or high spatial heterogeneity in the kahawai population. Although no consistent trends are evident in monthly age distributions, the number of kahawai landed and measured by boat ramp interviewers was generally higher in March and April (Figure 11).

Estimates of the distance offshore that kahawai were caught were available for 1385 fish in 2001–02 and 817 fish in 2002–03 (Figure 12). Of these, 72% and 80% respectively, were caught less than 5 km offshore, with the much of the remainder caught within 10 km of the shore. There was some indication of an increase in the size of kahawai landed with increasing distance offshore.
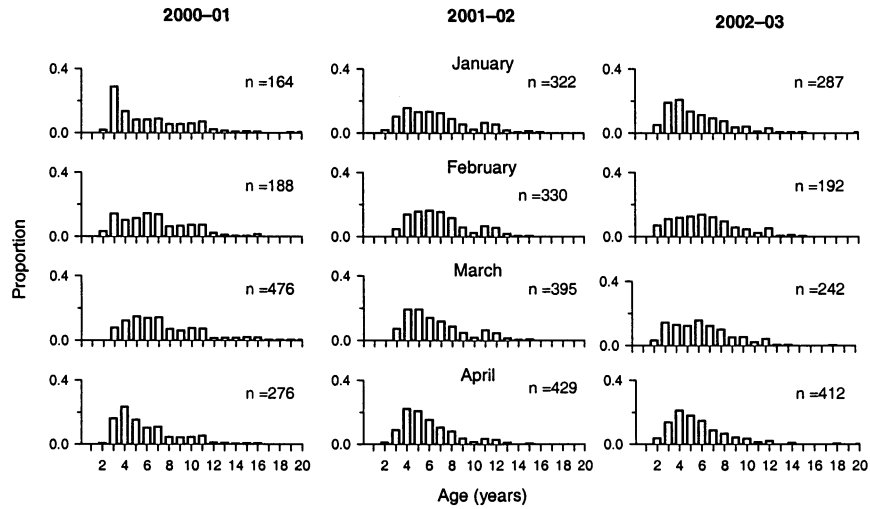
Figure 11: Age distributions by month in the Bay of Plenty in 2000–01, 2001–02, and 2002–03. The number of fish measured is given for each month.
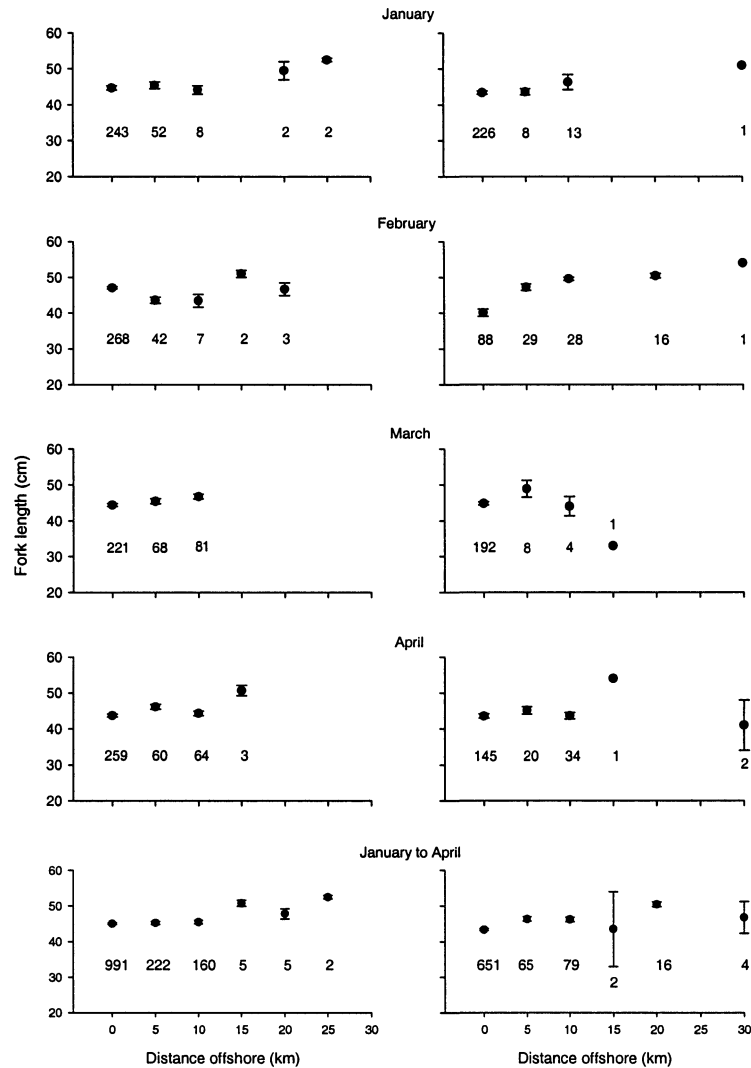
Figure 12: Average size of kahawai caught in relation to distance offshore (in 5 km bins) by month in the Bay of Plenty in 2001–02 and 2002–03. Error bars denote standard errors and numbers denote number of kahawai measured.

19

3.5 Growth rate estimates

On a regional basis, there is a marked similarity between the growth curves derived from each of the annual surveys (Figure 13, Table 3). Slight differences are evident when regional growth curves are compared, however, for example, the East Northland curves are steeper. To some extent the shape of these growth curves will be determined by the availability of the smaller and larger length classes, which influence the fitting of von Bertalanffy parameters. In the Hauraki Gulf, for instance, where juvenile fish are more common, the ascendant left hand limb of the curve will be described more accurately and precisely than in other regions, where fewer small kahawai are landed. All von Bertalanffy growth curves derived from the last three years are steeper than those previously documented for males and females in KAH 1 (McKenzie et al. 1992).

**Table 3: Von Bertalanffy growth parameters derived from kahawai sampled from recreational catches in East Northland, the Hauraki Gulf. and the Bay of Plenty in 2000–01, 2001–02, and 2002–03. Parameter estimates previously reported for KAH 1, and currently used in the 2002 plenary (Annala et al. 2003) are given for comparison (McKenzie et al. 1992).**

Region	Year	T_0	K	Linf	n
East Northland	2000–01	-0.08	0.34	54.5	517
	2001–02	0.51	0.46	53.2	526
	2002–03	0.09	0.38	53.8	504
Hauraki Gulf	2000–01	-0.48	0.26	56.4	500
	2001–02	0.25	0.33	55.2	500
	2002–03	-0.39	0.29	55.8	527
Bay of Plenty	2000–01	-0.23	0.28	55.1	457
	2001–02	-0.33	0.31	53.6	495
	2002–03	-0.17	0.34	53.1	477
Plenary KAH 1 (female)	1991–92	-0.18	0.24	56.9	
Plenary KAH 1 (male)	1991–92	-0.20	0.24	55.6	
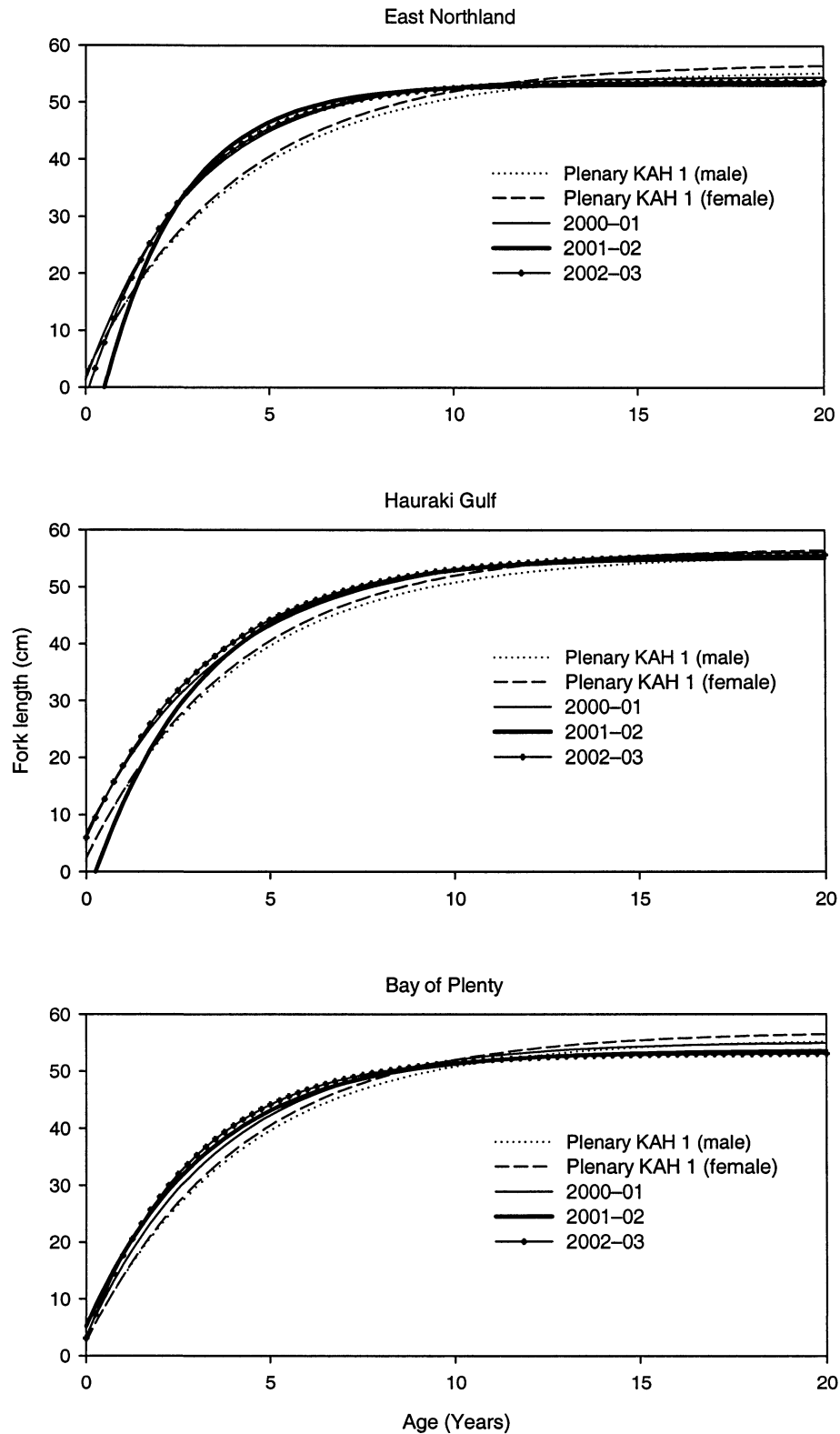
Figure 13: Comparison of von Bertalanffy growth curves derived from kahawai sampled from recreational catches in East Northland, the Hauraki Gulf, and the Bay of Plenty (unsexed) in 2000–01, 2001–02, and 2002–03, with those previously reported for males and females in KAH 1 (McKenzie et al. 1992).

4. DISCUSSION

Obtaining sufficient length at age samples from a region's recreational fishery is an uncertain process. Unlike commercial fisheries, where annual catch levels are largely determined by TACCs, recreational fishing effort and kahawai landings vary depending on prevailing weather patterns and local catch rates. In East Northland and the Hauraki Gulf, the number of kahawai landed per hour of interviewing was consistently lower than experienced on average during the 1991, 1994, and 1996 boat ramp surveys. It is not clear whether this is due to a reduction in overall fishing effort and/or reduced kahawai catch rates by recreational fishers, although anecdotal evidence also suggests that kahawai catch rates have fallen in recent years. Although fewer kahawai were measured than the preferred target sample of 1500 fish, analytically derived mean weighted c.v.s suggest that the length and age compositions of the regional populations have still been described with reasonable precision (less than 0.2).

There are clear regional differences in the length and age compositions of recreational kahawai catches, and these differences are consistent across years. The Hauraki Gulf population largely comprised relatively small, younger fish, with the East Northland region having the broadest kahawai length distribution, dominated by fish of less than 7 years of age, while the Bay of Plenty distribution mainly comprised larger fish reflecting a broader underlying age distribution. These patterns are broadly consistent with those derived from boat ramp survey data from the early 1990s (Bradford 2000, figures 1 to 3). Over the past three years, the East Northland age distributions have become increasingly similar to those of the Bay of Plenty.

In all three regions, localised age distributions derived from landings at individual ramps were variable, both spatially and temporally. This is perhaps not surprising given the size-specific schooling behaviour of kahawai, and the few fish measured at individual ramps. Over small spatial scales of kilometres, and temporal scales of one or two weeks, fish of a similar size (and hence age) from one school can dominate landings at a given ramp. When catch data from all ramps within each region are combined, however, consistent age distributions emerge, as discussed above. Comparison of ramp distributions across all three regions suggests that the regional boundaries have some biological as well as geographic basis, although there is still some cross-boundary similarity, e.g. between southern East Northland and northern Bay of Plenty.

In East Northland and the Bay of Plenty, the age distribution of landed kahawai appeared to broaden over the three years surveyed. Further, in all three regions the number of kahawai encountered by boat ramp interviewers was noticeably higher in the second half of the survey. These observations are consistent with an onshore migration of sexually mature kahawai in the autumn, following spawning in deeper waters in January and February (60–100 m) (Annala et al. 2003). Interannual variability in regional climates probably influences spawning and schooling behaviour. Over the last three years, New Zealand's northeastern coastal climate has gone from mild La Niña conditions (onshore north-easterly winds predominating with associated warmer than average water temperatures) to those associated with El Niño conditions (offshore southwesterly winds predominating and colder than average waters). Although interannual variability in the timing of onshore migrations may affect the comparability of age distributions between regions and years, future surveys should still take place over the same four-month period to help maintain consistency. Recreational fishing activity before January is too low and erratic, and the ageing of kahawai collected after April is problematic given the timing of otolith ring deposition.

When regional growth rates are compared between years they appear to be similar, which suggests that length and age data from all three regions could potentially be combined to provide a more comprehensive age-length key. However, if kahawai movements between areas are size related, and year-specific, as suggested by the differences between regional length and age distributions, the use of a combined age-length key may introduce bias to the age distributions, which is highly undesirable.

22

As in all ageing studies, the possibility and likelihood of ageing error should be considered when interpreting age distributions and growth rates. Although consistent relative year class strengths and growth rates suggest that ageing error is not excessive, the magnitude of this issue remains uncertain. Stevens & Kalish (1998) used repeated readings from a single reader to infer possible levels of reader error when interpreting structures in this sectioned otoliths. In this study, we used three independent readers to reduce the probability of reader error, but it is highly unlikely ageing error has been totally eliminated. Further, we used the thin sectioning otolith preparation technique, as Stevens & Kalish (1998) concluded that this approach gave the most reliable and consistent results. Difficulty was experienced when interpreting growth structures on the margin of otoliths collected in late April as ring deposition appears to occur in some, but not all fish, at this time of year. Ageing of kahawai collected later than early April should therefore be avoided when sufficient otoliths are already available.

The von Bertalanffy curves derived from the last three years are all steeper than those reported by Annala et al. (2003), possibly more so in East Northland. Growth estimates currently used for KAH 1 stock assessment were those obtained by McKenzie et al. (1992). These estimates were derived from the more selective commercial purse-seine and single trawl fisheries, and are therefore probably less representative than those derived from this study. Further, these earlier growth estimates are sex-specific, yet Bradford (1998) found little evidence for sexual dimorphism in growth rates.

The relationship between the size and abundance of kahawai landed relative to estimates of the distance offshore, by month, was investigated using data from East Northland and the Bay of Plenty in 2001–02 and 2002–03. There is some evidence of an increase in the size of fish landed with increasing distance offshore. However, this trend may be partially influenced by fisher effects, such as the tendency for experienced fishers to fish further offshore, and not land juvenile kahawai, which are used only for live bait, when targeting larger fish. A further limitation of these results is the lack of data relating to kahawai caught further offshore, especially off East Northland. The relationship between the distance offshore and the size of kahawai caught for all regions combined was not examined because region-specific length frequency distributions differ, and a suitable means of weighting these datasets together was not available. These apparent trends should therefore be interpreted cautiously.

5. ACKNOWLEDGMENTS

6. REFERENCES

Annala, J.H.; Sullivan, K.J.; O'Brien, C.J.; Smith, N.W.McL.; Grayling, S.M. (comps.) (2003). Report from the Fishery Assessment Plenary, May 2003: stock assessments and yield estimates. 616 p. (Unpublished report held in NIWA library, Wellington.)

Bradford, E. (1998a). Harvest estimates from the 1996 national marine recreational fishing surveys. New Zealand Fisheries Assessment Research Document 98/16 27 p. (Unpublished report held in NIWA library, Wellington.)

Bradford, E. (1998b). Unified kahawai growth parameters. *NIWA Technical Report 9*. 50 p.

Bradford, E. (1999). Size distribution of kahawai in commercial and recreational catches. *NIWA Technical Report 61.* 51 p.

Bradford, E. (2000). Feasibility of sampling the recreational fishery to monitor the kahawai stock. *New Zealand Fisheries Assessment Report 2000/11.* 34 p.

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

Hartill, B.; Blackwell, R.; Bradford, E. (1998). Estimation of mean fish weights from the recreational catch landed at boat ramps in 1996. *NIWA Technical Report 31.* 40 p.

McKenzie, J.R.; Hartill, B.; Trusewich, W. (1992). A summary report on commercial kahawai market sampling in the Auckland Fisheries Management Area (1991–1992). (Unpublished report held at NIWA, Auckland)

McKenzie, J.R.; Trusewich, W. (1996). Analysis of kahawai (*Arripis trutta* Family: Arripidae) commercial catch sampling from northern New Zealand purse-seine and trawl fisheries (KAH9 KAH1) between 1991-1993. (Unpublished report held at NIWA, Auckland)

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

Sylvester, T. (1993). Recreational fisheries catch per unit effort trends in the North region (1990/91). Northern Fisheries Region Internal Report No. 14. 23 p. (Unpublished report held in Ministry of Fisheries, Auckland.)

Sylvester, T. (1994). Recreational Fisheries research in the North region. *Seafood New Zealand 2*(1): 27–28.

Appendix 1: Estimated proportions at length and c.v.s fof kahawai sampled from recreational fishers in East Northland, Hauraki Gulf and the Bay of Plenty in 2000–01, 2001–02, and 2002–03

P.i. = proportion of fish in length class.   n = total number of fish sampled.
c.v. = coefficient of variation.   m.w.c.v. = mean weighted c.v.

Estimates of the proportion at length of kahawai from East Northland in 2000–01, 2001–02, and 2002–03

Length (cm)	2000–01 P.i.	2000–01 c.v.	2001–02 P.i.	2001–02 c.v.	2002–03 P.i.	2002–03 c.v.
10	0.0000	0.00	0.0000	0.00	0.0000	0.00
11	0.0000	0.00	0.0000	0.00	0.0000	0.00
12	0.0000	0.00	0.0000	0.00	0.0000	0.00
13	0.0000	0.00	0.0000	0.00	0.0000	0.00
14	0.0000	0.00	0.0000	0.00	0.0000	0.00
15	0.0000	0.00	0.0000	0.00	0.0000	0.00
16	0.0000	0.00	0.0000	0.00	0.0000	0.00
17	0.0000	0.00	0.0000	0.00	0.0000	0.00
18	0.0000	0.00	0.0000	0.00	0.0000	0.00
19	0.0000	0.00	0.0000	0.00	0.0000	0.00
20	0.0000	0.00	0.0008	1.00	0.0000	0.00
21	0.0008	1.00	0.0000	0.00	0.0009	1.00
22	0.0000	0.00	0.0000	0.00	0.0009	1.00
23	0.0000	0.00	0.0015	0.71	0.0009	1.00
24	0.0008	1.00	0.0023	0.58	0.0043	0.82
25	0.0040	0.53	0.0046	0.46	0.0043	0.52
26	0.0065	0.43	0.0068	0.52	0.0034	0.50
27	0.0048	0.46	0.0068	0.58	0.0043	0.44
28	0.0032	0.50	0.0076	0.44	0.0155	0.31
29	0.0097	0.32	0.0091	0.46	0.0086	0.35
30	0.0097	0.33	0.0061	0.47	0.0060	0.51
31	0.0129	0.27	0.0030	0.50	0.0112	0.38
32	0.0186	0.22	0.0091	0.42	0.0069	0.35
33	0.0234	0.20	0.0159	0.28	0.0112	0.31
34	0.0339	0.17	0.0243	0.27	0.0215	0.23
35	0.0517	0.17	0.0212	0.22	0.0396	0.18
36	0.0395	0.15	0.0250	0.21	0.0534	0.18
37	0.0379	0.16	0.0175	0.23	0.0517	0.17
38	0.0323	0.18	0.0182	0.23	0.0301	0.19
39	0.0379	0.15	0.0190	0.21	0.0250	0.18
40	0.0412	0.15	0.0288	0.22	0.0370	0.17
41	0.0404	0.14	0.0273	0.17	0.0233	0.19
42	0.0557	0.13	0.0448	0.15	0.0198	0.20
43	0.0460	0.14	0.0501	0.14	0.0224	0.21
44	0.0412	0.14	0.0478	0.12	0.0474	0.14
45	0.0476	0.13	0.0577	0.12	0.0457	0.15
46	0.0428	0.15	0.0781	0.10	0.0422	0.15
47	0.0484	0.14	0.0766	0.10	0.0577	0.13
48	0.0468	0.14	0.0797	0.11	0.0835	0.11
49	0.0387	0.15	0.0690	0.11	0.0655	0.12
50	0.0404	0.15	0.0486	0.13	0.0732	0.12
51	0.0323	0.17	0.0432	0.13	0.0500	0.14
52	0.0404	0.15	0.0417	0.13	0.0439	0.15
53	0.0266	0.18	0.0281	0.17	0.0319	0.19
54	0.0274	0.17	0.0250	0.18	0.0189	0.21
55	0.0186	0.20	0.0212	0.20	0.0172	0.22
56	0.0137	0.24	0.0137	0.23	0.0095	0.35
57	0.0121	0.26	0.0068	0.33	0.0052	0.47
58	0.0065	0.35	0.0061	0.35	0.0017	0.71
59	0.0032	0.50	0.0023	0.58	0.0017	0.70
60	0.0008	1.00	0.0015	0.71	0.0017	0.71
61	0.0000	0.00	0.0008	1.00	0.0000	0.00
62	0.0016	0.71	0.0008	1.00	0.0009	1.00
63	0.0000	0.00	0.0000	0.00	0.0000	0.00
64	0.0000	0.00	0.0008	1.00	0.0000	0.00
65	0.0000	0.00	0.0000	0.00	0.0000	0.00
66	0.0000	0.00	0.0000	0.00	0.0000	0.00
67	0.0000	0.00	0.0008	1.00	0.0000	0.00
68	0.0000	0.00	0.0000	0.00	0.0000	0.00
69	0.0000	0.00	0.0000	0.00	0.0000	0.00
70	0.0000	0.00	0.0000	0.00	0.0000	0.00
n	1 239		1 318		1 171	
m.w.c.v.		0.17		0.17		0.18

25

Appendix 1 – continued:
Estimates of the proportion at length of kahawai from the Hauraki Gulf in 2000–01, 2001–02, and 2002–03

Length	2000–01		2001–02		2002–03	
(cm)	*P.i.*	*c.v.*	*P.i.*	*c.v.*	*P.i.*	*c.v.*
10	0.0000	0.00	0.0000	0.00	0.0000	0.00
11	0.0000	0.00	0.0000	0.00	0.0000	0.00
12	0.0000	0.00	0.0000	0.00	0.0000	0.00
13	0.0000	0.00	0.0000	0.00	0.0000	0.00
14	0.0000	0.00	0.0000	0.00	0.0000	0.00
15	0.0011	1.00	0.0013	1.00	0.0000	0.00
16	0.0000	0.00	0.0013	1.00	0.0000	0.00
17	0.0022	0.99	0.0000	0.00	0.0000	0.00
18	0.0045	0.99	0.0000	0.00	0.0000	0.00
19	0.0101	0.61	0.0000	0.00	0.0000	0.00
20	0.0045	0.60	0.0000	0.00	0.0011	1.00
21	0.0000	0.00	0.0025	0.71	0.0000	0.00
22	0.0000	0.00	0.0038	0.74	0.0000	0.00
23	0.0045	0.61	0.0051	0.50	0.0068	0.47
24	0.0090	0.46	0.0280	0.37	0.0080	0.86
25	0.0123	0.42	0.0433	0.20	0.0114	0.41
26	0.0191	0.38	0.0534	0.19	0.0227	0.29
27	0.0247	0.26	0.0382	0.25	0.0182	0.26
28	0.0426	0.19	0.0267	0.25	0.0466	0.23
29	0.0224	0.23	0.0127	0.37	0.0284	0.20
30	0.0370	0.18	0.0216	0.27	0.0261	0.21
31	0.0549	0.15	0.0127	0.32	0.0239	0.29
32	0.0673	0.15	0.0191	0.27	0.0375	0.21
33	0.0751	0.13	0.0191	0.29	0.0500	0.17
34	0.0807	0.12	0.0356	0.22	0.0523	0.16
35	0.0830	0.13	0.0496	0.20	0.0830	0.14
36	0.0561	0.15	0.0458	0.20	0.0898	0.13
37	0.0415	0.17	0.0598	0.22	0.0841	0.15
38	0.0325	0.19	0.0496	0.17	0.0477	0.17
39	0.0224	0.25	0.0394	0.23	0.0216	0.23
40	0.0404	0.19	0.0267	0.24	0.0205	0.24
41	0.0348	0.23	0.0267	0.24	0.0193	0.23
42	0.0213	0.23	0.0254	0.23	0.0330	0.19
43	0.0179	0.29	0.0293	0.22	0.0216	0.28
44	0.0191	0.27	0.0216	0.24	0.0318	0.21
45	0.0168	0.27	0.0267	0.24	0.0205	0.23
46	0.0056	0.45	0.0420	0.18	0.0205	0.30
47	0.0157	0.28	0.0318	0.23	0.0250	0.24
48	0.0078	0.43	0.0433	0.21	0.0216	0.23
49	0.0146	0.30	0.0293	0.21	0.0261	0.21
50	0.0202	0.27	0.0331	0.23	0.0193	0.24
51	0.0146	0.30	0.0165	0.29	0.0216	0.26
52	0.0078	0.38	0.0191	0.25	0.0205	0.27
53	0.0090	0.35	0.0051	0.49	0.0080	0.38
54	0.0146	0.28	0.0165	0.29	0.0125	0.32
55	0.0123	0.30	0.0140	0.29	0.0057	0.45
56	0.0101	0.33	0.0089	0.37	0.0057	0.45
57	0.0045	0.50	0.0064	0.53	0.0057	0.44
58	0.0011	1.00	0.0051	0.50	0.0011	1.00
59	0.0022	0.71	0.0013	1.00	0.0011	1.00
60	0.0011	1.00	0.0000	0.00	0.0000	0.00
61	0.0011	1.00	0.0025	0.71	0.0000	0.00
62	0.0000	0.00	0.0000	0.00	0.0000	0.00
63	0.0000	0.00	0.0000	0.00	0.0000	0.00
64	0.0000	0.00	0.0000	0.00	0.0000	0.00
65	0.0000	0.00	0.0000	0.00	0.0000	0.00
66	0.0000	0.00	0.0000	0.00	0.0000	0.00
67	0.0000	0.00	0.0000	0.00	0.0000	0.00
68	0.0000	0.00	0.0000	0.00	0.0000	0.00
69	0.0000	0.00	0.0000	0.00	0.0000	0.00
70	0.0000	0.00	0.0000	0.00	0.0000	0.00
n	892		786		880	
m.w.c.v.		0.22		0.25		0.22

26

Appendix 1 – continued:
Estimates of the proportion at length of kahawai from the Bay of Plenty in 2000–01, 2001–02, and 2002–03

Length	2000–01		2001–02		2002–03	
(cm)	*P.i.*	*c.v.*	*P.i.*	*c.v.*	*P.i.*	*c.v.*
10	0.0000	0.00	0.0000	0.00	0.0000	0.00
11	0.0000	0.00	0.0000	0.00	0.0000	0.00
12	0.0000	0.00	0.0000	0.00	0.0000	0.00
13	0.0000	0.00	0.0000	0.00	0.0000	0.00
14	0.0000	0.00	0.0000	0.00	0.0009	1.00
15	0.0000	0.00	0.0000	0.00	0.0000	0.00
16	0.0000	0.00	0.0000	0.00	0.0009	1.00
17	0.0000	0.00	0.0000	0.00	0.0009	1.00
18	0.0000	0.00	0.0000	0.00	0.0009	1.00
19	0.0000	0.00	0.0000	0.00	0.0009	1.00
20	0.0009	1.00	0.0000	0.00	0.0000	0.00
21	0.0000	0.00	0.0000	0.00	0.0000	0.00
22	0.0000	0.00	0.0014	0.71	0.0009	1.00
23	0.0009	1.00	0.0020	0.74	0.0009	1.00
24	0.0027	0.75	0.0027	0.61	0.0044	0.45
25	0.0036	0.50	0.0007	1.00	0.0088	0.37
26	0.0027	0.74	0.0034	0.45	0.0062	0.43
27	0.0054	0.41	0.0014	0.70	0.0079	0.33
28	0.0045	0.66	0.0041	0.47	0.0035	0.49
29	0.0109	0.35	0.0027	0.50	0.0088	0.37
30	0.0181	0.27	0.0068	0.37	0.0053	0.47
31	0.0100	0.30	0.0108	0.29	0.0053	0.40
32	0.0217	0.22	0.0095	0.26	0.0071	0.34
33	0.0236	0.22	0.0102	0.27	0.0221	0.24
34	0.0245	0.22	0.0142	0.27	0.0282	0.21
35	0.0272	0.19	0.0136	0.27	0.0318	0.20
36	0.0263	0.23	0.0149	0.24	0.0247	0.20
37	0.0145	0.30	0.0264	0.18	0.0221	0.23
38	0.0290	0.19	0.0312	0.17	0.0265	0.19
39	0.0371	0.17	0.0346	0.14	0.0318	0.17
40	0.0281	0.17	0.0434	0.13	0.0477	0.14
41	0.0317	0.18	0.0454	0.13	0.0415	0.14
42	0.0308	0.19	0.0400	0.13	0.0406	0.14
43	0.0344	0.17	0.0542	0.12	0.0335	0.20
44	0.0462	0.15	0.0373	0.13	0.0397	0.16
45	0.0480	0.14	0.0454	0.14	0.0415	0.15
46	0.0607	0.12	0.0515	0.11	0.0450	0.15
47	0.0543	0.12	0.0596	0.10	0.0556	0.13
48	0.0489	0.13	0.0996	0.08	0.0724	0.11
49	0.0562	0.12	0.0610	0.11	0.0759	0.10
50	0.0652	0.12	0.0738	0.10	0.0812	0.10
51	0.0616	0.13	0.0637	0.10	0.0565	0.12
52	0.0462	0.15	0.0454	0.12	0.0503	0.14
53	0.0344	0.18	0.0379	0.13	0.0300	0.17
54	0.0317	0.16	0.0210	0.19	0.0168	0.24
55	0.0245	0.19	0.0136	0.23	0.0106	0.29
56	0.0154	0.26	0.0061	0.33	0.0044	0.45
57	0.0091	0.34	0.0014	0.70	0.0026	0.58
58	0.0045	0.53	0.0041	0.41	0.0009	1.00
59	0.0027	0.57	0.0027	0.50	0.0018	0.71
60	0.0018	0.71	0.0007	1.00	0.0000	0.00
61	0.0000	0.00	0.0000	0.00	0.0009	1.00
62	0.0000	0.00	0.0007	1.00	0.0000	0.00
63	0.0000	0.00	0.0007	1.00	0.0000	0.00
64	0.0000	0.00	0.0007	1.00	0.0000	0.00
65	0.0000	0.00	0.0000	0.00	0.0000	0.00
66	0.0000	0.00	0.0000	0.00	0.0000	0.00
67	0.0000	0.00	0.0000	0.00	0.0000	0.00
68	0.0000	0.00	0.0000	0.00	0.0000	0.00
69	0.0000	0.00	0.0000	0.00	0.0000	0.00
70	0.0000	0.00	0.0000	0.00	0.0000	0.00
n	1 104		1 476		1 133	
m.w.c.v.		0.18		0.15		0.17

27

Appendix 2: Estimated proportions at age and c.v.s of kahawai sampled from recreational fishers in East Northland, Hauraki Gulf and the Bay of Plenty in 2000–01, 2001–02 and 2002–03

P.j. = proportion of fish in age class.   n = total number of fish sampled.

c.v. = coefficient of variation.   m.w.c.v. = mean weighted c.v.

Estimates of the proportion at age of kahawai from East Northland in 2000–01, 2001–02, and 2002–03

Age	2000–01		2001–02		2002–03	
(years)	*P.j.*	*c.v.*	*P.j.*	*c.v.*	*P.j.*	*c.v.*
1	0.0000	0.00	0.0000	0.00	0.0009	1.00
2	0.0223	0.26	0.0241	0.27	0.0430	0.16
3	0.2511	0.06	0.1780	0.08	0.2277	0.06
4	0.2629	0.07	0.2663	0.07	0.1599	0.09
5	0.1182	0.12	0.1430	0.11	0.1649	0.10
6	0.1091	0.12	0.1426	0.11	0.1119	0.13
7	0.0537	0.18	0.0713	0.15	0.1021	0.14
8	0.0221	0.29	0.0410	0.21	0.0832	0.15
9	0.0287	0.26	0.0222	0.28	0.0278	0.27
10	0.0279	0.25	0.0334	0.22	0.0204	0.32
11	0.0281	0.23	0.0327	0.22	0.0236	0.30
12	0.0304	0.23	0.0276	0.24	0.0077	0.52
13	0.0230	0.25	0.0070	0.45	0.0103	0.47
14	0.0127	0.38	0.0063	0.46	0.0140	0.38
15	0.0032	0.74	0.0000	0.00	0.0000	0.00
16	0.0013	1.01	0.0000	0.00	0.0000	0.00
17	0.0039	0.75	0.0000	0.00	0.0000	0.00
18	0.0000	0.00	0.0000	0.00	0.0000	0.00
19	0.0000	0.00	0.0000	0.00	0.0000	0.00
>19	0.0000	0.00	0.0000	0.00	0.0000	0.00
n	517		526		504	
m.w.c.v.		0.13		0.12		0.13

Estimates of the proportion at age of kahawai from the Hauraki Gulf in 2000–01, 2001–02, and 2002–03

Age	2000–01		2001–02		2002–03	
(years)	*P.j.*	*c.v.*	*P.j.*	*c.v.*	*P.j.*	*c.v.*
1	0.0224	0.22	0.0025	0.71	0.0000	0.00
2	0.1029	0.12	0.0581	0.17	0.1618	0.08
3	0.5377	0.03	0.4188	0.05	0.4677	0.03
4	0.1548	0.10	0.1835	0.09	0.1498	0.10
5	0.0748	0.16	0.1067	0.13	0.0514	0.21
6	0.0137	0.46	0.0615	0.17	0.0430	0.25
7	0.0020	1.07	0.0591	0.17	0.0397	0.26
8	0.0070	0.77	0.0313	0.27	0.0210	0.30
9	0.0103	0.45	0.0080	0.52	0.0177	0.36
10	0.0114	0.52	0.0098	0.50	0.0096	0.55
11	0.0268	0.32	0.0164	0.35	0.0119	0.44
12	0.0128	0.49	0.0083	0.53	0.0076	0.64
13	0.0048	0.83	0.0084	0.56	0.0113	0.49
14	0.0149	0.50	0.0207	0.33	0.0029	1.03
15	0.0015	1.12	0.0028	1.02	0.0011	1.09
16	0.0000	0.00	0.0000	0.00	0.0000	0.00
17	0.0000	0.00	0.0015	1.07	0.0011	1.09
18	0.0000	0.00	0.0000	0.00	0.0000	0.00
19	0.0000	0.00	0.0000	0.00	0.0000	0.00
>19	0.0000	0.00	0.0000	0.00	0.0000	0.00
n	500		500		527	
m.w.c.v.		0.11		0.13		0.12

Appendix 2 – continued:
Estimates of the proportion at age of kahawai from the Bay of Plenty in 2000–01, 2001–02, and 2002–03

Age (years)	2000–01		2001–02		2002–03	
	P.j.	*c.v.*	*P.j.*	*c.v.*	*P.j.*	*c.v.*
1	0.0000	0.00	0.0000	0.00	0.0000	0.00
2	0.0101	0.32	0.0075	0.39	0.0446	0.17
3	0.1405	0.08	0.0768	0.13	0.1469	0.09
4	0.1482	0.09	0.1807	0.08	0.1762	0.09
5	0.1331	0.11	0.1747	0.09	0.1461	0.11
6	0.1217	0.13	0.1464	0.11	0.1387	0.11
7	0.1244	0.13	0.1234	0.12	0.1019	0.14
8	0.0596	0.22	0.0913	0.15	0.0806	0.16
9	0.0558	0.21	0.0482	0.22	0.0457	0.20
10	0.0650	0.20	0.0187	0.35	0.0419	0.23
11	0.0669	0.19	0.0556	0.22	0.0158	0.33
12	0.0158	0.38	0.0448	0.27	0.0327	0.24
13	0.0123	0.47	0.0147	0.45	0.0046	0.72
14	0.0098	0.64	0.0037	0.72	0.0076	0.40
15	0.0120	0.56	0.0061	0.51	0.0028	0.76
16	0.0130	0.44	0.0020	1.08	0.0000	0.00
17	0.0015	1.05	0.0000	0.00	0.0000	0.00
18	0.0015	1.05	0.0000	0.00	0.0034	0.62
19	0.0026	1.01	0.0000	0.00	0.0000	0.00
>19	0.0027	0.58	0.0000	0.00	0.0026	0.75
n	457		495		477	
m.w.c.v.		0.16		0.14		0.14

Appendix 3: Age–length keys derived from otolith samples collected from recreational fishers from East Northland in 2000–01, 2001–02, and 2002–03.

Estimates of proportion of length at age for kahawai sampled from the East Northland recreational fishery, January to April 2000–01. (Note: Aged to 01/01/01)

Length (cm)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	>19	No. aged
10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
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	1.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
25	0	0	1.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
26	0	0.25	0.75	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4
27	0	0.50	0.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
28	0	0.50	0.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
29	0	1.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
30	0	0.33	0.50	0.17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6
31	0	0.14	0.86	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7
32	0	0.10	0.70	0.20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10
33	0	0	0.91	0.09	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	11
34	0	0	0.76	0.24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	21
35	0	0	1.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	13
36	0	0	0.86	0.09	0.05	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	22
37	0	0	0.65	0.29	0.06	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	17
38	0	0	0.65	0.35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20
39	0	0	0.10	0.75	0.10	0.05	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20
40	0	0	0.11	0.68	0.16	0.05	0	0	0	0	0	0	0	0	0	0	0	0	0	0	19
41	0	0	0.12	0.88	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	25
42	0	0	0.09	0.50	0.23	0.14	0.05	0	0	0	0	0	0	0	0	0	0	0	0	0	22
43	0	0	0.05	0.62	0.24	0.10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	21
44	0	0	0.16	0.53	0.21	0.11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	19
45	0	0	0.07	0.45	0.21	0.21	0.07	0	0	0	0	0	0	0	0	0	0	0	0	0	29
46	0	0	0	0.22	0.30	0.39	0.09	0	0	0	0	0	0	0	0	0	0	0	0	0	23
47	0	0	0	0.18	0.27	0.18	0.27	0.05	0.05	0	0	0	0	0	0	0	0	0	0	0	22
48	0	0	0	0	0.34	0.34	0.17	0.03	0.07	0.03	0	0	0	0	0	0	0	0	0	0	29
49	0	0	0	0.07	0.27	0.13	0.20	0.07	0.20	0	0.07	0	0	0	0	0	0	0	0	0	15
50	0	0	0	0.12	0.18	0.24	0	0.06	0.06	0.24	0	0.12	0	0	0	0	0	0	0	0	17
51	0	0	0	0.06	0.06	0.41	0.06	0.12	0	0.06	0.12	0	0.06	0.06	0	0	0	0	0	0	17
52	0	0	0	0.06	0	0.16	0.13	0.16	0.06	0.09	0.22	0.06	0	0.03	0	0.03	0	0	0	0	32
53	0	0	0	0	0	0.11	0.06	0	0.06	0.06	0.11	0.28	0.17	0.11	0	0	0.06	0	0	0	18
54	0	0	0	0	0	0	0.06	0.06	0.13	0.13	0.13	0.25	0.25	0	0	0	0	0	0	0	16
55	0	0	0	0	0	0	0.08	0.08	0.08	0.33	0.08	0.17	0.08	0	0.08	0	0	0	0	0	12
56	0	0	0	0	0	0	0.25	0	0.13	0	0.13	0.13	0.25	0.13	0	0	0	0	0	0	8
57	0	0	0	0	0	0	0	0	0.20	0	0	0.20	0	0.40	0	0	0.20	0	0	0	5
58	0	0	0	0	0	0	0	0	0	0	0	0.25	0.50	0	0.25	0	0	0	0	0	4
59	0	0	0	0	0	0	0	0	0	0	1.00	0	0	0	0	0	0	0	0	0	1
60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
61	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
62	0	0	0	0	0	0	0	0	0	0	0	0	1.00	0	0	0	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	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

Total 517

Estimates of proportion of length at age for kahawai sampled from the East Northland recreational fishery, January to April 2001–02. (Note: Aged to 01/01/02).

Length (cm)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	>19	No. aged
10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20	0	1.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
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	1.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
24	0	1.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
25	0	0.50	0.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
26	0	0.50	0.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
27	0	0.67	0.33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
28	0	0	1.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
29	0	0.60	0.40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5
30	0	0.20	0.80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5
31	0	0.50	0	0.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
32	0	0.13	0.88	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8
33	0	0	0.86	0.14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7
34	0	0	1.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8
35	0	0	0.92	0.08	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	12
36	0	0	0.91	0.09	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	11
37	0	0	0.60	0.30	0.10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10
38	0	0	0.77	0.23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	13
39	0	0	0.27	0.73	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	11
40	0	0	0.05	0.86	0.09	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	22
41	0	0	0.35	0.65	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	17
42	0	0	0.17	0.61	0.17	0.06	0	0	0	0	0	0	0	0	0	0	0	0	0	0	18
43	0	0	0.12	0.46	0.31	0.12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	26
44	0	0	0.11	0.42	0.26	0.21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	19
45	0	0	0	0.62	0.19	0.10	0.05	0.05	0	0	0	0	0	0	0	0	0	0	0	0	21
46	0	0	0.09	0.26	0.32	0.21	0.06	0.06	0	0	0	0	0	0	0	0	0	0	0	0	34
47	0	0	0	0.31	0.17	0.34	0.14	0.03	0	0	0	0	0	0	0	0	0	0	0	0	35
48	0	0	0	0.24	0.13	0.32	0.18	0.05	0.05	0.03	0	0	0	0	0	0	0	0	0	0	38
49	0	0	0	0.14	0.27	0.30	0.14	0.11	0.02	0.02	0	0	0	0	0	0	0	0	0	0	44
50	0	0	0	0.18	0.23	0.09	0.14	0.14	0	0.09	0.09	0.05	0	0	0	0	0	0	0	0	22
51	0	0	0	0.07	0.24	0.21	0.07	0.03	0.10	0.07	0.10	0.10	0	0	0	0	0	0	0	0	29
52	0	0	0	0.04	0.07	0.18	0.32	0.07	0.04	0.07	0.11	0.04	0.07	0	0	0	0	0	0	0	28
53	0	0	0	0	0	0.12	0.12	0.12	0	0.18	0.29	0.12	0	0.06	0	0	0	0	0	0	17
54	0	0	0	0	0	0.11	0.11	0.11	0.05	0.21	0.16	0.11	0.05	0.11	0	0	0	0	0	0	19
55	0	0	0	0	0	0.11	0	0.11	0.22	0.11	0.22	0.22	0	0	0	0	0	0	0	0	9
56	0	0	0	0	0	0	0	0	0.20	0.30	0.10	0.20	0.20	0	0	0	0	0	0	0	10
57	0	0	0	0	0	0.25	0	0	0.25	0.25	0	0.25	0	0	0	0	0	0	0	0	4
58	0	0	0	0	0	0	0	0	0	0.17	0.17	0.33	0	0.33	0	0	0	0	0	0	6
59	0	0	0	0	0	0	0	0	0	0	0	1.00	0	0	0	0	0	0	0	0	1
60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
61	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	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

Total 526

Estimates of proportion of length at age for kahawai sampled from the East Northland recreational fishery, January to April 2002–03. (Note: Aged to 01/01/03)

Length (cm)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	>19	No. aged
10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21	0	1.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
22	1.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
23	0	1.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
24	0	1.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
25	0	1.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
26	0	1.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
27	0	1.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
28	0	0.60	0.40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5
29	0	1.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
30	0	0	1.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
31	0	0	1.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6
32	0	0.13	0.88	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8
33	0	0.14	0.86	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7
34	0	0	0.93	0.07	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	14
35	0	0	0.86	0.14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	21
36	0	0.06	0.94	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	35
37	0	0.03	0.94	0.03	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	34
38	0	0	0.75	0.25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20
39	0	0	0.36	0.64	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	14
40	0	0	0.05	0.63	0.32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	19
41	0	0	0	0.64	0.36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	11
42	0	0	0.11	0.67	0.22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9
43	0	0	0	0.64	0.36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	11
44	0	0	0	0.46	0.42	0.04	0.08	0	0	0	0	0	0	0	0	0	0	0	0	0	24
45	0	0	0	0.38	0.34	0.17	0.07	0.03	0	0	0	0	0	0	0	0	0	0	0	0	29
46	0	0	0	0.35	0.40	0.05	0.10	0	0.05	0.05	0	0	0	0	0	0	0	0	0	0	20
47	0	0	0	0.04	0.30	0.26	0.15	0.15	0.11	0	0	0	0	0	0	0	0	0	0	0	27
48	0	0	0	0.07	0.21	0.29	0.25	0.14	0.04	0	0	0	0	0	0	0	0	0	0	0	28
49	0	0	0	0	0.18	0.39	0.11	0.29	0	0	0	0.04	0	0	0	0	0	0	0	0	28
50	0	0	0	0	0.34	0.13	0.09	0.28	0.03	0.06	0.03	0.03	0	0	0	0	0	0	0	0	32
51	0	0	0	0	0.09	0.13	0.48	0.04	0.13	0.04	0.09	0	0	0	0	0	0	0	0	0	23
52	0	0	0	0	0.08	0.21	0.17	0.33	0.08	0.08	0.04	0	0	0	0	0	0	0	0	0	24
53	0	0	0	0	0	0.27	0.27	0	0	0.09	0.18	0	0.09	0.09	0	0	0	0	0	0	11
54	0	0	0	0	0	0.10	0.40	0.10	0	0.10	0.20	0.10	0	0	0	0	0	0	0	0	10
55	0	0	0	0	0	0	0	0.11	0.22	0.11	0.22	0	0.11	0.22	0	0	0	0	0	0	9
56	0	0	0	0	0	0	0	0.13	0	0.13	0	0.13	0.13	0.50	0	0	0	0	0	0	8
57	0	0	0	0	0	0	0	0	0	0	0	0	0.50	0.50	0	0	0	0	0	0	2
58	0	0	0	0	0	0	0	0	0	0	0	0	1.00	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	1.00	0	0	0	0	0	0	0	0	0	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	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

Total   504

Appendix 4: Age–length keys derived from otolith samples collected from recreational fishers from the Hauraki Gulf in 2000–01, 2001–02, and 2002–03.

Estimates of proportion of length at age for kahawai sampled from the Hauraki Gulf recreational fishery, January to April 2000–01. (Note: Aged to 01/01/01)

Length (cm)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	>19	No. aged
10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	1.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17	1.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
18	1.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4
19	1.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8
20	1.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
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	1.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
24	0	1.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8
25	0	1.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5
26	0	1.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5
27	0	0.63	0.38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8
28	0	0.44	0.56	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	16
29	0	0.55	0.45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	11
30	0	0.19	0.81	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	16
31	0	0.09	0.88	0.03	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	34
32	0	0	0.90	0.10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	41
33	0	0	0.88	0.10	0.02	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	50
34	0	0	0.93	0.07	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	42
35	0	0	0.98	0.02	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	44
36	0	0	0.87	0.10	0.03	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	31
37	0	0	0.70	0.20	0.10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20
38	0	0	0.38	0.44	0.19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	16
39	0	0	0.42	0.42	0.17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	12
40	0	0	0.35	0.35	0.25	0.05	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20
41	0	0	0.13	0.81	0.06	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	16
42	0	0	0.10	0.70	0.20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10
43	0	0	0.30	0.50	0.20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10
44	0	0	0.25	0.63	0.13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8
45	0	0	0.17	0.33	0.33	0.17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6
46	0	0	0	1.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
47	0	0	0	0.50	0.17	0.33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6
48	0	0	0	0.33	0.67	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
49	0	0	0	0	0.75	0.25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4
50	0	0	0	0	0.25	0	0	0.13	0	0.13	0.38	0.13	0	0	0	0	0	0	0	0	8
51	0	0	0	0	0	0	0	0	0.33	0.17	0.17	0.17	0	0.17	0	0	0	0	0	0	6
52	0	0	0	0	0	0	0.25	0	0.50	0	0.25	0	0	0	0	0	0	0	0	0	4
53	0	0	0	0	0	0	0	0.50	0	0	0	0	0	0.50	0	0	0	0	0	0	2
54	0	0	0	0	0	0	0	0	0	0	0.50	0.25	0.25	0	0	0	0	0	0	0	4
55	0	0	0	0	0	0	0	0	0	0.25	0.25	0.25	0	0.25	0	0	0	0	0	0	4
56	0	0	0	0	0	0	0	0	0	0.33	0.33	0	0	0.33	0	0	0	0	0	0	3
57	0	0	0	0	0	0	0	0	0.33	0	0	0	0	0.33	0.33	0	0	0	0	0	3
58	0	0	0	0	0	0	0	0	0	0	0	1.00	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	1.00	0	0	0	0	0	0	0	1
61	0	0	0	0	0	0	0	0	0	0	1.00	0	0	0	0	0	0	0	0	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	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

Total   500

Appendix 4 – continued:

Estimates of proportion of length at age for kahawai sampled from the Hauraki Gulf recreational fishery, January to April 2001–02.
(Note: Aged to 01/01/02)

Length (cm)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	>19	No. aged
10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	1.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
16	1.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
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	1.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
23	0	0	1.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4
24	0	0.15	0.85	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	13
25	0	0.23	0.77	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	26
26	0	0.23	0.77	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	31
27	0	0.33	0.67	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	18
28	0	0.14	0.86	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	14
29	0	0	0.33	0.67	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
30	0	0.44	0.56	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9
31	0	0.14	0.71	0.14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7
32	0	0	1.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7
33	0	0	1.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10
34	0	0	0.71	0.21	0.07	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	14
35	0	0	0.78	0.19	0.03	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	32
36	0	0	0.68	0.26	0.05	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	19
37	0	0	0.59	0.37	0.04	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	27
38	0	0	0.67	0.25	0.04	0.04	0	0	0	0	0	0	0	0	0	0	0	0	0	0	24
39	0	0	0.50	0.31	0.19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	16
40	0	0	0.50	0.40	0.10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10
41	0	0	0.14	0.71	0.14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	14
42	0	0	0.10	0.40	0.10	0.30	0	0.10	0	0	0	0	0	0	0	0	0	0	0	0	10
43	0	0	0	0.76	0.19	0	0.05	0	0	0	0	0	0	0	0	0	0	0	0	0	21
44	0	0	0	0.50	0.42	0.08	0	0	0	0	0	0	0	0	0	0	0	0	0	0	12
45	0	0	0	0.40	0.33	0.13	0.07	0	0	0	0	0.07	0	0	0	0	0	0	0	0	15
46	0	0	0	0.23	0.32	0.14	0.23	0.05	0.05	0	0	0	0	0	0	0	0	0	0	0	22
47	0	0	0	0	0.50	0.22	0.17	0.11	0	0	0	0	0	0	0	0	0	0	0	0	18
48	0	0	0	0	0.25	0.38	0.29	0.08	0	0	0	0	0	0	0	0	0	0	0	0	24
49	0	0	0	0.07	0.36	0.07	0.29	0.07	0.07	0	0.07	0	0	0	0	0	0	0	0	0	14
50	0	0	0	0	0.17	0.17	0.25	0.17	0.08	0	0	0.08	0	0	0.08	0	0	0	0	0	12
51	0	0	0	0	0	0.30	0.40	0.20	0	0	0	0	0	0.10	0	0	0	0	0	0	10
52	0	0	0	0.10	0	0.10	0.10	0.10	0	0.10	0.30	0	0.10	0.10	0	0	0	0	0	0	10
53	0	0	0	0	0	0.25	0	0.25	0	0.25	0.25	0	0	0	0	0	0	0	0	0	4
54	0	0	0	0	0	0.10	0.20	0	0	0.10	0.20	0.10	0	0.30	0	0	0	0	0	0	10
55	0	0	0	0	0	0	0	0.25	0	0.25	0	0	0.25	0.25	0	0	0	0	0	0	4
56	0	0	0	0	0	0	0	0	0	0.17	0.17	0	0.33	0.17	0	0	0.17	0	0	0	6
57	0	0	0	0	0	0	0	0.33	0	0	0	0.33	0	0.33	0	0	0	0	0	0	3
58	0	0	0	0	0	0	0	0	0	0	0.50	0	0	0.50	0	0	0	0	0	0	2
59	0	0	0	0	0	0	0	0	1.00	0	0	0	0	0	0	0	0	0	0	0	1
60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
61	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	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

Total 500

Appendix 4 – continued:

Estimates of proportion of length at age for kahawai sampled from the Hauraki Gulf recreational fishery, January to April 2002–03.
(Note: Aged to 01/01/03)

Length (cm)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	>19	No. aged
10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
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	1.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4
24	0	1.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
25	0	1.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8
26	0	0.75	0.25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	16
27	0	1.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9
28	0	0.88	0.13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	32
29	0	0.81	0.19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	16
30	0	0.31	0.69	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	16
31	0	0.38	0.63	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	16
32	0	0.16	0.68	0.16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	25
33	0	0.07	0.90	0.03	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	30
34	0	0.09	0.79	0.12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	33
35	0	0.02	0.93	0.05	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	55
36	0	0	0.92	0.08	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	48
37	0	0.02	0.93	0.05	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	42
38	0	0.04	0.85	0.08	0.04	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	26
39	0	0	0.55	0.45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	11
40	0	0	0.50	0.40	0.10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10
41	0	0	0.20	0.50	0.30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10
42	0	0	0.08	0.75	0.08	0.08	0	0	0	0	0	0	0	0	0	0	0	0	0	0	12
43	0	0	0	0.88	0.13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8
44	0	0	0	0.80	0.20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10
45	0	0	0	0.70	0.20	0	0.10	0	0	0	0	0	0	0	0	0	0	0	0	0	10
46	0	0	0	0.25	0	0.50	0.25	0	0	0	0	0	0	0	0	0	0	0	0	0	4
47	0	0	0	0	0.43	0.29	0.14	0	0	0	0	0.14	0	0	0	0	0	0	0	0	7
48	0	0	0	0	0.30	0.20	0.40	0	0.10	0	0	0	0	0	0	0	0	0	0	0	10
49	0	0	0	0	0.17	0.17	0.17	0.42	0.08	0	0	0	0	0	0	0	0	0	0	0	12
50	0	0	0	0	0.22	0.11	0.22	0.22	0.11	0	0	0	0.11	0	0	0	0	0	0	0	9
51	0	0	0	0	0	0.38	0.25	0	0.13	0.13	0.13	0	0	0	0	0	0	0	0	0	8
52	0	0	0	0	0	0	0.14	0	0.14	0.14	0.14	0.14	0.14	0.14	0	0	0	0	0	0	7
53	0	0	0	0	0	0.50	0.25	0	0	0	0	0	0	0	0	0	0	0	0	0	4
54	0	0	0	0	0	0	0	0.17	0.33	0	0.50	0	0	0	0	0	0	0	0	0	6
55	0	0	0	0	0	0	0	0	0	0.50	0	0	0.50	0	0	0	0	0	0	0	2
56	0	0	0	0	0	0	0.25	0.25	0.25	0	0	0	0.25	0	0	0	0	0	0	0	4
57	0	0	0	0	0	0	0	0.40	0	0	0	0.20	0	0	0.20	0	0.20	0	0	0	5
58	0	0	0	0	0	0	0	0	0	1.00	0	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	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

Total   527

Appendix 5: Age–length keys derived from otolith samples collected from recreational fishers from the Bay of Plenty in 2000–01, 2001–02, and 2002–03.

Estimates of proportion of length at age for kahawai sampled from the Bay of Plenty recreational fishery, January to April 2000–01. (Note: Aged to 01/01/01)

Length (cm)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	>19	No. aged
10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
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	0.50	0.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
24	0	1.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
25	0	1.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
27	0	0.20	0.60	0.20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5
28	0	0.25	0.25	0.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4
29	0	0	1.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7
30	0	0.06	0.88	0.06	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	17
31	0	0	0.86	0.14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7
32	0	0	0.90	0.10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10
33	0	0	1.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10
34	0	0	0.75	0.25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	16
35	0	0	0.63	0.31	0.06	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	16
36	0	0	0.35	0.59	0.06	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	17
37	0	0	0.25	0.67	0.08	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	12
38	0	0	0.06	0.71	0.24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	17
39	0	0	0.08	0.68	0.24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	25
40	0	0	0.06	0.61	0.22	0.11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	18
41	0	0	0.08	0.42	0.33	0.08	0.08	0	0	0	0	0	0	0	0	0	0	0	0	0	12
42	0	0	0	0.17	0.58	0.17	0.08	0	0	0	0	0	0	0	0	0	0	0	0	0	12
43	0	0	0	0.15	0.54	0.15	0.08	0.08	0	0	0	0	0	0	0	0	0	0	0	0	13
44	0	0	0	0.20	0.52	0.12	0.12	0	0.04	0	0	0	0	0	0	0	0	0	0	0	25
45	0	0	0	0.04	0.35	0.35	0.13	0.04	0.04	0.04	0	0	0	0	0	0	0	0	0	0	23
46	0	0	0	0.04	0.17	0.39	0.22	0.09	0.04	0.04	0	0	0	0	0	0	0	0	0	0	23
47	0	0	0	0	0.05	0.47	0.32	0.05	0.05	0.05	0	0	0	0	0	0	0	0	0	0	19
48	0	0	0	0	0.11	0.11	0.50	0.11	0.06	0.06	0.06	0	0	0	0	0	0	0	0	0	18
49	0	0	0	0	0	0.23	0.36	0.09	0.05	0.05	0.18	0.05	0	0	0	0	0	0	0	0	22
50	0	0	0	0	0	0.12	0.24	0.24	0.06	0.29	0.06	0	0	0	0	0	0	0	0	0	17
51	0	0	0	0	0	0.06	0.11	0.11	0.22	0.11	0.28	0.06	0.06	0	0	0	0	0	0	0	18
52	0	0	0	0	0	0.05	0.16	0.05	0.21	0.21	0.21	0.05	0.05	0	0	0	0	0	0	0	19
53	0	0	0	0	0	0.06	0	0.12	0.24	0.18	0.29	0.12	0	0	0	0	0	0	0	0	17
54	0	0	0	0	0	0	0	0.08	0.08	0.08	0.42	0	0.08	0	0	0.17	0	0	0.08	0	12
55	0	0	0	0	0	0	0	0.20	0	0	0	0	0	0.40	0.40	0	0	0	0	0	5
56	0	0	0	0	0	0	0	0	0.20	0.40	0	0	0	0	0	0.40	0	0	0	0	5
57	0	0	0	0	0	0	0	0	0	0.17	0	0.17	0.17	0	0	0.17	0.17	0.17	0	0	6
58	0	0	0	0	0	0	0	0	0	0	0	0	0.50	0	0.50	0	0	0	0	0	2
59	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00	1
60	0	0	0	0	0	0	0	0	0	0	0	1.00	0	0	0	0	0	0	0	0	2
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

Total 457

36

Estimates of proportion of length at age for kahawai sampled from the Bay of Plenty recreational fishery, January to April 2001–02. (Note: Aged to 01/01/02)

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
10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
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	1.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
25	0	1.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
26	0	0.60	0.40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5
27	0	0	1.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
28	0	0.50	0.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
29	0	0	1.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
30	0	0	0.50	0.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
31	0	0	0.86	0.14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7
32	0	0	0.86	0.14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7
33	0	0	1.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5
34	0	0	0.67	0.22	0.11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9
35	0	0	0.20	0.80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5
36	0	0	0.13	0.75	0.13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8
37	0	0	0.20	0.50	0.30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20
38	0	0	0.12	0.59	0.29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	17
39	0	0	0.14	0.77	0.09	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	22
40	0	0	0.04	0.61	0.32	0.04	0	0	0	0	0	0	0	0	0	0	0	0	0	0	28
41	0	0	0.00	0.61	0.35	0.04	0	0	0	0	0	0	0	0	0	0	0	0	0	0	23
42	0	0	0.04	0.29	0.54	0.04	0	0.08	0	0	0	0	0	0	0	0	0	0	0	0	24
43	0	0	0.04	0.15	0.48	0.26	0.04	0.04	0	0	0	0	0	0	0	0	0	0	0	0	27
44	0	0	0.04	0.12	0.40	0.32	0.08	0.04	0	0	0	0	0	0	0	0	0	0	0	0	25
45	0	0	0.09	0.13	0.22	0.30	0.09	0.13	0.04	0	0	0	0	0	0	0	0	0	0	0	23
46	0	0	0	0	0.25	0.29	0.29	0.14	0	0.04	0	0	0	0	0	0	0	0	0	0	28
47	0	0	0	0	0.19	0.43	0.24	0.08	0.05	0	0	0	0	0	0	0	0	0	0	0	37
48	0	0	0	0.02	0.16	0.20	0.33	0.18	0.09	0	0.02	0	0	0	0	0	0	0	0	0	45
49	0	0	0	0	0.06	0.25	0.25	0.38	0	0	0	0.06	0	0	0	0	0	0	0	0	16
50	0	0	0	0.04	0.04	0.18	0.32	0.11	0.07	0.04	0.11	0.07	0.04	0	0	0	0	0	0	0	28
51	0	0	0	0.03	0	0.06	0.13	0.13	0.16	0.10	0.26	0.10	0	0.03	0	0	0	0	0	0	31
52	0	0	0	0	0.06	0.12	0.00	0.18	0.06	0.18	0.12	0.18	0.06	0	0.06	0	0	0	0	0	17
53	0	0	0	0	0	0.08	0.08	0	0.25	0	0.17	0.25	0.17	0	0	0	0	0	0	0	12
54	0	0	0	0	0	0	0	0	0	0	0.67	0.33	0	0	0	0	0	0	0	0	3
55	0	0	0	0	0	0	0.13	0.13	0.25	0	0.25	0.13	0	0.13	0	0	0	0	0	0	8
56	0	0	0	0	0	0	0	0	0.50	0	0	0	0.50	0	0	0	0	0	0	0	2
57	0	0	0	0	0	0	0	0	0	0	0	1.00	0	0	0	0	0	0	0	0	1
58	0	0	0	0	0	0	0	0	0	0	0	0.50	0	0	0	0.50	0	0	0	0	2
59	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00	0	0	0	0	0	1
60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
61	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	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	1.00	0	0	0	0	0	1
64	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
65	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	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

Total   495

Estimates of proportion of length at age for kahawai sampled from the Bay of Plenty recreational fishery, January to April 2002–03. (Note: Aged to 01/01/03)

Length (cm)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	>19	No. aged
10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
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	1.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
24	0	1.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
25	0	1.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4
26	0	1.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4
27	0	0.86	0.14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7
28	0	0.50	0.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
29	0	0.40	0.60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5
30	0	0	1.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
31	0	0	1.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
32	0	0.33	0.67	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
33	0	0.14	0.86	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	14
34	0	0.05	0.75	0.20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20
35	0	0.08	0.67	0.25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	12
36	0	0	0.64	0.36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	14
37	0	0	0.58	0.42	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	12
38	0	0.10	0.40	0.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10
39	0	0	0.18	0.64	0.18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	11
40	0	0	0.13	0.79	0.08	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	24
41	0	0	0.05	0.53	0.37	0.05	0	0	0	0	0	0	0	0	0	0	0	0	0	0	19
42	0	0	0.12	0.42	0.35	0	0.04	0.04	0.04	0	0	0	0	0	0	0	0	0	0	0	26
43	0	0	0	0.08	0.46	0.33	0.08	0.04	0	0	0	0	0	0	0	0	0	0	0	0	24
44	0	0	0.06	0.38	0.19	0.25	0.06	0	0	0.06	0	0	0	0	0	0	0	0	0	0	16
45	0	0	0.04	0	0.48	0.36	0.04	0.04	0.04	0	0	0	0	0	0	0	0	0	0	0	25
46	0	0	0	0.20	0.40	0.13	0.20	0	0	0.07	0	0	0	0	0	0	0	0	0	0	15
47	0	0	0	0.09	0.26	0.26	0.18	0.12	0.03	0.03	0.03	0	0	0	0	0	0	0	0	0	34
48	0	0	0	0	0.26	0.26	0.30	0.11	0	0.04	0	0.04	0	0	0	0	0	0	0	0	27
49	0	0	0	0.04	0	0.41	0.30	0.11	0.11	0.04	0	0	0	0	0	0	0	0	0	0	27
50	0	0	0	0	0.13	0.19	0.13	0.23	0.10	0.13	0	0.06	0.03	0	0	0	0	0	0	0	31
51	0	0	0	0	0.04	0.17	0.17	0.29	0	0.21	0.08	0.04	0	0	0	0	0	0	0	0	24
52	0	0	0	0	0	0.04	0.15	0.23	0.15	0.08	0.04	0.23	0.04	0	0.04	0	0	0	0	0	26
53	0	0	0	0	0	0.10	0.10	0.05	0.15	0.05	0.25	0.25	0	0.05	0	0	0	0	0	0	20
54	0	0	0	0	0	0	0	0.30	0.10	0.10	0	0.20	0	0.10	0	0	0	0.10	0	0.10	10
55	0	0	0	0	0	0	0	0	1.00	0	0	0	0	0	0	0	0	0	0	0	1
56	0	0	0	0	0	0	0	0	0	0	0	0	1.00	0	0	0	0	0	0	0	2
57	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
58	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00	0	0	0	0	0	0	1
59	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00	0	0	0	1
60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
61	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00	1
62	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
63	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
64	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
65	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	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

Total 477