Baywide Recreational Fishery Surveys Sub-Program

Progress Report No. 11 (May–Sept. 2011)

No. 153

November 2011

Victoria
The Place To Be

Baywide Recreational Fishery Surveys Sub-Program

Progress Report No. 11 (May–Sept. 2011)

Thérèse Bruce, Natalie Bridge, Daniel Grixti, Karina Ryan and Simon Conron

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Table of Contents

List of Tables iv
List of Figures iv

Introduction 1
Purpose of this report 1

Materials and Methods 2
Statistical Analysis 2
QAQC 2

Results and Discussion 4
Conclusions 4

References 5

Appendix 1 Methods 7
On-site surveys 7
Catch rate 7
Catch length composition 7
Statistical analysis 7
Catch rate 7
Catch length composition 8

Appendix 2 Results 9
Catch rate 9

Appendix 3 17
Raw data 17

List of Tables

Table 1. On-site survey sample days required, undertaken and used for analysis in each region of PPB for May–September 2011. 10

Table 2. Estimated mean catch rate comparison statistic (t_o) of confidence limits from on-site surveys in May–September to compare 2011 with 2008–10 for combined and individual species and regions using bootstrap analysis (log transformed data, results significant at p<0.05, significant results in bold). 12

Table 3. Summary of length (TL)-frequency distributions from on-site surveys in May–September 2008–10 and 2011. 16

List of Figures

Figure 1. Boat ramps of PPB selected for on-site surveys. 3

Figure 2. Estimated mean combined catch rates (± 95 % confidence limits) of snapper, King George whiting and flathead retained by boat-based anglers fishing within PPB overall and in the Melbourne, Mornington and Bellarine regions during May–September 2008–11. 11

Figure 3. A comparison of the length (TL)-frequency (%) distribution of snapper retained by boat-based anglers fishing in PPB from May–September 2008–10 and 2011 (n=number of fish measured). 13

Figure 4. A comparison of the length (TL)-frequency (%) distribution of King George whiting retained by boat-based anglers fishing in PPB from May–September 2008–10 and 2011 (n=number of fish measured). 14

Figure 5. A comparison of the length (TL)-frequency (%) distribution of flathead (all species) retained by boat-based anglers fishing in PPB from May–September 2008–10 and 2011 (n=number of fish measured). 15

Introduction

The Recreational Fishery Surveys Sub-Program of the Channel Deepening Baywide Monitoring Programs (CDBMP) for Port Phillip Bay (PPB) consists of two components:

- On-site surveys to assess the recreational catch rates of boat-based anglers: Anglers are interviewed on return to the boat ramp and detailed data are recorded on fishing effort and retained catch (i.e. fish above the Legal Minimum Length, LML)
- Angler-based assessments of fish stocks: Research anglers (a select group of experienced anglers) record 'diary' information on all fish caught, including those below the LML.

This sub-program is described in the CDBMP Recreational Fishery Surveys Detailed Design - CDP_ENV_MD_017 Rev 3 (PoMC 2010).

The objective of this sub-program is to detect changes in the abundance and recruitment of key recreational fishery species outside of expected variability.

Purpose of this report

This report summarises results for the on-site survey component of the sub-program from late-autumn to early-spring 2011 (May–September 2011).

Materials and Methods

Project design and methods for this study are described in PoMC (2010). Additional methods presented in this report, and not otherwise described, are summarised in Appendix 1.

Surveys were undertaken from May to September 2011 at selected boat ramps around PPB (Figure 1).

Statistical Analysis

Statistical analyses of data were undertaken according to agreed design specifications for the sub-program (PoMC 2010). Statistical comparisons of data collected during the survey period (May–September 2011) were made with data from May–September 2008–10 for:

- Mean combined catch rates of snapper, King George whiting and flathead in each of three regions of PPB and in the Bay as a whole
- Mean individual catch rates of snapper, King George whiting and flathead in each of three regions of PPB and in the Bay as a whole
- Length-frequency distributions of snapper, King George whiting and flathead (all species) retained by boat-based anglers fishing in PPB.

QAQC

There were no significant field events observed or other QA/QC issues recorded during this reporting period.

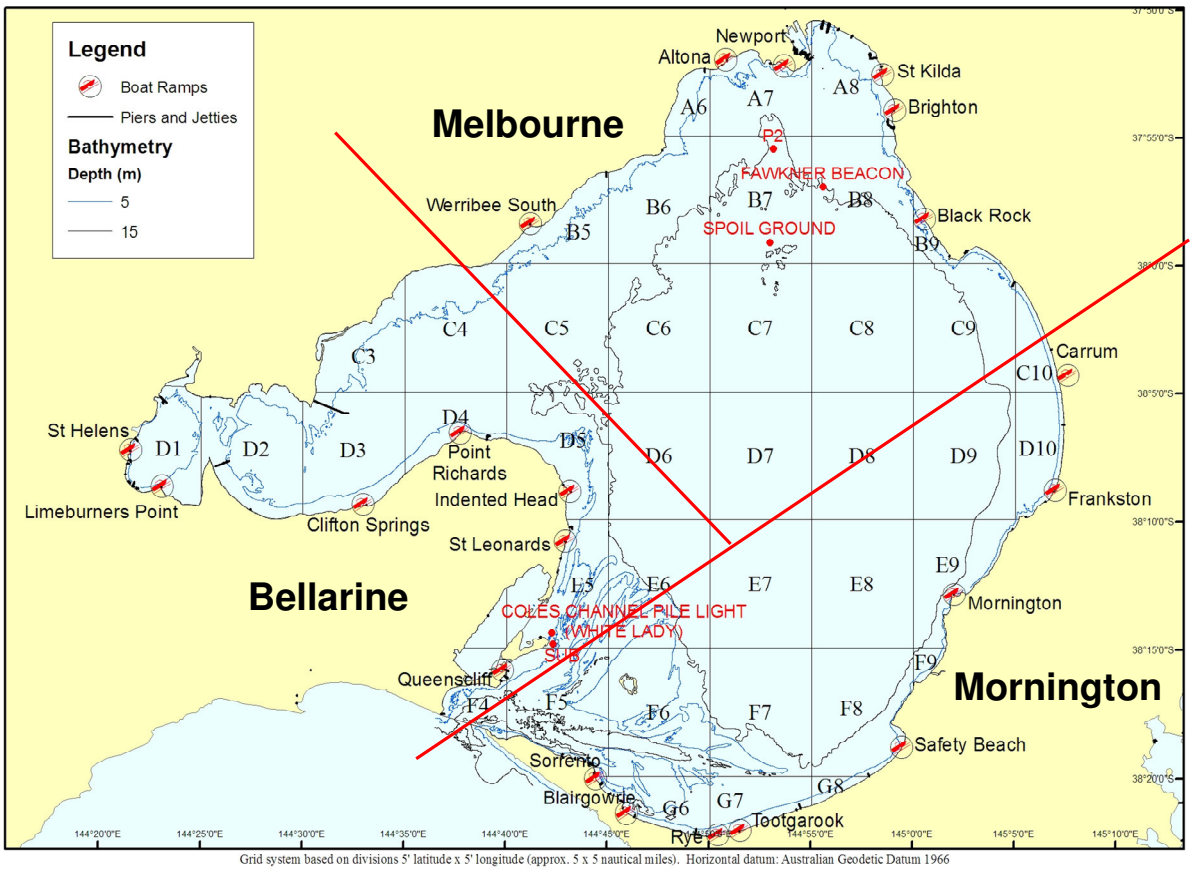

Figure 1. Boat ramps of PPB selected for on-site surveys.

Results and Discussion

Preliminary results for the survey period (May–September 2011) are provided in Appendix 2, and summarised here.

During the survey period, catch data were recorded from 291 boat fishing trips. Those trips reported a combined retained catch of 1052 snapper, King George whiting and flathead, of which 339 were measured.

There were no significant differences in mean combined catch rates (fish per angler hour) of snapper, King George whiting and flathead during May–September 2011 compared with May–September 2008–10.

When comparing the mean individual catch rates of snapper, King George whiting and flathead for the survey period with 2008–10:

- There was a statistically significant decrease for flathead in PPB as a whole and in the Bellarine region, with no significant change detected in the Melbourne and Mornington regions
- There were no statistically significantly differences for snapper or King George whiting in any region or in PPB as a whole.

The decrease in flathead catch rates in PPB as a whole and in the Bellarine region were based on a small number of interviews and survey days. Flathead abundance is more precisely measured during the January–April and October–December survey periods when flathead are targeted more frequently by anglers. Data for the October-December 2011 period will be provided as part of the next progress report (#12) for this sub-program.

The length-frequency distributions of snapper and King George whiting were significantly different between May–September 2011 and 2008–10 (snapper K-S test statistic=1.911, $p<0.01$, whiting K-S test statistic=1.515, $p=0.02$). Few snapper and whiting are caught and measured during the May–September period. Low sample sizes may affect the reliability of the K-S test. Comparisons between snapper and whiting length distributions are more meaningful during peak fishing periods when sample sizes are larger (see also next progress report (#12) for this sub-program).

The length-frequency distributions for flathead were not significantly different between May–September 2011 and 2008–10 (K-S test statistic=1.228, $p=0.10$).

Conclusions

Comparisons of mean combined and mean individual catch rates and size composition for snapper, King George whiting and flathead during the survey period (May–September), suggest that stocks in PPB were similar between 2011 and 2008–10.

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Appendix 1 Methods

The methods and associated statistical analyses undertaken for this sub-program are described in PoMC (2010), and have been documented in Bruce *et al.* (2010, 2011a,b,c,d,e), Conron *et al.* (2008a,b, 2009a,b,c), Ryan *et al.* (2008, 2009) and Stokie *et al.* (2009a,b,c, 2010a,b,c,d).

On-site surveys

The primary sampling unit for the on-site survey component is the number of 'face to face' survey days.

Angling in PPB decreases during winter compared with spring, summer and autumn. To maximise contact with anglers, the sampling schedule for the winter reporting period (May–September 2011) was conducted on weekends only (PoMC 2010).

Surveys were undertaken from May to September 2011 at selected boat ramps around PPB. Boat ramps were grouped into three key regions:

- Melbourne
- Mornington
- Bellarine.

Anglers were asked to provide information about the fishing trips they completed including:

- Target species
- Number of fish of each species retained and released
- Time spent fishing
- Location fished
- Level of fishing experience.

A sample of the important recreational species in the retained catch, namely snapper, King George whiting, flathead (all species), Australian salmon (*Arripis trutta*), calamari (*Sepioteuthis australis*) and garfish (Family Hemiramphidae) were inspected, species identified and individuals counted and measured. Results for snapper, King George whiting and flathead are presented in this report. Data from all other species will be presented in the final report for this subprogram.

Total length (TL) was recorded for species with truncate or rounded caudal fins (including flathead). Fork length (FL; distance from the tip of the snout to the base of the tail fin) was recorded for species with emarginate or forked caudal fins (including snapper and King George whiting).

For use in all analyses, FL was converted to TL using the following regression equations:

- Snapper
  TL=1.125FL+1.38 (Francis and Winstanley 1989)
- King George whiting
  TL=1.0644FL–0.3708 (DPI unpublished data).

Catch rate

Mean combined catch rates (measured in fish per angler hour) of snapper, King George whiting and (all) flathead, were calculated as mean estimated retained catch rates for anglers targeting species, excluding garfish and calamari, in each of three regions and for PPB as a whole.

Mean individual catch rates of snapper, King George whiting and (all) flathead were also calculated as mean estimated retained catch rates for anglers targeting the species of interest, in each of three regions and for PPB as a whole.

Catch length composition

Length-frequency distributions of the total retained angler catch in the survey period were plotted for snapper, King George whiting and flathead for PPB as a whole.

Statistical analysis

Statistical comparisons of mean catch rate and length-frequency data collected from the survey period (May–September 2011) were made with data collected during May–September 2008–10 (n. b. no comparable data were available prior to 2008 for the May–September period).

Catch rate

Data were collected from anglers targeting key species that recalled fishing at least five days in the previous 12 months. Calculating mean catch rates from these anglers increases consistency in the sampling effort and reliability of the analyses.

Mean catch rates (combined species and individual species) were calculated using the

ratio-of means estimator (Jones *et al.* 1995). Analysis was based on catch rates per day, which represents the appropriate level of sampling (Steffe 2007). The analysis threshold used for this report was based on one or more interviews per survey day (PoMC 2010).

Statistical analysis was based on log transformed catch rate data:

[log ((catch+1)/effort)].

A linear mixed model using the Restricted Maximum Likelihood (REML) algorithm was performed to compare mean catch rates from 2011 with 2008–10. Analysis was performed on data derived from each region and on data pooled for PPB as a whole. Confidence intervals obtained using bias-corrected, accelerated bootstrap percentile methods based on a residual bootstrap (Efron and Tibshirani 1993).

Catch length composition

Length-frequency distributions for the survey period were combined by region and compared statistically with May–September 2008–10 by a Kolmogorov-Smirnov (K-S) two sample asymptotic test using SAS PROC NPAR1WAY (SAS Institute 1989; PoMC 2010).

Appendix 2 Results

During the survey period (May–September 2011), catch data were recorded from 291 boat fishing trips. Those trips reported a combined retained catch of 1052 snapper, King George whiting and flathead, of which 339 were measured. Across the three regions, 30 survey days were undertaken (Table 1).

The number of interviews required for May–September was determined from a sampling schedule of two 'weekend days' per region per month (PoMC 2010). This target was met (Table 1).

Catch rate

Mean combined catch rates for snapper, King George whiting and flathead in each region and PPB as a whole are presented in Figure 2.

There were no significant differences in mean combined catch rates (fish per angler hour) of snapper, King George whiting and flathead during May–September 2011 compared with May–September 2008–10 (Table 2).

When comparing the mean individual catch rates of snapper, King George whiting and flathead for the survey period with 2008–10 (Table 2):

- There was a statistically significant decrease for flathead in PPB as a whole and in the Bellarine region, with no significant change detected in the Melbourne and Mornington regions
- There were no statistically significantly differences for snapper or King George whiting in any region or in PPB as a whole.

The decrease in flathead catch rates in PPB as a whole and in the Bellarine region were based on a small number of interviews and survey days. Flathead were targeted by anglers during 3 of 10 survey days undertaken in the Bellarine region (5 interviews) and during 12 of the 30 survey days undertaken in PPB as a whole (21 interviews). More definitive data is provided during the January–April and October–December periods.

Catch length composition

The length-frequency distributions of snapper, King George whiting and flathead for May–September 2008–10 and 2011 are shown in Figures 3–5, respectively.

The length frequency distribution for snapper and King George whiting during May–September 2011 was significantly different when compared with May–September 2008–10.

Few snapper (56) and King George whiting (71) were caught and measured during the May–September period. Comparisons between length distributions are more meaningful during peak fishing periods when sample sizes are larger.

A summary of length (TL)-frequency distributions of snapper, King George whiting and flathead during May–September 2011 and 2008–10 are shown in Table 3.

Table 1. On-site survey sample days required, undertaken and used for analysis in each region of PPB for May–September 2011.

		Region			
Survey period	**Sampling days**	**Melbourne**	**Mornington**	**Bellarine**	**Total**
May–September 2011	**Required#**	**10**	**10**	**10**	**30**
	Undertaken	10	10	10	30
	Used for analysis	10	10	10	30

*Details of sampling days 'used for analysis' are as described in the Methods section (Appendix 1).

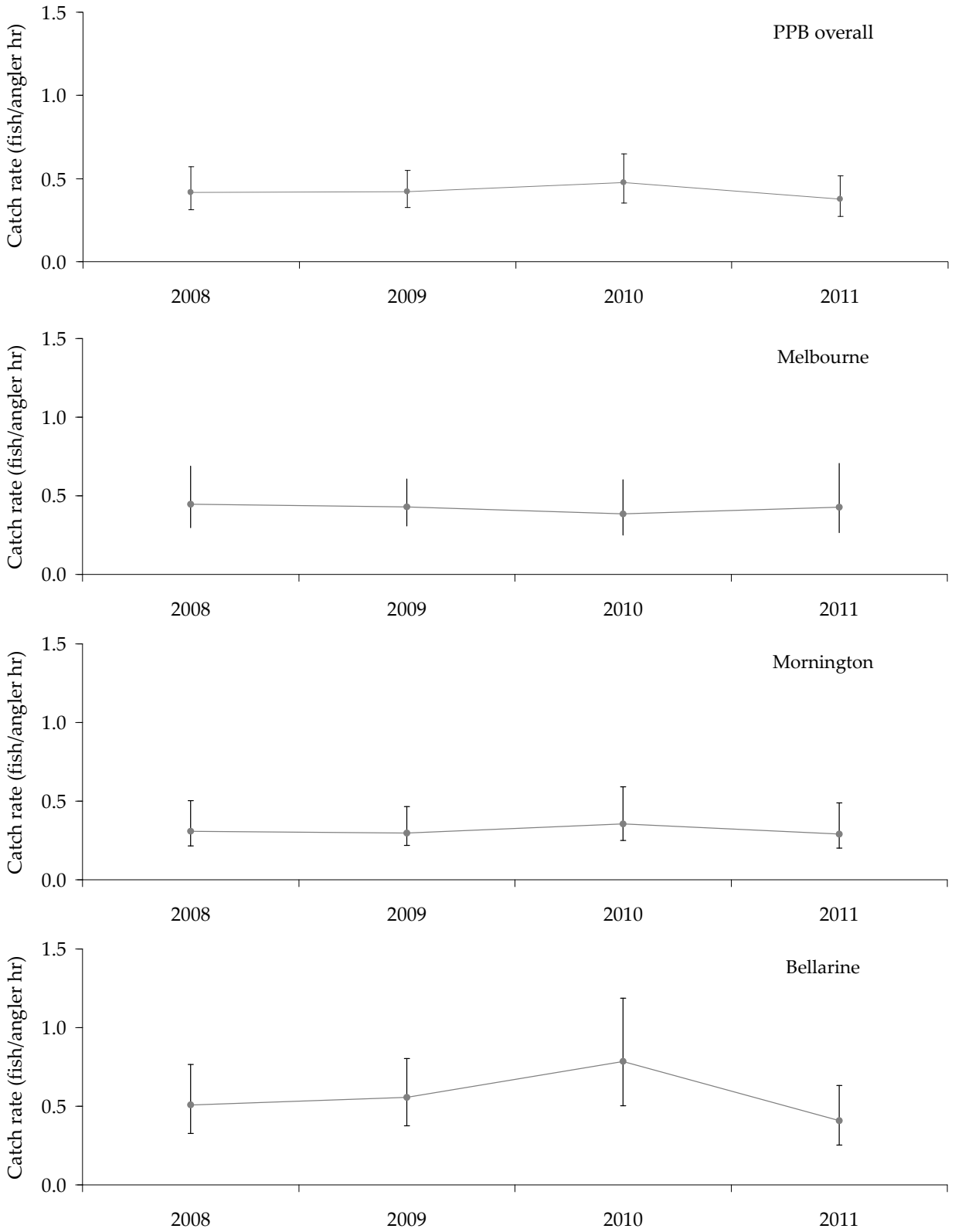

Figure 2. Estimated mean combined catch rates (± 95 % confidence limits) of snapper, King George whiting and flathead retained by boat-based anglers fishing within PPB overall and in the Melbourne, Mornington and Bellarine regions during May–September 2008–11.

Table 2. Estimated mean catch rate comparison statistic (t_o) of confidence limits from on-site surveys in May–September to compare 2011 with 2008–10 for combined and individual species and regions using bootstrap analysis (log transformed data, results significant at p<0.05, significant results in bold).

Species	Region	Estimate (t_o)	Lower 95% Confidence Interval	Upper 95% Confidence Interval
Combined	Melbourne	0.976	0.560	1.709
Combined	Mornington	0.957	0.588	1.694
Combined	Bellarine	0.767	0.448	1.312
Combined	Overall	0.894	0.661	1.246
Snapper	Melbourne	0.869	0.476	1.623
Snapper	Mornington	0.722	0.404	1.438
Snapper	Bellarine	0.953	0.536	1.801
Snapper	Overall	0.826	0.579	1.205
King George whiting	Melbourne	2.166	0.969	5.766
King George whiting	Mornington	0.920	0.347	2.524
King George whiting	Bellarine	0.726	0.365	1.407
King George whiting	Overall	1.006	0.614	1.668
Flathead	Melbourne	0.651	0.258	1.747
Flathead	Mornington	0.235	0.076	1.047
Flathead	**Bellarine**	**0.272***	**0.101**	**0.707**
Flathead	**Overall**	**0.407***	**0.215**	**0.777**

An 'estimate' greater than 1 indicates that means in 2011 are greater than means in 2008–10. If the confidence interval range includes 1, there is no statistically significant difference between periods.

*There were significant decreases in the mean catch rate of flathead in PPB as a whole and in the Bellarine region. These were based on a small number of interviews and survey days. More definitive data is provided during the January–April and October–December periods.

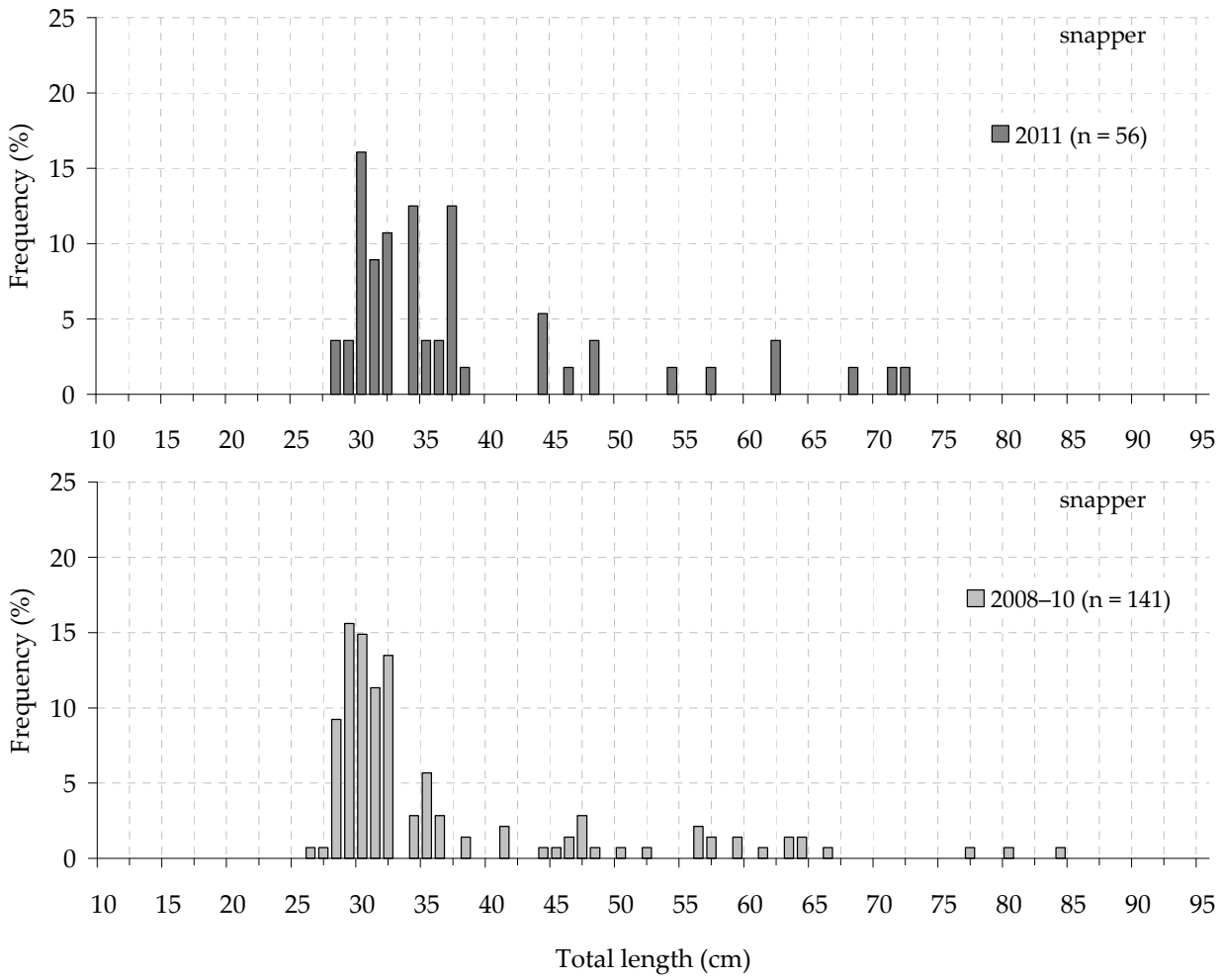

Figure 3. A comparison of the length (TL)-frequency (%) distribution of snapper retained by boat-based anglers fishing in PPB from May–September 2008–10 and 2011 (n=number of fish measured).

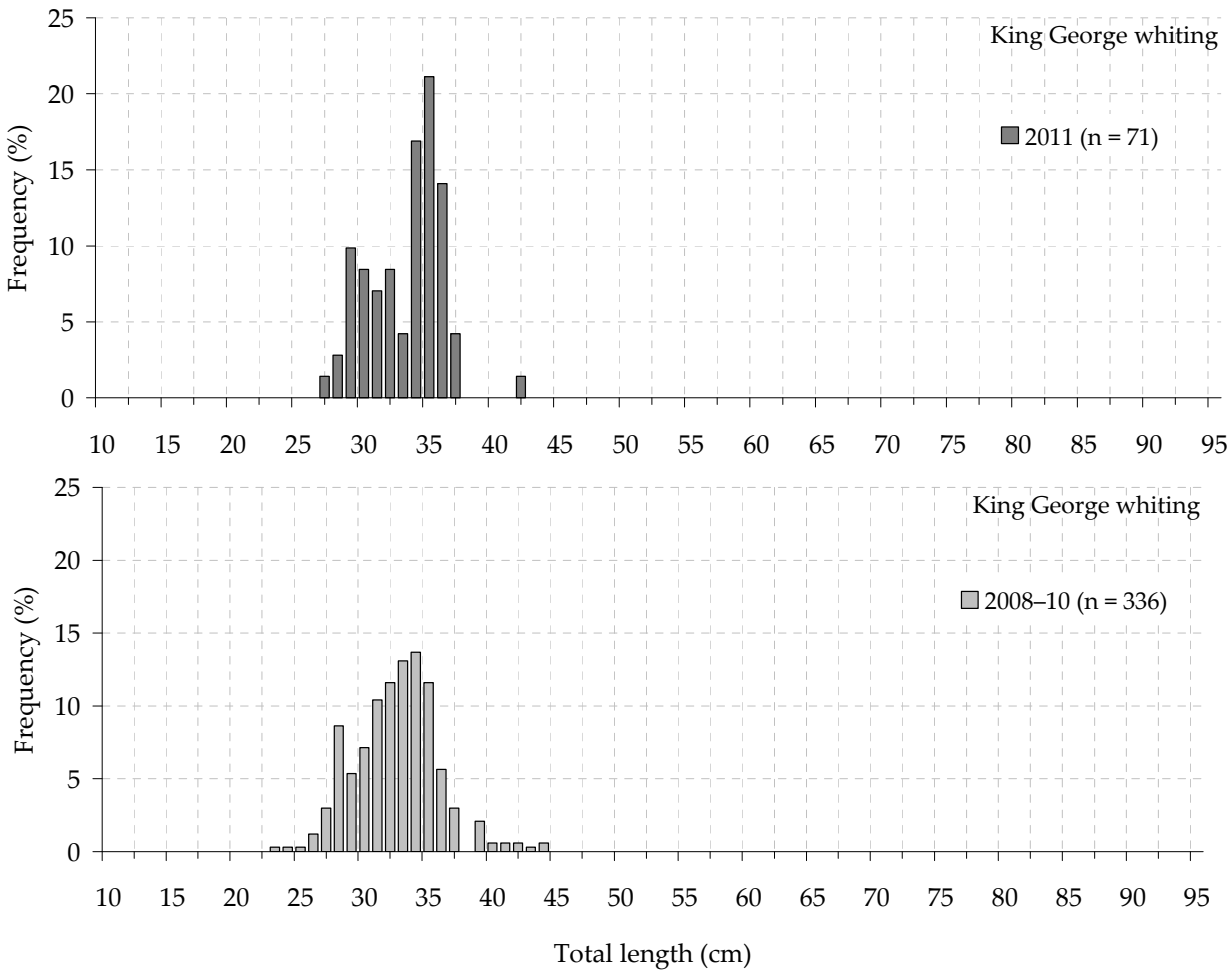

Figure 4. A comparison of the length (TL)-frequency (%) distribution of King George whiting retained by boat-based anglers fishing in PPB from May–September 2008–10 and 2011 (n=number of fish measured).

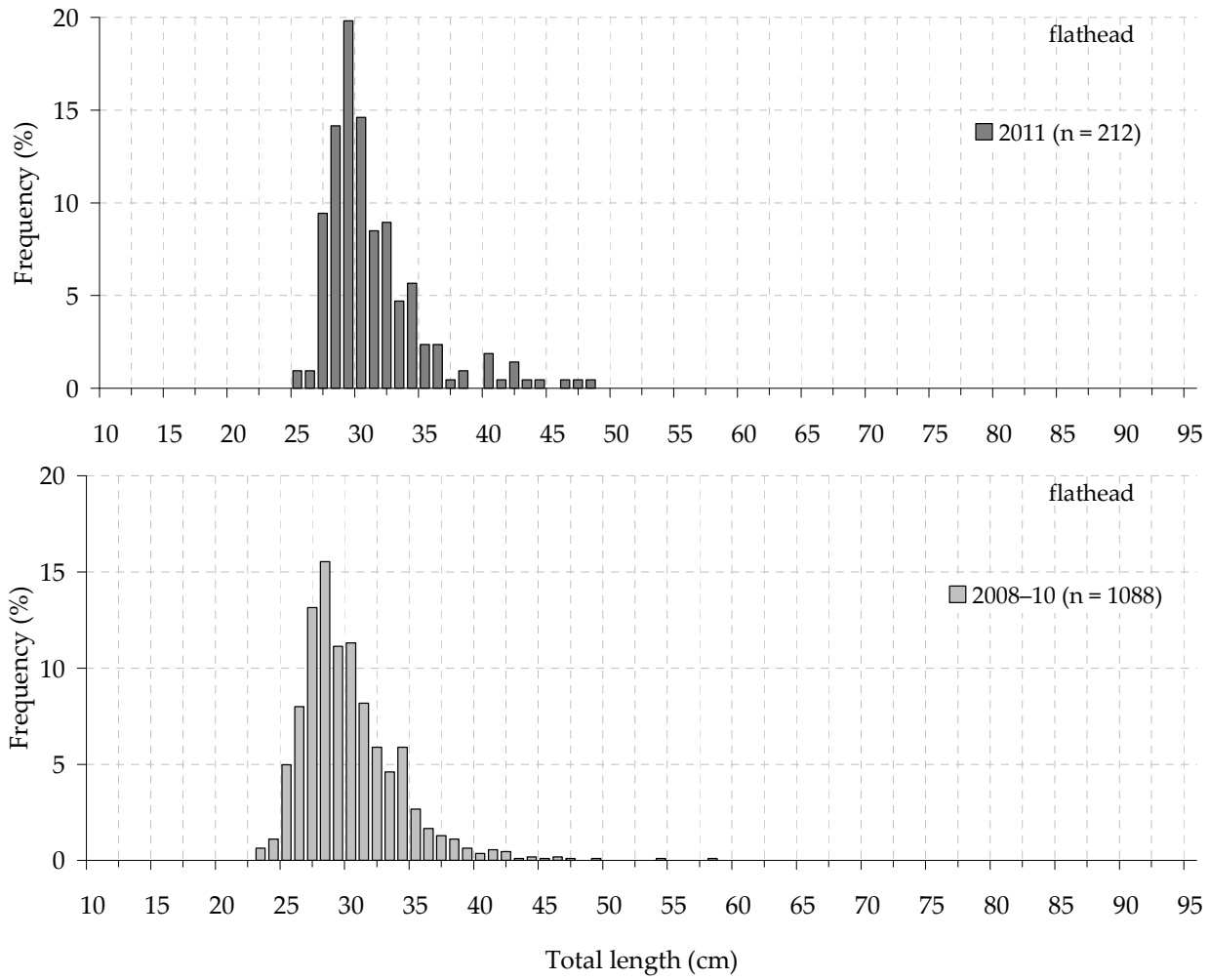

Figure 5. A comparison of the length (TL)-frequency (%) distribution of flathead (all species) retained by boat-based anglers fishing in PPB from May–September 2008–10 and 2011 (n=number of fish measured).

Table 3. Summary of length (TL)-frequency distributions from on-site surveys in May–September 2008–10 and 2011.

	Year	Minimum (cm)	Maximum (cm)	Mode# (cm)	Proportions (%)		
Snapper					<LML (28 cm)	28–39 cm	≥40 cm
On-site survey	2008–10	26	84	29	1.42	77.30	21.28
	2011	28	72	30	–	76.79	23.21
King George whiting					<LML (27 cm)	27–39 cm	≥40 cm
On-site survey	2008–10	23	44	34	2.08	95.24	2.68
	2011	27	42	35	–	98.59	1.41
Flathead					<LML (27 cm)	27–39 cm	≥40 cm
On-site survey	2008–10	23	58	28	14.71	83.00	2.30
	2011	25	48	29	1.89	91.98	6.13

Appendix 3

Raw data

Data sets have been provided with this report electronically as a MS Excel spreadsheet (Fish3_P11.xls), including two worksheets:

- On-site_catch_P11
- On-site_length_P11

Metadata are included in the above file as additional worksheets. There are no missing data.