Summary of the west coast rock lobster recreational fishery estimates

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Period 1991/92 – 2000/2001

The telephone surveys during this period were conducted by Decision Surveys International. Note no surveys were conducted in the 1995/96 and 1999/2000 seasons. Each season was broken into two-week survey stages. The number of stages, number of interviews per stage, and total number of interviews is as follows:

	Number of stages	Number of interviews per stage	Total number of interviews
1991/92	7	100	700
1992/93	17	70	1190
1993/94	14	70	980
1994/95	10	70	700
1996/97	12	70	840
1997/98	12	90	1080
1998/99	11	100	1100
2000/01	10	100	1000

Calculation of total recreational catch

Total volume per stage	= number of permits sold x ave # lobster removed per person per fortnight
Thus,	
Total volume per stage	= (# permits x total # lobsters removed by interviewees for that stage)/# of interviewees in the sample for that stage

The total catch is then simple the addition of the catches over all the stages.

Estimate of variance associated with the total recreational catch estimate
The total recreational catch estimate is provided with the 95% confidence level (see Table 1). The method used to provide this CI is not provided.

Period 2001/02

This telephone survey as conducted by Lara Atkinson of Anchor Environmental Consultants CC, Department of Zoology, UCT.

The season was broken down into six interview stages. A total of 1500 interviews were conducted. Stages 2-6 had 184 interviews conducted, and 580 interviews were conducted for stage 1.

Calculation of total recreational catch

Total volume per stage = (Adjusted number of permits sold x Total # of rock lobster removed for that stage)/# of interviewees sampled for that stage

where adjusted number of permits sold takes into the account that some for the fact that some permit holders may have purchased their permit at the start of the stage and had more time available to fish. The method employed was as follows:

Stage 1:
Dates for interviews 31 Jan-10 Feb; interview relating to period 22 Nov-31 Jan

$\quad$ # Permit sales for Oct (280) + Nov (20 829) $\quad$ = 21109

$\quad + \dfrac{3}{4}$ #permits sales for Dec (24 941) $\quad$ = 18705.75

$\quad + \dfrac{1}{4}$ # permits sales for Jan (5190) $\quad$ = 1297.5

Stage 1 adjusted permits soled $\quad$ = 41112.25

Stage 2:
Dates for interviews 11 Feb-13 Feb; interview relating to period 2-3 Feb and 9-10 Feb

$\quad$ Total permits sold during Stage 1 $\quad$ = 50283

$\quad + \dfrac{1}{2}$ difference of permits sold between Stage 2 and Stage 1 (50960-50283)/2

$\qquad\qquad\qquad\qquad\qquad\qquad\qquad$ = 338.5

$\quad$ Stage two adjusted permits sold $\quad$ =50621.5

Figures for the other stages were adjusted in a similar manner.

Estimate of variance associated with the total recreational catch estimate
The total recreational catch estimate is provided with the 95% confidence level (see Table 1). The method used to provide this CI is not provided.

Period 2003/04 – 2007/08

For the period covering the 2003/04 – 2007/08 seasons, a telephonic survey was carried out by Enviro-Fish Africa (Pty) Ltd. The method used to estimate the recreational catch for each season is as follows.

The recreational catch season was broken up into two-week periods (there would thus be between 7-11 survey periods each season, depending on the season length). About 150 phone interviews were conducted for each sample period. The total number of interviews each season is:

$\qquad$ 2003/04 = 1502
$\qquad$ 2004/05 = 1054
$\qquad$ 2005/06 = 1644
$\qquad$ 2006/07 = 1498
$\qquad$ 2007/08 = 1336

During an interview, the person was asked about their lobster fishing in the previous two-week period. The person was asked how many days they fished, and the total number of lobsters caught during this period. Other questions were also asked e.g. from what area did most lobsters come from.

Calculation of total recreational catch

$$C_{total} = cpue \ x \ E_{total} \tag{1}$$

where

C_{total} is the total recreational catch in numbers

$cpue$ is mean CPUE (lobsters/fisher-day) over all four areal zones

E_{total} is the total effort (fisher-days)

C_{total} in numbers is converted to C_{total} in kgs by multiplying numbers by 0.345kg.

Estimation of CPUE

Each person was asked how many lobsters they caught in the season (C) and how many fisher-days they used (E). A *cpue* for each person was then calculated as follows:

$$cpue = \frac{C}{E} \tag{2}$$

These cpue values were averaged for each of four Zones (Zones A, B, C and D). A mean value across all four zones was then used in equation (1).

Estimation of fishing effort E_{total}

The estimation of fishing effort takes into account the increase in effort that occurs throughout the season – as recreational licences are sold throughout the fishing season, the number of fishers entering the fishery will increase as the season progresses. As such, the fishing effort is calculated individually for each sample period using the following equation:

$$E_i = \left(\frac{e}{fs}\right) P \tag{3}$$

where

E_i is the effort (in days) during survey period *i*,

e is the effort recorded by the interviewees during the sample period (in days),

fs is the number of fishers interviewed during the survey period, and

P is the number of permits that have been issued at that point in the season.

P is calculated as:

$$P = p_i + \left(\frac{i}{d_m} \ x \ d_s\right) \tag{4}$$

where

p_i is the number of permits that have previously been issued during the season,

i is the number of permits issued in the month,

d_m is the days in the month, and

d_s is the number of days that are within the survey period.

Total fishing effort is then calculated as:

$$E_{total} = \sum_{i=1}^{n=10} E_i \tag{5}$$

where

E_{total} is the total seasonal fishing effort, and

E_i is the fishing effort during the two weekly sampling periods.

<u>Estimate of variance associated with the total recreational catch estimate</u>

For each season, the analysts provide the mean for all respondents from the final sample period of how many lobsters they had caught over the whole season. The SD of this figure is provided for the last two seasons only, where for both seasons the number of interviews in the last stage was 149.

       2003/04 = 11.54
       2004/05 = 12.04
       2005/06 = 9.8
       2006/07 = 28 $\pm$ 23.8
       2007/08 = 20.1 $\pm$ 15.5

Obtaining a standard error of the mean based on the number of interviews for the last two seasons suggests CVs for the total takes per respondent and hence the estimate of total recreational catch to be:

2006/07 = 0.104
2007/08 = 0.094.

Summary Plots
Figures 1-3 provide plots of the number of permits sold in relation to the season length, and total recreational catches estimates in relation to permit sales and season length. There are no obvious trends in any of these plots.

Discussion
A key component of results from these surveys is the precision with which the total take is estimated.

For the earlier period of surveys this averages 7.5%, but no explanation of the method used is given in the reports. For the last two surveys this average is similar at 9.9%. What however concerns is that the earlier analyses apparently use all the data for this computation whereas the later use only data from the last set of interviews based on a much smaller sample. Why then are the CVs so similar?

Table 1: Summary of recreational catch estimates. Values in square parentheses show the 95% CI where available; the associated CV is given in round parentheses.

Season	Analyst	Total Catch estimate (kgs)	Total Catch estimate (#s)	Mean *cpue* (lobsters/fisher/ day)	E_{total} (fisher days)	Total number of fishing days	Total number of permits sold
1991/92	DSI	**159 229/205 931**	419 286/541 923			5 months (150 days)	44 469
1992/93	DSI	**469 257 (0.098) [379 550; 558 964]**	1360 166 (0.098) 1100 146; 1620 186]			8 months (240 days)	59 202
1993/94	DSI	**391 137 (0.058) [346 436; 435 839]**	1133 731 (0.058_ [1004 161; 1263 301]			6.5 months (195 days)	57 590
1994/95	DSI	**336 017 (0.070) [289 719; 382 316]**	973 963 (0.070) [839 764; 1018 163]			6.5 months (195 days)	54 160
1996/97	DSI	**495 617 (0.091) [407 434; 583 800]**	1436 571 (0.091) [1180 968; 1692 173]			5.5 months (165 days)	65 617
1997/98	DSI	**339 560 (0.066) [295 552; 383 568]**	984 233 (0.066) [856 673; 1111 792]			5.5 months (165 days)	44 383
1998/99	DSI	**258 264 (0.071) [222 543; 293 983]**	748 591 (0.071) [645 054; 852 127]			5.5 months (165 days)	39 982
2000/01	DSI	**314 169 (0.071) [270 679; 357 660]**	910 636 (0.071) [784 577; 1036 695]			146	47 063
2001/02	Anchor	**336 964 (0.115) [261 088; 412 841]**	976 708 (0.115) [756 776; 1196 640]			91	53 704
2003/04	Enviro	**135 053**	391 459	3.03	129 409	78	55 077*
2004/05	Enviro	**156 408**	453 358	3.17	143 015	107	28 902
2005/06	Enviro	**275 063**	797 285	3.07	259 702	99	47 325
2006/07	Enviro	**162 092**	469 833	3.38	139 004	108	34 245
2007/08	Enviro	**170 676**	494 713	3.17	156 061	80	42 177

*Estimate based on previous three years – this value seems unlikely however, as it is bigger than all three previous seasons total number of permits sold?
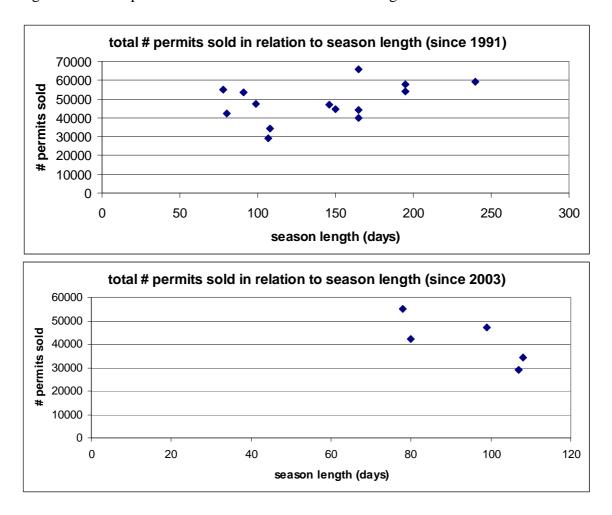
Figure 1: Total # permits sold in relation to the season length.

total # permits sold in relation to season length (since 1991)

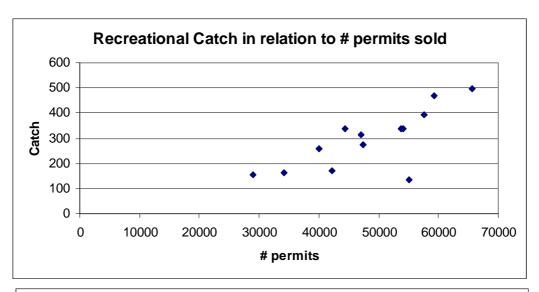**total # permits sold in relation to season length (since 2003)**
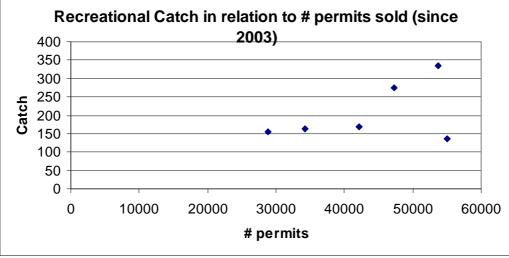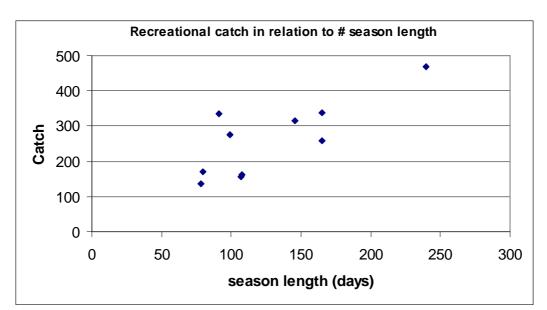
Figure 2: The recreational catch in relation to # permits sold

Figure 3: Recreational catch in relation to season length.

Recreational catch in relation to # season length

Recreational catch in relation to # season length (since 2003)