Revised abalone confiscation estimates and CPUPE for Zones A-D in 2007

Éva Plagányi
Department of Maths and Applied Maths, University of Cape Town

SUMMARY

Poaching confiscation data have been updated using all data currently available up until the end of May 2007. The data have been reworked in terms of a standard Model year *y* that is taken to run from October of year *y*-1 to September of year *y*. This was necessary for reasons of internal consistency in the assessment process which uses a Model year as thus defined.

Poaching trend assumptions

The poaching confiscation data are used to obtain base-case estimates of the trend in poaching over time in each of Zones A-D. A better measure of changes in the level of poaching in a Zone is not confiscation *per se*, but the Confiscations Per Unit of Policing Effort (CPUPE). Table 1 shows the poaching trend based only on the location-known zonal confiscation data. As in previous years, a linear increase in poaching (from zero in 1990 increasing up to the 1994 level) is assumed for Zone C and for Zone D (from zero in 1991 increasing up to the 1994 level) because confiscation data are available only from 1994 onwards. Poaching is thought to have started earlier in these Zones than in Zones A and B.

Computations take account of confiscated abalone which may have been taken from the Eastern Cape and from Dyer Island. As previously agreed by the WG, the Zone D data (number of abalone confiscated) for Model years 2001 to 2003 inclusive have been halved to account for the increase in poaching confiscations from Betty's Bay, a marine reserve area located within Zone D. Given that the level of poaching from the reserve in subsequent years is thought to be less than this, for Model years 2004 - 2007 it is assumed that 0.20 of the Zone D confiscations are taken from Betty's Bay.

When considering poached abalone that is likely to have come from each of Zones A and B, rather than from, Dyer Island, the assumption was used that there are approximately equal amounts poached from each of Zones A, B and Dyer Island: the recorded confiscation amounts for each of Zones A and B are thus reduced by one-third each for all years from 2001.

Poaching data for Model year 2007 are currently only available for 8 months (up until the end of May) and hence (as with last year's assessment) have been linearly extrapolated to make them comparable to the estimates for the previous years. Note that the data suggest that the number of abalone confiscated from Zone A is likely to reach a peak in Model year 2007.

The policing efficiency levels shown in Table 2 represent the "best guess" of the increase in policing efficiency based on knowledge of police operations (as previously advised by Marcel Kroese, MCM). Note that, for example, a policing level factor of 2 implies a 100% increase in policing efficiency so that the corresponding confiscation amounts are multiplied by a factor of 0.5 to make them comparable to the other values.

The *recommended* revised poaching trends for use as inputs (in terms of relative numbers poached) into the 2007 model runs are summarised in Table 2 and Fig. 1. Fig. 1 also shows a

3-point moving average superimposed on each plot. These smoothed plots are used as inputs to the model in preference to the unsmoothed CPUPE trends.

Assumptions regarding numbers confiscated

There have recently been very large confiscations from the Eastern Cape (Port Elizabeth = PE in particular). Data were therefore reworked to take account of this. On average, about 45% of the "Undefined zone category" is confiscated beyond the SW Cape boarders (based on manually sorting through the database and ascribing entries in the Undefined zone category to "SW Cape" or "Other" depending on the confiscation location). A certain amount of the remaining 55% of the Undefined zone category may have been taken from PE rather than from the SW Cape. A preliminary rough estimate of this amount was computed based on the proportion of the total countrywide number of confiscations that is known to have been taken from PE compared to from the SW Cape. The number of abalone in the Undefined zone category was then reduced accordingly (see Table 3). Ultimately this has an effect on the minimum number of abalone assumed taken from each zone in each year (Table 4).

The total confiscations in the Unknown category are assumed to derive from Zones A-D in the same proportions as in Table 1. The total number of confiscations per Zone per Model year is then determined as the sum of the Zonal estimate and the "Undefined zone category" estimate.

Table 4 shows the total number of abalone confiscated (after adjusting for the Zone D effect and scaling the 2007 values linearly upwards) per Zone per Model year. The Table shows the TOTAL number of abalone confiscations per Zone if the Zone "Unknown" confiscation component is assumed allocated to the various Zones in the same proportion as the relative number of confiscations per Zone. The values shown in Table 4 are also used as a diagnostic check in scenarios in which the poaching level is estimated within the model: they represent the minimum realistic poaching estimates (i.e. the actual amount poached must be greater than the corresponding confiscation estimates).

Acknowledgements

Table 1. Summary of "Zone-known" confiscations for each of Zones A-D. The data include adjustments to account for takes from Betty's Bay and Dyer Island. These data are used to compute the poaching trend scenarios given in the next table.

Model Year	Zone A	Zone B	Zone C	Zone D
1994	0	415	9852	1081
1995	0	2633	15145	2654
1996	0	1502	12658	1560
1997	5843	4470	15961	2969
1998	24673	7663	10674	3521
1999	13470	3656	6843	2393
2000	8952	17650	11962	4939
2001	6132	25915	4652	4266
2002	30344	62242	9549	6996
2003	19272	23134	5109	5830
2004	37478	13189	6329	2678
2005	22188	10411	2973	2794
2006	20225	12743	2817	3478
2007	41224	6139	1787	1587
Yr when Poaching at a maximum	2007	2002	1997	2002

Table 2. Summary of revised 2007 reference poaching trend scenarios for each of the abalone fishery Zones A-D. Note that the proportions in each column represent the poaching intensity in that Zone relative to the maximum poaching level observed for that Zone. The "policing efficiency levels" shown in the last two columns were proposed by the Abalone Working Group and have been used to derive modified time series representing confiscations-per-unit-policing. For all Zones A-D, all years from 1980 to 1993 are set to 10% of the 1997 value; and for Zone A , years from 1994 to 1996 are similarly set to 10% of the 1997 Zone A value. Other model sensitivities will most likely also be tested. Note that for Zone C, the same pattern of poaching is assumed to apply to subareas CNP and CP. Note that these computations are still preliminary as the *recommendation that the 2006 policing efficiency level be taken as the same as the 2005 level still needs to be adopted by the WG.*

	Zone A	Zone B	Zone C	Zone D	Policing efficiency level
Pre-1980	0	0	0	0	
1980-1989	0.013	0.008	0.096	0.048	
1990	0.013	0.008	0.096	0.048	
1991	0.013	0.008	0.096	0.048	
1992	0.013	0.008	0.096	0.048	
1993	0.013	0.008	0.096	0.048	
1994	0.013	0.008	0.651	0.193	1
1995	0.013	0.053	1	0.474	1
1996	0.013	0.030	0.836	0.279	1
1997	0.129	0.082	0.958	0.482	1.1
1998	0.544	0.140	0.641	0.572	1.1
1999	0.261	0.059	0.361	0.342	1.25
2000	0.174	0.284	0.632	0.706	1.25
2001	0.119	0.416	0.246	0.610	1.25
2002	0.589	1.000	0.504	1.000	1.25
2003	0.374	0.372	0.270	0.833	1.25
2004	0.909	0.265	0.418	0.478	1
2005	0.538	0.209	0.196	0.499	1
2006	0.491	0.256	0.186	0.621	1
2007	1.000	0.123	0.118	0.284	1

Table 3. Summary of the total number of abalone confiscated per Zones A-D and rest of South Africa per standard Model year *y* that is taken to run from October of year *y*-1 to September of year *y*. Columns 2-5 show the total number of confiscations known to have been poached from the zone as shown. Column 6 shows the total number of confiscations that are from "undefined zones" within the SW Cape whereas Column 7 shown the balance of the Undefined zone category that are confiscated outside the SW Cape borders. The total shown in Column 8 includes confiscations from the Eastern Cape (Port Elizabeth = PE in particular), and hence is the total countrywide. Of the grand total shown in Column 8, the proportions recorded as taken from the SW Cape (Zones A-D combined) and from PE are shown in Columns 9 and 10 respectively. Based on the ratio of these two proportions, the proportion of the Undefined category in Column 7 that is assumed to have been poached from Zones A-D (Column 11) is computed and used to estimate the total number of confiscated abalone from the Undefined zones category that is assumed to have been taken from Zones A-D (Column 12).

Column:	2	3	4	5	6	7	8	9	10	11	12
Model Year	Zone A	Zone B	Zone C	Zone D	Undefined zone within SW Cape category	Undefined category confiscated beyond SW Cape borders	TOTAL incl PE*	Zones A-D as % of TOTAL	PE as % of TOTAL	% Undefined (in Column 7) from A-D	No. of abalone from "Undefined zones" category assumed from A-D (Col. 11*Col. 7 + Col. 6)
1994	0	415	9852	1081	0	0					
1995	0	2633	15145	2654	30553	24998					55551
1996	0	1502	12658	1560	30414	24884	71594	0.64	0.01	0.99	54992
1997	5843	4470	15961	2969	16792	13739	66419	0.69	0.10	0.87	28798
1998	24673	7663	10674	3521	50596	41397	151399	0.64	0.09	0.88	87148
1999	13470	3656	6843	2393	24337	19912	85680	0.59	0.18	0.77	39686
2000	8952	17650	11962	4939	99821	81672	254762	0.56	0.12	0.83	167448
2001	6132	25915	4652	4266	120403	98512	289569	0.56	0.10	0.84	203607
2002	30344	62242	9549	6996	337860	276431	819481	0.55	0.12	0.82	565394
2003	19272	23134	5109	5830	316400	258873	733688	0.50	0.14	0.78	517988
2004	37478	13189	6329	2678	307096	251261	824041	0.45	0.25	0.64	467987
2005	22188	10411	2973	2794	247671	202640	801109	0.36	0.39	0.48	344522
2006	20225	12743	2817	3478	386827	316495	884030	0.48	0.16	0.75	624443
2007 (extrapolated)	41224	6139	1787	1587	*581821*	*476036*	*1319754*	*0.48*	*0.16*	*0.75*	*938718*

[a] Single sample of 174 confiscated abalone excluded from analysis due to small sample size.

$ In this preliminary analysis, confiscation data all correspond to Model years, except for the PE confiscations which were only available at the time of analysis per calendar year. This is considered adequate for current purposes, especially considering that the PE as % of TOTAL values are similar across years.

Table 4. Total confiscation estimates per Zone after adding contribution from "Undefined zone" category as shown in Column 12 of Table 1. As explained in the text, confiscations per zone have been adjusted to account for takes from Betty's Bay and Dyer Island. Values in this table are used to set the minimum number of poached animals that must have been taken from a particular zone in a particular year. See also Fig. 1.

| Model year	Zone A	Zone B	Zone C	Zone D	Total
1994	0	415	9 852	1 081	11 348
1995	0	9 792	56 322	9 870	75 983
1996	0	6 786	57 185	7 048	71 019
1997	11 943	9 137	32 625	6 069	59 774
1998	73 452	22 813	31 777	10 482	138 524
1999	36 079	9 793	18 329	6 410	70 611
2000	46 299	91 285	61 867	25 544	224 996
2001	28 134	118 893	21 342	19 572	187 941
2002	145 595	298 649	45 818	33 568	523 629
2003	144267	173172	38245	43642	399325
2004	243752	85781	41163	17420	388116
2005	221429	103901	29670	27888	382888
2006	341888	215414	47619	58785	663706
2007	803944	119722	34841	30947	989454
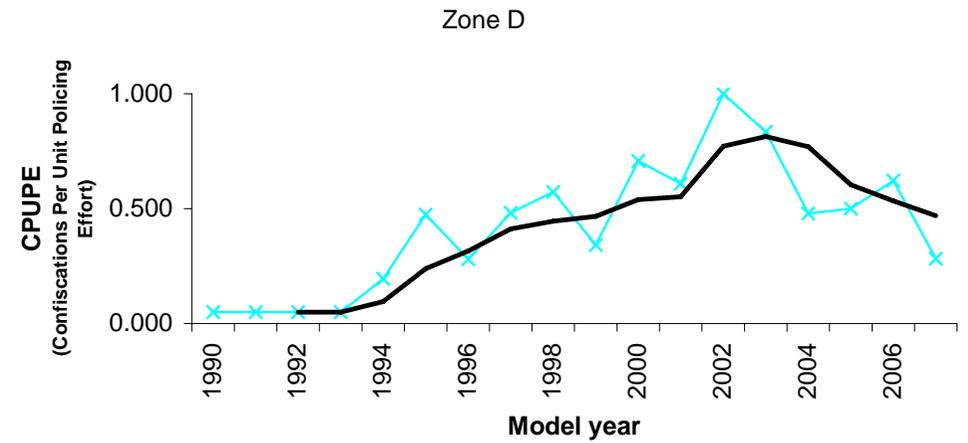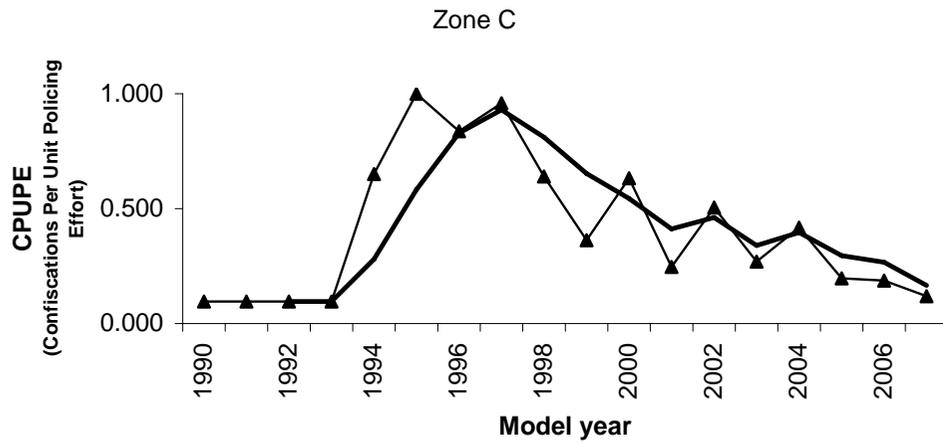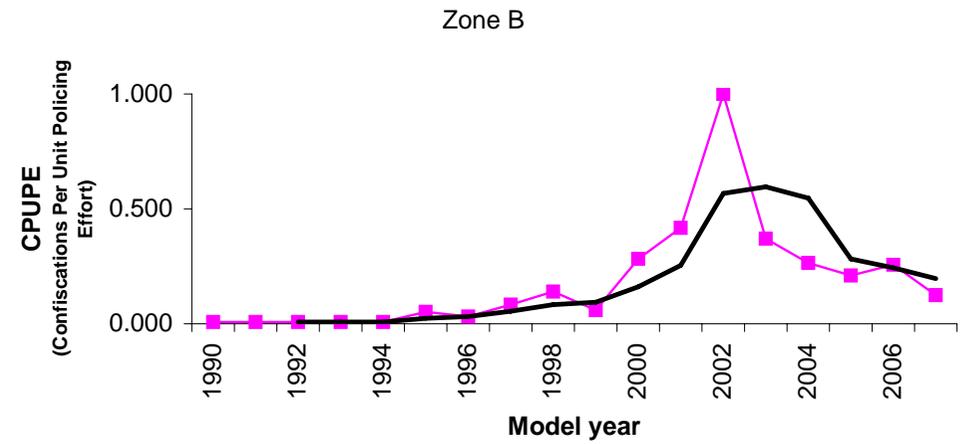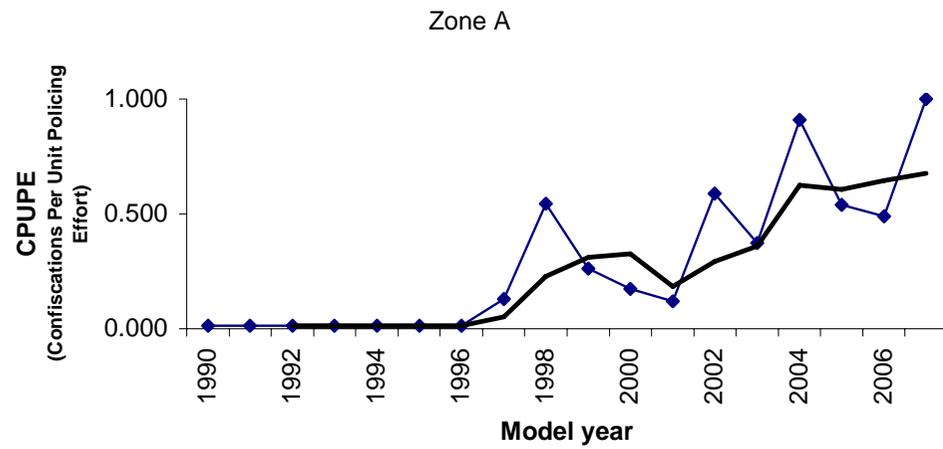
Fig. 1. Plots of CPUPE for each of Zones A-D. The solid black line shows a 3-point moving average.