

Updated analyses of the Fisheries Independent Monitoring Survey data of the Rock Lobster resource of South Africa to include the 2013/14 season

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Abstract

Analyses of FIMS data are updated to include data for the 2013/14 season. Results show a drop in the last season's index for the FIMS relative abundance indices in the Cape Point and Saldanha Bay Zones and an increase for those of Dassen Island and Lambert's Bay. There is a large decrease for Cape Point from the previous season, although that estimate had a large standard error, and the present estimate is still slightly higher than estimates since 1999. Dassen Island shows a significant increase in the last season's index compared to the previous season and is larger than the estimates for the last four years. Although the index for Lambert's Bay is higher than those since 1997, there is a very large standard error associated with this estimate. The percentage of females in the last season has increased in Saldanha Bay and decreased in Dassen Island, and is slightly down for Cape Point and Lambert's Bay.

Introduction

In this paper the FIMS relative abundance indices for rock lobster, the FIMS length composition and the percentage of females reported in Brandão and Butterworth (2013) are updated to include FIMS data for the 2013/14 season.

Data and Methodology

Data from the FIMS surveys carried out over the period 1992/93 to 2013/14 are available for analysis.

Relative Abundance Indices by Zone

The overall CPUE index for each Zone (Dassen Island, Lambert's Bay, Saldanha Bay and Cape Point) is the combination of the weighted mean CPUE (as a proportion of the total area surveyed) for each stratum (where stratum here reflects whether a station in a particular Zone is within the 100 m contour (shallow),

within the 100 to 200 m contour (deep, applicable to the Cape Point only), or if it lies within a “Hotspot”). The weighted mean CPUE for each stratum in a particular Zone is given by the average of the weighted mean CPUE for each leg in that stratum. A full description of the methodology of the FIMS analysis to obtain relative abundance indices is given in Brandão and Butterworth (2009).

For each Zone, except for Lambert’s Bay, CPUE indices were calculated considering each individual Hotspot stratum in that Zone. For Lambert’s Bay this posed a problem when calculating standard errors of CPUE estimates as most Hotspot strata in this Zone have only one station surveyed on a particular leg and thus no standard deviation can be calculated. Therefore, for Lambert’s Bay, it was previously decided to consider all Hotspot strata as one combined stratum. It is more appropriate to use the total area of all Hotspot strata as a weight when combining all Hotspot strata into one stratum as is now the case for Lambert’s Bay.

In the Cape Point Zone, for the 1997/98 and the 2005/06 seasons, there was only one station in one of the Hotspot strata in one of the legs. The standard deviation ($\sigma_{y,z,t}$) for these two records were estimated as the average of the observed (and computable) standard deviations or CVs for that stratum. The choice between using the average of standard deviations or the average of the CVs was based on which measure was steadier over the years.

The 1999/00 FIMS data point (for Cape Point) is based on only a single leg (leg 2) as the first leg was not conducted. In the 2011/12 season for Cape Point there were no observations for the second leg of the Deep and one of the Hotspot strata. Therefore for these strata, means and standard deviations are based on a single leg.

Length composition and percentage of females

Brandão and Butterworth (2010) presented a method for obtaining length distributions whereby proportions are weighted and adjusted for small sample sizes. This method provides more appropriate length distributions in that the variation in the effort across stations, the variation in the area that each station represents and the effect of small sample sizes are all taken into account. They also presented a method to obtain annual percentage numbers of females that are weighted by area and adjusted for small sample sizes. These methods have been used in the analyses presented in this paper to obtain length distributions and annual percentages of females for rock lobster for each Zone.

Results

Table 1 reports the FIMS CPUE indices for each individual Zone for rock lobsters measuring more than 60 cm carapace length, together with their standard errors. Figure 1 shows these indices together with 95% confidence intervals, calculated given an assumption of distributional lognormality. Results show a drop in the last season's index for the FIMS relative abundance indices in the Cape Point and Saldanha Bay Zones and an increase for those of Dassen Island and Lambert's Bay. There is a large decrease for Cape Point from the previous season, although that estimate had a large standard error, and the present estimate is still slightly higher than estimates since 1999. A noticeable feature is a fairly steady downward trend for Dassen Island since 2002, however the estimate for the 2013/14 is significantly higher than the estimate for the previous season and is higher than the estimates for the last four seasons. Although the index for Lambert's Bay is higher than those since 1997, there is a very large standard error associated with this estimate.

Tables 2–5 give the length distributions of rock lobsters for each Zone, with Tables (a) giving those for males, while Tables (b) give those for female rock lobsters. Figures 2–5 show the length distributions of rock lobsters for males and females for each Zone.

Table 6 and Figure 6 give the estimates of the annual percentage female rock lobsters for each Zone. The percentage of females in the last season has increased in Saldanha Bay and decreased in Dassen Island, and is slightly down for Cape Point and Lambert's Bay.

Reference

- Brandão, A. and Butterworth, D.S. 2009. Re-analysis of the Fisheries Independent Monitoring Survey of the rock lobster resource of South Africa. Marine and Coastal Management Document: MCM/2009/AUG/SWG-WCRL/11b.
- Brandão, A. and Butterworth, D.S. 2010. FIMS length composition and percentage of females of the west coast rock lobster resource of South Africa. Department of Agriculture, Forestry and Fisheries Document: FISHERIES/2010/OCT/SWG-WCRL/30.
- Brandão, A. and Butterworth, D.S. 2013. Analyses of the Fisheries Independent Monitoring Survey data of the rock lobster resource of South Africa to include the 2012/13 season. Department of Agriculture, Forestry and Fisheries Document: FISHERIES/2013/AUG/SWG-WCRL/22.

Table 1. FIMS CPUE series for each individual Zone and their corresponding standard errors.

Year	Zone			
	Cape Point	Dassen Island	Saldanha Bay	Lambert's Bay
1992/93	140.75 (17.30)	24.89 (4.37)	2.72 (0.87)	3.04 (1.22)
1993/94	128.18 (13.47)	13.16 (3.44)	0.61 (0.67)	0.17 (0.06)
1994/95	112.43 (20.97)	6.06 (1.73)	0.82 (0.44)	0.19 (0.07)
1995/96	120.07 (17.61)	2.54 (1.20)	0.18 (0.06)	4.23 (1.04)
1996/97	75.50 (9.572)	9.30 (2.73)	0.65 (0.47)	9.16 (2.14)
1997/98	132.26 (19.17) [†]	12.84 (3.38)	0.11 (0.05)	0.09 (0.05)
1998/99	141.64 (16.32)	22.97 (4.02)	3.40 (1.00)	1.65 (0.55)
1999/00	86.60 (20.02)*			
2000/01	100.71 (16.60)	4.81 (1.12)	0.18 (0.10)	1.21 (0.18)
2001/02	105.01 (18.17)	58.66 (7.13)	0.08 (0.06)	0.18 (0.09)
2002/03	52.02 (10.43)	14.49 (2.62)	0.19 (0.17)	0.39 (0.22)
2003/04	98.67 (14.48)	35.78 (6.70)	0.28 (0.39)	0.34 (0.20)
2004/05	89.05 (12.35)	25.36 (3.94)	0.07 (0.03)	0.35 (0.24)
2005/06	62.71 (35.89) [†]	15.79 (3.97)	0.24 (0.06)	1.71 (0.72)
2006/07	79.18 (21.90)	13.96 (3.39)	0.12 (0.14)	0.24 (0.09)
2007/08	106.65 (29.10)	21.88 (4.21)	1.27 (1.34)	0.27 (0.19)
2008/09	101.43 (33.20)	9.67(1.97)	0.76 (0.31)	1.55 (0.51)
2009/10	101.02 (23.59)	5.09 (1.18)	0.71 (0.59)	0.01 (0.01)
2010/11	94.41 (18.17)	3.27 (0.92)	0.59 (0.37)	3.86 (1.39)
2011/12	105.61 (29.65)	2.89 (0.78)	2.32 (1.67)	1.23 (0.38)
2012/13	247.06 (87.33)	1.59 (0.58)	2.11 (2.48)	0.41 (0.15)
2013/14	115.58 (19.34)	6.86 (1.43)	0.38 (0.16)	6.18 (4.24)

* Based on only one leg of the survey.

† Standard error based on an estimate (see text) because only one station was sampled in a leg for a particular Hotspot.

Table 2a. Carapace length distribution (mm) of male rock lobster for Cape Point.

Year	<45	45-50	50-55	55-60	60-65	65-70	70-75	75-80	80-85	85-90	90-95	95-100	100-105	105-110	110-115	115-120	120-125	125-130	130-135	135-140
1992/93	0.000	0.000	0.002	0.014	0.113	0.251	0.226	0.182	0.117	0.065	0.021	0.007	0.002	0.001	0.000	0.000	0.000	0.000	0.000	0.000
1993/94	0.000	0.000	0.004	0.029	0.142	0.248	0.252	0.181	0.094	0.034	0.012	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1994/95	0.000	0.000	0.005	0.028	0.164	0.244	0.281	0.164	0.068	0.032	0.010	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1995/96	0.000	0.000	0.005	0.025	0.134	0.264	0.282	0.186	0.070	0.023	0.007	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1996/97	0.000	0.000	0.003	0.018	0.087	0.222	0.294	0.218	0.108	0.036	0.010	0.003	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1997/98	0.000	0.000	0.005	0.028	0.126	0.210	0.258	0.208	0.107	0.040	0.012	0.005	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1998/99	0.000	0.001	0.011	0.046	0.177	0.241	0.218	0.163	0.089	0.035	0.011	0.004	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1999/00*	0.000	0.001	0.010	0.037	0.137	0.269	0.268	0.158	0.081	0.028	0.009	0.002	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2000/01	0.000	0.000	0.002	0.022	0.096	0.206	0.293	0.201	0.104	0.049	0.019	0.006	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2001/02	0.000	0.000	0.003	0.024	0.099	0.194	0.268	0.232	0.105	0.043	0.021	0.009	0.003	0.001	0.000	0.000	0.000	0.000	0.000	0.000
2002/03	0.000	0.000	0.003	0.019	0.089	0.206	0.245	0.222	0.134	0.055	0.019	0.006	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2003/04	0.000	0.000	0.002	0.015	0.103	0.203	0.236	0.206	0.136	0.065	0.023	0.007	0.003	0.001	0.000	0.000	0.000	0.000	0.000	0.000
2004/05	0.000	0.000	0.004	0.021	0.094	0.210	0.287	0.207	0.106	0.044	0.015	0.008	0.003	0.001	0.000	0.000	0.000	0.000	0.000	0.000
2005/06	0.000	0.001	0.011	0.029	0.094	0.222	0.293	0.207	0.097	0.031	0.010	0.003	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2006/07	0.000	0.000	0.008	0.041	0.127	0.176	0.257	0.215	0.114	0.043	0.014	0.004	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2007/08	0.000	0.001	0.012	0.049	0.147	0.217	0.254	0.178	0.095	0.032	0.010	0.004	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2008/09	0.000	0.000	0.004	0.025	0.111	0.221	0.307	0.192	0.095	0.031	0.010	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2009/10	0.000	0.000	0.004	0.018	0.101	0.175	0.310	0.201	0.121	0.046	0.018	0.004	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2010/11	0.000	0.000	0.004	0.021	0.143	0.169	0.324	0.168	0.114	0.035	0.016	0.005	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2011/12	0.000	0.000	0.009	0.025	0.127	0.141	0.300	0.167	0.150	0.041	0.032	0.005	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2012/13	0.000	0.000	0.017	0.017	0.219	0.117	0.294	0.100	0.163	0.029	0.027	0.011	0.004	0.001	0.000	0.000	0.000	0.000	0.000	0.000
2013/14	0.002	0.005	0.082	0.104	0.307	0.191	0.176	0.064	0.048	0.015	0.006	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

* Based on only one leg of the survey.

Table 2b. Carapace length distribution (mm) of female rock lobster for Cape Point.

Year	<45	45-50	50-55	55-60	60-65	65-70	70-75	75-80	80-85	85-90	90-95	95-100	100-105	105-110	110-115	115-120	120-125	125-130	130-135	135-140
1992/93	0.000	0.000	0.010	0.089	0.423	0.379	0.082	0.013	0.004	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1993/94	0.000	0.002	0.019	0.133	0.485	0.290	0.062	0.007	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1994/95	0.000	0.001	0.017	0.105	0.458	0.344	0.058	0.014	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1995/96	0.000	0.001	0.016	0.145	0.501	0.281	0.048	0.007	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1996/97	0.000	0.003	0.020	0.161	0.489	0.277	0.043	0.006	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1997/98	0.000	0.005	0.032	0.183	0.475	0.261	0.038	0.005	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1998/99	0.000	0.006	0.044	0.197	0.477	0.211	0.040	0.024	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1999/00*	0.000	0.002	0.035	0.168	0.484	0.267	0.038	0.005	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2000/01	0.000	0.002	0.019	0.136	0.510	0.276	0.050	0.006	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2001/02	0.000	0.001	0.040	0.208	0.472	0.235	0.038	0.005	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2002/03	0.000	0.002	0.036	0.200	0.476	0.245	0.036	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2003/04	0.000	0.002	0.021	0.162	0.501	0.266	0.043	0.003	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2004/05	0.000	0.002	0.037	0.174	0.461	0.275	0.044	0.006	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2005/06	0.001	0.010	0.057	0.205	0.460	0.235	0.030	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2006/07	0.000	0.004	0.045	0.174	0.447	0.288	0.035	0.004	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2007/08	0.000	0.005	0.047	0.163	0.372	0.270	0.091	0.037	0.013	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2008/09	0.000	0.001	0.029	0.126	0.457	0.322	0.056	0.007	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2009/10	0.000	0.001	0.022	0.122	0.484	0.303	0.055	0.011	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2010/11	0.000	0.000	0.014	0.106	0.514	0.306	0.054	0.006	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2011/12	0.001	0.006	0.074	0.181	0.489	0.185	0.058	0.005	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2012/13	0.005	0.008	0.060	0.076	0.597	0.191	0.053	0.005	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2013/14	0.001	0.004	0.122	0.122	0.512	0.166	0.062	0.008	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

* Based on only one leg of the survey.

Table 3a. Carapace length distribution (mm) of male rock lobster for Dassen Island.

Year	<45	45-50	50-55	55-60	60-65	65-70	70-75	75-80	80-85	85-90	90-95	95-100	100-105	105-110	110-115	115-120	120-125	125-130	130-135	135-140
1992/93	0.000	0.000	0.001	0.024	0.119	0.193	0.232	0.232	0.127	0.054	0.014	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1993/94	0.000	0.000	0.000	0.008	0.049	0.146	0.315	0.278	0.142	0.049	0.013	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1994/95	0.000	0.000	0.002	0.017	0.097	0.208	0.292	0.206	0.086	0.066	0.014	0.009	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000
1995/96	0.002	0.000	0.001	0.003	0.037	0.182	0.314	0.274	0.146	0.038	0.002	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1996/97	0.000	0.000	0.005	0.015	0.059	0.125	0.315	0.262	0.144	0.058	0.014	0.002	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1997/98	0.000	0.000	0.002	0.028	0.106	0.099	0.156	0.245	0.198	0.102	0.047	0.013	0.005	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1998/99	0.000	0.000	0.002	0.034	0.141	0.165	0.125	0.152	0.160	0.112	0.065	0.028	0.013	0.003	0.000	0.000	0.000	0.000	0.000	0.000
1999/00	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
2000/01	0.000	0.000	0.000	0.004	0.025	0.093	0.253	0.317	0.174	0.091	0.032	0.011	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2001/02	0.000	0.000	0.000	0.002	0.033	0.150	0.264	0.242	0.184	0.086	0.026	0.009	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2002/03	0.000	0.072	0.206	0.245	0.213	0.167	0.051	0.026	0.010	0.005	0.003	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2003/04	0.000	0.000	0.000	0.015	0.086	0.139	0.166	0.179	0.174	0.119	0.083	0.034	0.003	0.001	0.000	0.000	0.000	0.000	0.000	0.000
2004/05	0.000	0.000	0.000	0.003	0.034	0.164	0.236	0.216	0.156	0.095	0.060	0.030	0.007	0.001	0.000	0.000	0.000	0.000	0.000	0.000
2005/06	0.000	0.000	0.002	0.016	0.093	0.212	0.351	0.206	0.066	0.038	0.012	0.003	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2006/07	0.000	0.000	0.004	0.059	0.116	0.145	0.303	0.235	0.089	0.030	0.010	0.007	0.002	0.001	0.000	0.000	0.000	0.000	0.000	0.000
2007/08	0.000	0.000	0.009	0.042	0.212	0.323	0.239	0.120	0.040	0.011	0.002	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2008/09	0.000	0.000	0.004	0.023	0.118	0.229	0.357	0.184	0.060	0.010	0.011	0.005	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2009/10	0.001	0.001	0.005	0.047	0.130	0.179	0.332	0.217	0.074	0.011	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2010/11*	0.001	0.000	0.007	0.058	0.183	0.134	0.196	0.281	0.110	0.029	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2011/12	0.000	0.000	0.028	0.157	0.369	0.149	0.103	0.072	0.088	0.019	0.010	0.004	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000
2012/13	0.000	0.001	0.014	0.128	0.321	0.213	0.136	0.080	0.066	0.033	0.006	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2013/14	0.000	0.001	0.083	0.113	0.335	0.151	0.156	0.089	0.048	0.016	0.006	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

* Only one male lobster caught and measured on the second leg of the survey.

Table 3b. Carapace length distribution (mm) of female rock lobster for Dassen Island.

Year	<45	45-50	50-55	55-60	60-65	65-70	70-75	75-80	80-85	85-90	90-95	95-100	100-105	105-110	110-115	115-120	120-125	125-130	130-135	135-140
1992/93	0.000	0.001	0.011	0.080	0.295	0.401	0.181	0.029	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1993/94	0.000	0.000	0.003	0.047	0.311	0.435	0.175	0.027	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1994/95	0.000	0.000	0.002	0.067	0.191	0.284	0.344	0.102	0.010	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1995/96	0.003	0.000	0.000	0.027	0.254	0.447	0.226	0.043	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1996/97	0.000	0.001	0.026	0.147	0.215	0.390	0.179	0.041	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1997/98	0.000	0.003	0.010	0.112	0.260	0.331	0.217	0.053	0.006	0.003	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1998/99	0.000	0.000	0.014	0.161	0.344	0.315	0.132	0.028	0.004	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1999/00	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
2000/01	0.000	0.000	0.008	0.095	0.375	0.349	0.147	0.024	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2001/02	0.000	0.000	0.002	0.020	0.236	0.450	0.222	0.058	0.009	0.001	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2002/03	0.037	0.144	0.230	0.211	0.206	0.137	0.030	0.006	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2003/04	0.000	0.000	0.006	0.059	0.265	0.427	0.197	0.041	0.003	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2004/05	0.000	0.000	0.000	0.029	0.226	0.443	0.238	0.051	0.007	0.001	0.004	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2005/06	0.000	0.000	0.007	0.093	0.362	0.379	0.137	0.022	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2006/07	0.000	0.000	0.010	0.109	0.268	0.396	0.192	0.024	0.001	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2007/08	0.000	0.005	0.034	0.175	0.388	0.265	0.096	0.035	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2008/09	0.000	0.000	0.018	0.174	0.358	0.290	0.128	0.023	0.008	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2009/10	0.000	0.013	0.081	0.302	0.293	0.211	0.086	0.013	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2010/11*	0.000	0.000	0.062	0.297	0.308	0.216	0.082	0.034	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2011/12	0.000	0.001	0.101	0.344	0.273	0.186	0.082	0.009	0.005	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2012/13	0.000	0.002	0.082	0.319	0.416	0.132	0.049	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2013/14	0.000	0.001	0.136	0.294	0.331	0.124	0.086	0.028	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

* Based on only one leg of the survey as no female lobsters were caught on the second leg of the survey.

Table 4a. Carapace length distribution (mm) of male rock lobster for Saldanha Bay.

Year	<45	45-50	50-55	55-60	60-65	65-70	70-75	75-80	80-85	85-90	90-95	95-100	100-105	105-110	110-115	115-120	120-125	125-130	130-135	135-140
1992/93	0.005	0.004	0.034	0.156	0.306	0.215	0.108	0.049	0.037	0.050	0.022	0.009	0.005	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1993/94	0.000	0.002	0.021	0.097	0.261	0.247	0.134	0.055	0.042	0.066	0.049	0.016	0.007	0.004	0.000	0.000	0.000	0.000	0.000	0.000
1994/95	0.000	0.000	0.004	0.115	0.383	0.249	0.074	0.035	0.028	0.029	0.022	0.041	0.016	0.004	0.000	0.000	0.000	0.000	0.000	0.000
1995/96	0.000	0.000	0.011	0.044	0.307	0.356	0.100	0.027	0.043	0.016	0.038	0.037	0.016	0.005	0.000	0.000	0.000	0.000	0.000	0.000
1996/97	0.014	0.052	0.110	0.151	0.284	0.201	0.110	0.041	0.011	0.006	0.009	0.006	0.006	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1997/98	0.000	0.000	0.082	0.273	0.480	0.072	0.048	0.000	0.000	0.006	0.006	0.028	0.000	0.000	0.006	0.000	0.000	0.000	0.000	0.000
1998/99	0.000	0.001	0.015	0.185	0.414	0.256	0.072	0.010	0.001	0.006	0.009	0.007	0.014	0.004	0.001	0.004	0.000	0.000	0.000	0.000
1999/00	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
2000/01	0.000	0.000	0.003	0.182	0.434	0.292	0.070	0.012	0.003	0.000	0.000	0.002	0.000	0.000	0.000	0.002	0.000	0.000	0.000	0.000
2001/02	0.000	0.000	0.015	0.063	0.149	0.251	0.184	0.012	0.043	0.131	0.056	0.000	0.008	0.000	0.000	0.048	0.040	0.000	0.000	0.000
2002/03	0.011	0.242	0.248	0.146	0.168	0.052	0.011	0.009	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.113
2003/04	0.000	0.004	0.033	0.117	0.247	0.188	0.102	0.042	0.031	0.045	0.023	0.063	0.041	0.021	0.041	0.000	0.000	0.000	0.000	0.000
2004/05	0.000	0.000	0.000	0.029	0.138	0.166	0.088	0.019	0.070	0.031	0.194	0.123	0.039	0.068	0.000	0.002	0.033	0.000	0.000	0.000
2005/06	0.000	0.000	0.003	0.134	0.346	0.256	0.089	0.061	0.007	0.023	0.039	0.022	0.001	0.020	0.000	0.000	0.000	0.000	0.000	0.000
2006/07	0.000	0.000	0.014	0.180	0.304	0.111	0.066	0.056	0.162	0.027	0.027	0.000	0.027	0.027	0.000	0.000	0.000	0.000	0.000	0.000
2007/08	0.020	0.046	0.074	0.106	0.318	0.199	0.142	0.026	0.020	0.010	0.019	0.000	0.010	0.000	0.000	0.009	0.000	0.001	0.000	0.000
2008/09	0.000	0.000	0.041	0.229	0.367	0.192	0.099	0.026	0.035	0.007	0.001	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2009/10	0.000	0.000	0.000	0.111	0.348	0.112	0.181	0.075	0.055	0.047	0.024	0.000	0.022	0.025	0.000	0.000	0.000	0.000	0.000	0.000
2010/11	0.000	0.005	0.049	0.104	0.228	0.147	0.083	0.060	0.057	0.054	0.059	0.012	0.072	0.058	0.001	0.012	0.001	0.000	0.000	0.000
2011/12	0.000	0.002	0.042	0.282	0.332	0.154	0.061	0.026	0.020	0.020	0.020	0.023	0.008	0.004	0.002	0.002	0.000	0.000	0.000	0.000
2012/13	0.003	0.003	0.018	0.173	0.352	0.221	0.041	0.023	0.025	0.029	0.040	0.041	0.014	0.014	0.004	0.000	0.000	0.000	0.000	0.000
2013/14	0.017	0.011	0.064	0.244	0.395	0.166	0.034	0.024	0.002	0.020	0.008	0.015	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Table 4b. Carapace length distribution (mm) of female rock lobster for Saldanha Bay.

Year	<45	45-50	50-55	55-60	60-65	65-70	70-75	75-80	80-85	85-90	90-95	95-100	100-105	105-110	110-115	115-120	120-125	125-130	130-135	135-140
1992/93	0.002	0.008	0.088	0.338	0.272	0.139	0.103	0.043	0.004	0.004	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1993/94	0.001	0.004	0.054	0.315	0.321	0.161	0.079	0.049	0.011	0.005	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1994/95	0.000	0.000	0.049	0.366	0.414	0.108	0.040	0.016	0.008	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1995/96	0.000	0.000	0.056	0.282	0.413	0.169	0.029	0.041	0.010	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1996/97	0.016	0.101	0.186	0.271	0.202	0.145	0.039	0.030	0.010	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1997/98	0.000	0.000	0.208	0.383	0.216	0.050	0.052	0.083	0.000	0.000	0.008	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1998/99	0.000	0.003	0.111	0.493	0.276	0.078	0.001	0.012	0.026	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1999/00	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2000/01	0.000	0.000	0.031	0.265	0.467	0.134	0.043	0.017	0.017	0.022	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2001/02	0.000	0.000	0.055	0.080	0.286	0.260	0.089	0.108	0.079	0.000	0.043	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2002/03	0.466	0.282	0.104	0.078	0.045	0.013	0.010	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2003/04	0.005	0.000	0.081	0.323	0.399	0.068	0.052	0.004	0.012	0.028	0.027	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2004/05	0.000	0.003	0.060	0.344	0.228	0.079	0.102	0.074	0.045	0.018	0.047	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2005/06	0.000	0.000	0.112	0.446	0.374	0.032	0.018	0.004	0.014	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2006/07	0.000	0.001	0.139	0.290	0.298	0.143	0.077	0.044	0.009	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2007/08	0.017	0.055	0.130	0.237	0.327	0.155	0.024	0.031	0.009	0.014	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2008/09	0.000	0.002	0.146	0.410	0.259	0.125	0.014	0.036	0.000	0.007	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2009/10	0.000	0.013	0.035	0.318	0.356	0.117	0.091	0.012	0.029	0.029	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2010/11	0.000	0.007	0.104	0.405	0.109	0.178	0.117	0.012	0.051	0.017	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2011/12	0.004	0.017	0.191	0.459	0.201	0.063	0.035	0.014	0.014	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2012/13	0.003	0.025	0.099	0.446	0.270	0.064	0.064	0.014	0.010	0.002	0.002	0.000	0.000	0.000	0.002	0.000	0.000	0.000	0.000	0.000
2013/14	0.002	0.011	0.186	0.467	0.204	0.067	0.031	0.014	0.014	0.000	0.000	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Table 5a. Carapace length distribution (mm) of male rock lobster for Lambert's Bay.

Year	<45	45-50	50-55	55-60	60-65	65-70	70-75	75-80	80-85	85-90	90-95	95-100	100-105	105-110	110-115	115-120	120-125	125-130	130-135	135-140
1992/93	0.000	0.000	0.003	0.074	0.165	0.122	0.148	0.118	0.089	0.124	0.095	0.041	0.012	0.005	0.005	0.000	0.000	0.000	0.000	0.000
1993/94	0.000	0.000	0.006	0.033	0.129	0.113	0.010	0.044	0.064	0.082	0.082	0.123	0.149	0.082	0.062	0.000	0.000	0.021	0.000	0.000
1994/95	0.000	0.001	0.029	0.179	0.339	0.199	0.080	0.017	0.023	0.023	0.010	0.027	0.048	0.014	0.000	0.010	0.000	0.000	0.000	0.000
1995/96	0.000	0.000	0.011	0.099	0.314	0.308	0.145	0.065	0.037	0.008	0.009	0.000	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1996/97	0.000	0.001	0.033	0.164	0.233	0.130	0.123	0.131	0.117	0.059	0.009	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1997/98	0.000	0.000	0.000	0.062	0.156	0.115	0.067	0.102	0.183	0.086	0.083	0.040	0.020	0.040	0.023	0.023	0.000	0.000	0.000	0.000
1998/99	0.000	0.000	0.004	0.030	0.135	0.207	0.200	0.106	0.113	0.086	0.059	0.037	0.011	0.006	0.005	0.002	0.000	0.000	0.000	0.000
1999/00	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
2000/01	0.000	0.000	0.000	0.015	0.124	0.266	0.333	0.189	0.047	0.020	0.005	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2001/02	0.000	0.000	0.000	0.036	0.086	0.169	0.152	0.268	0.204	0.056	0.027	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2002/03	0.000	0.000	0.002	0.065	0.072	0.070	0.139	0.189	0.201	0.162	0.064	0.021	0.013	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2003/04	0.000	0.000	0.003	0.018	0.061	0.064	0.091	0.179	0.268	0.182	0.112	0.014	0.000	0.000	0.000	0.009	0.000	0.000	0.000	0.000
2004/05	0.000	0.000	0.000	0.000	0.148	0.224	0.180	0.170	0.134	0.105	0.039	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2005/06	0.000	0.000	0.024	0.216	0.295	0.244	0.125	0.069	0.023	0.003	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2006/07	0.000	0.012	0.062	0.269	0.374	0.176	0.049	0.041	0.014	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2007/08*	0.000	0.000	0.000	0.015	0.023	0.231	0.245	0.245	0.195	0.029	0.003	0.014	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2008/09	0.000	0.015	0.074	0.164	0.234	0.199	0.138	0.079	0.068	0.024	0.004	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2009/10	0.000	0.000	0.000	0.375	0.426	0.000	0.000	0.000	0.099	0.099	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2010/11	0.000	0.002	0.022	0.088	0.236	0.096	0.129	0.105	0.179	0.089	0.042	0.008	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2011/12	0.001	0.001	0.045	0.059	0.176	0.113	0.225	0.089	0.173	0.067	0.040	0.006	0.005	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2012/13	0.000	0.022	0.150	0.065	0.180	0.023	0.105	0.062	0.144	0.072	0.135	0.035	0.007	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2013/14	0.018	0.009	0.173	0.047	0.162	0.046	0.187	0.044	0.169	0.036	0.097	0.014	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

*Based on only one leg of the survey as no lobsters were caught on the second leg of the survey.

Table 5b. Carapace length distribution (mm) of female rock lobster for Lambert's Bay.

Year	<45	45-50	50-55	55-60	60-65	65-70	70-75	75-80	80-85	85-90	90-95	95-100	100-105	105-110	110-115	115-120	120-125	125-130	130-135	135-140
1992/93	0.000	0.002	0.038	0.152	0.199	0.168	0.234	0.140	0.046	0.020	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1993/94	0.000	0.000	0.033	0.107	0.169	0.125	0.066	0.183	0.186	0.131	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1994/95	0.000	0.001	0.110	0.410	0.225	0.102	0.056	0.037	0.050	0.010	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1995/96	0.000	0.004	0.061	0.294	0.342	0.185	0.068	0.021	0.024	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1996/97	0.000	0.003	0.134	0.344	0.267	0.170	0.056	0.021	0.003	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1997/98	0.000	0.000	0.080	0.268	0.268	0.140	0.154	0.056	0.031	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1998/99	0.000	0.002	0.045	0.117	0.301	0.322	0.174	0.034	0.001	0.003	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1999/00	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
2000/01	0.000	0.005	0.016	0.069	0.285	0.382	0.174	0.052	0.018	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2001/02	0.000	0.000	0.009	0.223	0.273	0.263	0.205	0.006	0.021	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2002/03	0.000	0.000	0.103	0.272	0.157	0.270	0.120	0.024	0.029	0.024	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2003/04	0.000	0.000	0.018	0.126	0.246	0.275	0.275	0.055	0.003	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2004/05 [†]	0.000	0.000	0.000	0.000	0.500	0.000	0.000	0.452	0.048	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2005/06	0.000	0.000	0.111	0.251	0.382	0.173	0.060	0.022	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2006/07	0.001	0.009	0.213	0.281	0.297	0.103	0.082	0.012	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2007/08*	0.000	0.000	0.000	0.034	0.260	0.475	0.109	0.107	0.013	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2008/09	0.000	0.018	0.036	0.119	0.309	0.256	0.132	0.081	0.042	0.006	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2009/10	0.000	0.000	0.000	0.677	0.162	0.162	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2010/11	0.008	0.002	0.069	0.245	0.408	0.135	0.111	0.012	0.001	0.009	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2011/12	0.000	0.018	0.152	0.161	0.322	0.199	0.126	0.021	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2012/13	0.000	0.050	0.316	0.181	0.310	0.087	0.048	0.000	0.008	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2013/14	0.003	0.012	0.380	0.130	0.287	0.091	0.084	0.008	0.005	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

[†]Based on only one leg of the survey as no female lobsters were caught on the second leg of the survey.

*Based on only one leg of the survey as no lobsters were caught on the second leg of the survey.

Table 6. Percentages of female west coast rock lobster for each Zone.

Year	Cape Point	Dassen Island	Saldanha Bay	Lambert's Bay
1992/93	24.49	48.61	42.38	37.67
1993/94	27.46	40.09	38.79	60.71
1994/95	24.16	47.33	37.59	54.67
1995/96	25.24	32.55	31.68	48.52
1996/97	21.70	22.45	47.35	33.68
1997/98	29.64	34.00	46.07	39.16
1998/99	30.77	32.13	33.87	43.09
1999/00	17.21			
2000/01	21.68	8.50	45.51	38.64
2001/02	22.85	34.20	54.76	18.42
2002/03	17.63	49.89	45.14	15.82
2003/04	20.69	55.22	48.25	31.53
2004/05	22.94	29.50	48.61	0.08
2005/06	23.78	31.60	46.00	61.63
2006/07	27.45	36.62	44.98	39.79
2007/08	29.17	36.96	39.43	39.79
2008/09	23.72	20.29	46.01	25.00
2009/10	23.44	14.41	44.75	21.32
2010/11	12.68	18.47	48.46	29.45
2011/12	19.30	30.12	35.36	19.72
2012/13	23.39	32.69	37.97	21.55
2013/14	22.95	26.25	42.73	20.23

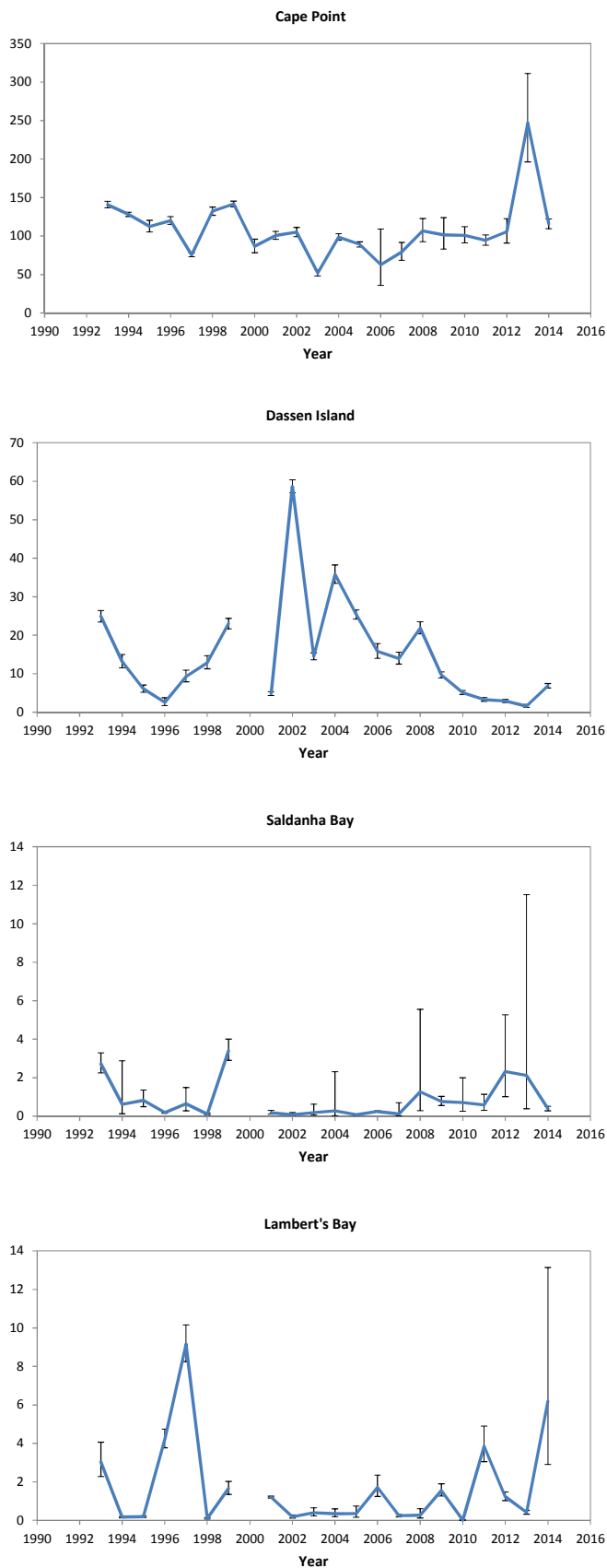


Figure 1. FIMS CPUE series (with 95% confidence intervals) for each Zone. In this plot the period shown as 1993 corresponds to the 1992/93 season, and so on.

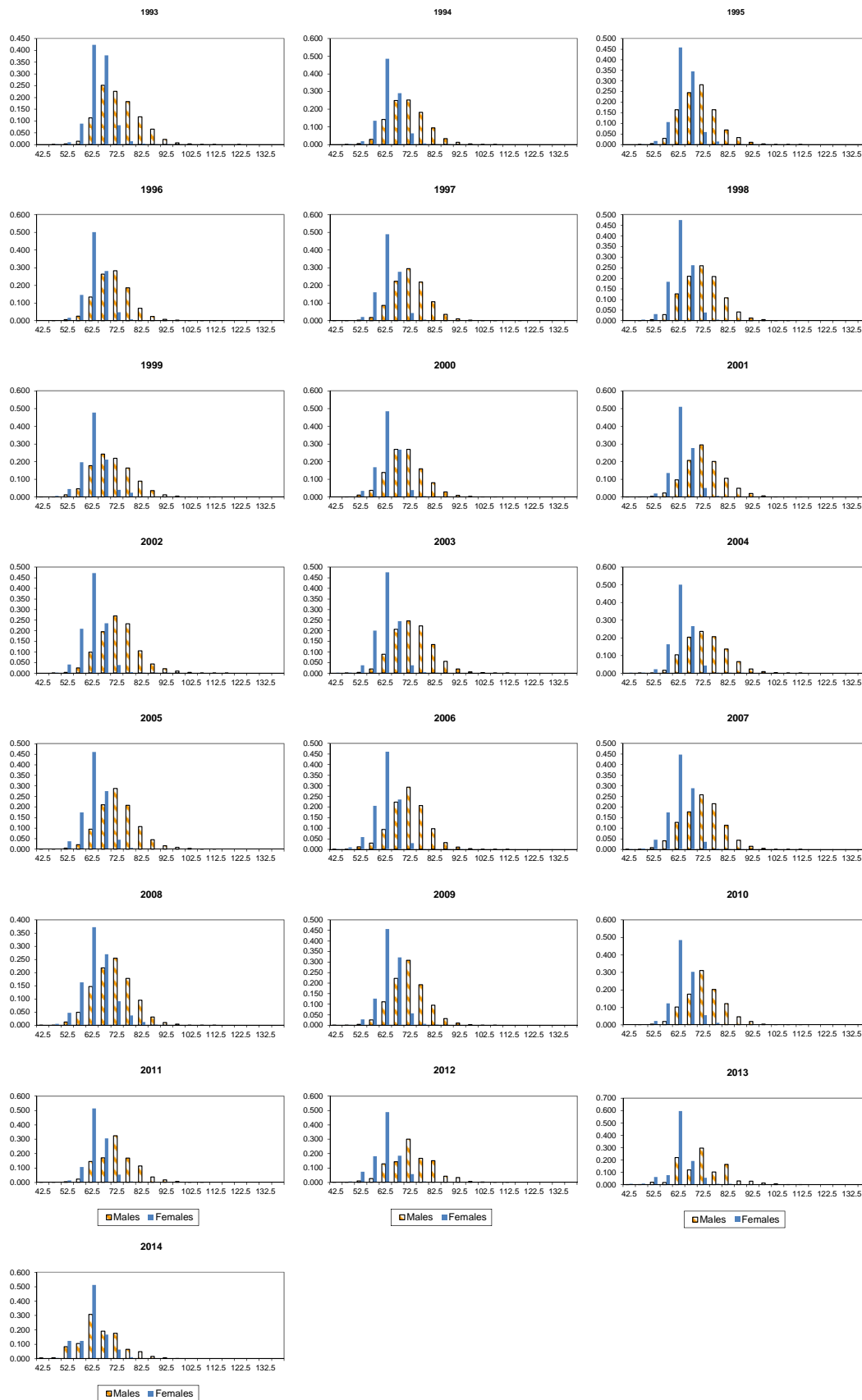


Figure 2. Length distributions of male and female rock lobsters for Cape Point.

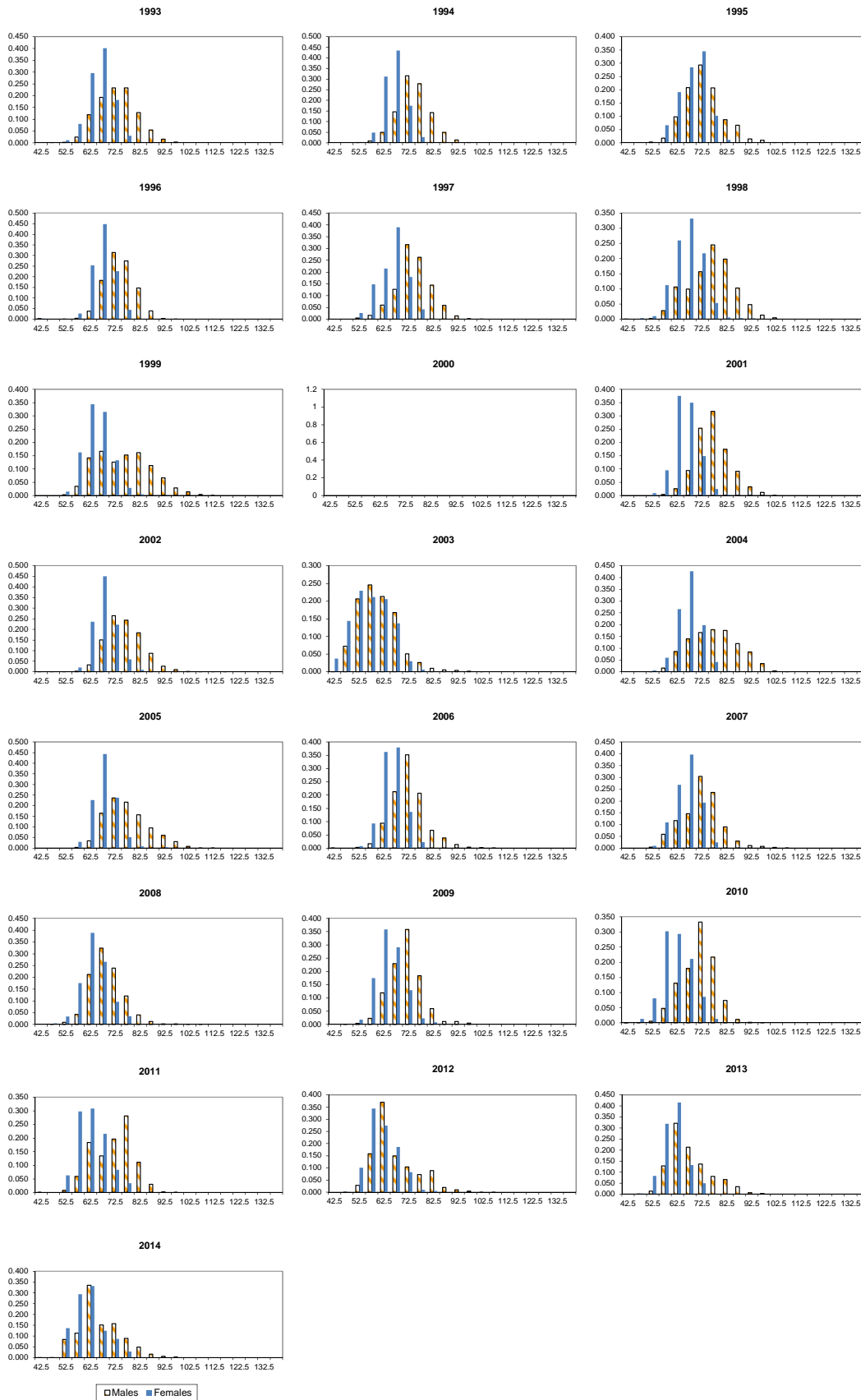


Figure 3. Length distributions of male and female rock lobsters for Dassen Island.

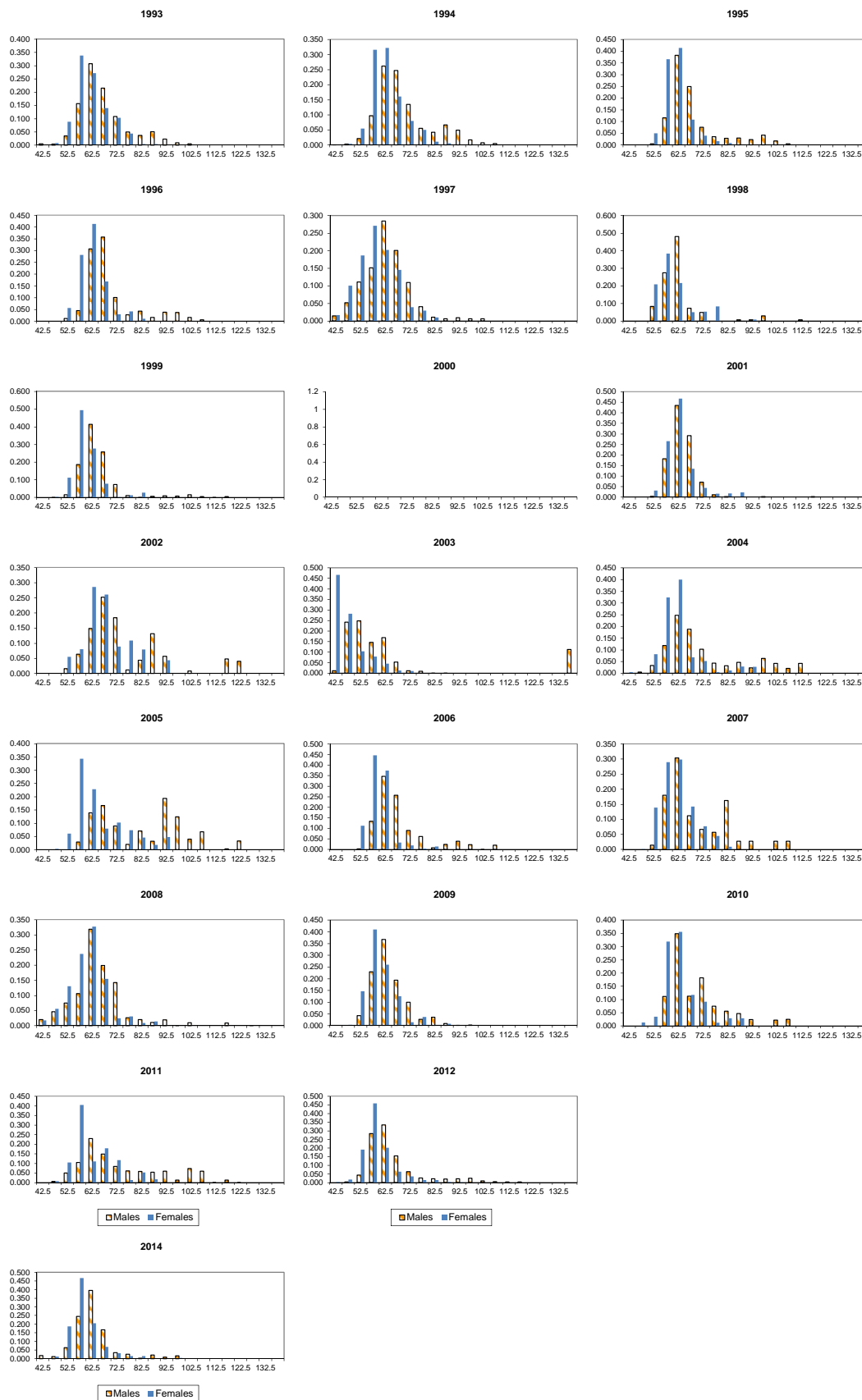


Figure 4. Length distributions of male and female rock lobsters for Saldanha Bay.

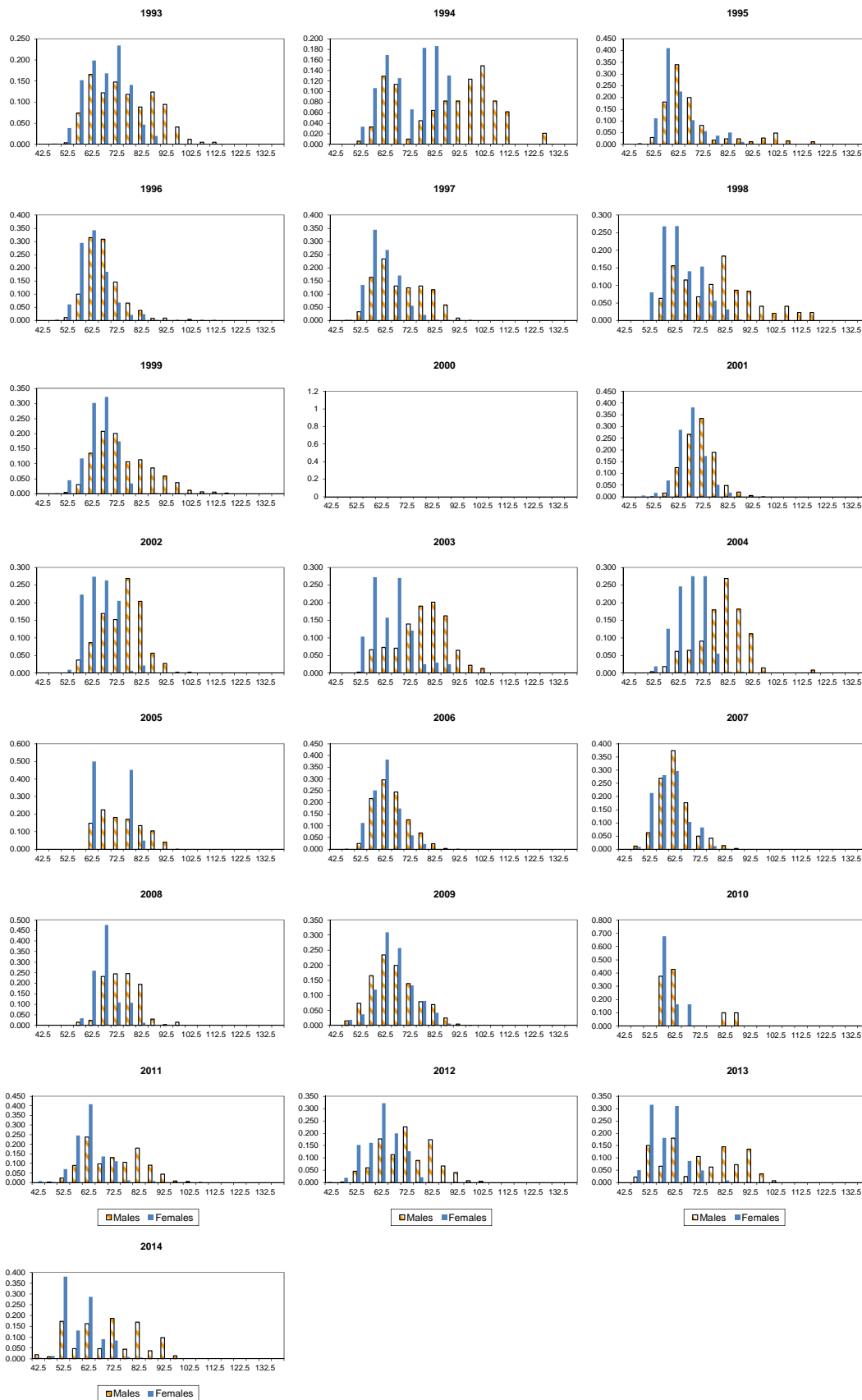


Figure 5. Length distributions of male and female rock lobsters for Lambert’s Bay.

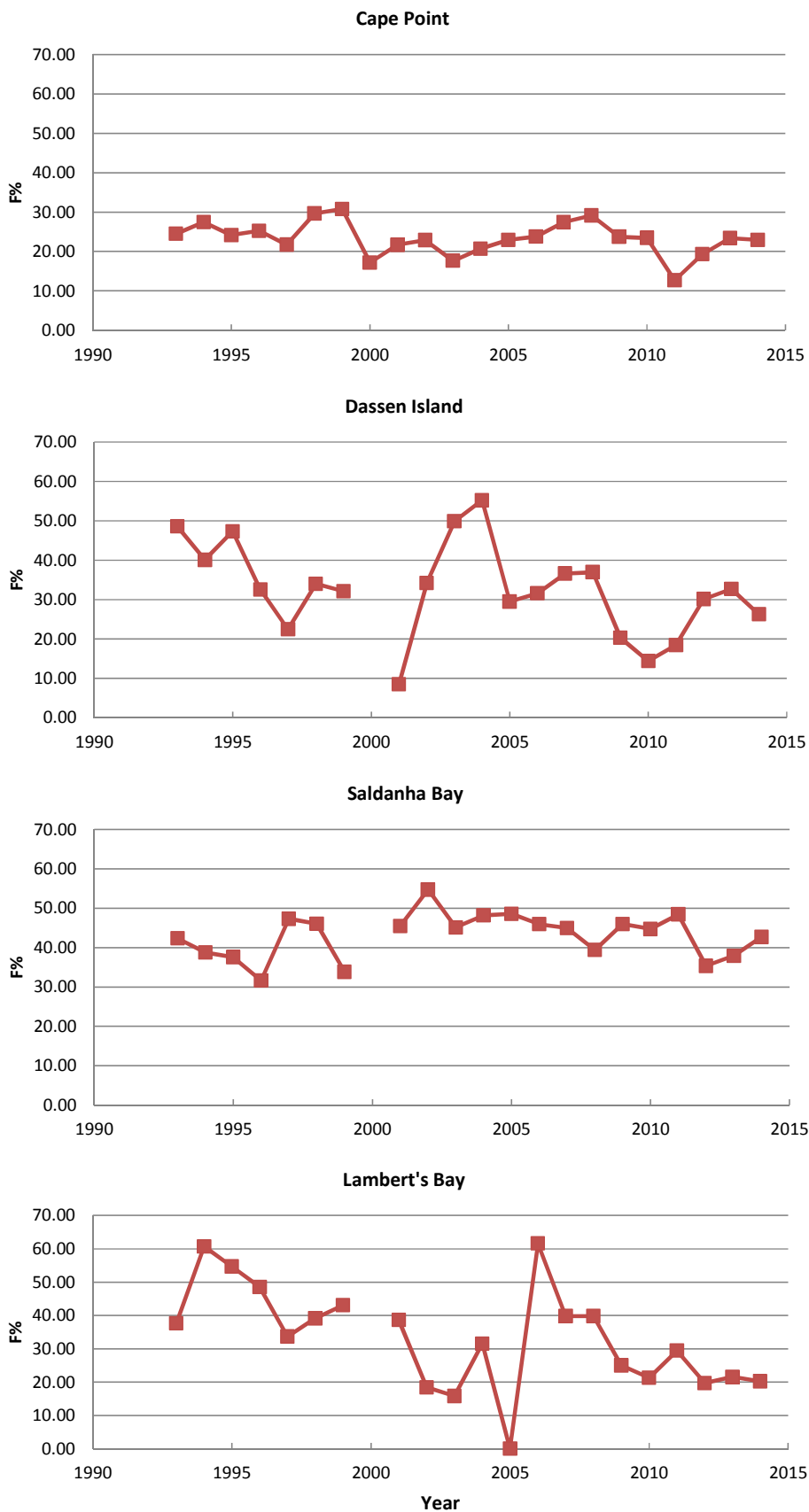


Figure 6. Percentage female rock lobsters to be used in the population assessment model for each Zone.