

Current status of western blue groper at selected locations in South Australia: results of 2013 survey and comparison with historical surveys



Report to the Conservation Council of South Australia

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2013

This publication should be cited as:

Bryars, S. and Brook, J. (2013) Current status of western blue groper at selected locations in South Australia: results of 2013 survey and comparison with historical surveys. Report to the Conservation Council of South Australia. Dr Simon Richard Bryars and J Diversity Pty Ltd, Adelaide.

Cover photo: Female western blue groper (*Achoerodus gouldii*) at Penneshaw, Kangaroo Island.
Photo credit: Simon Bryars.

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Acknowledgements

The current report was funded by a State Community NRM Grant through the Conservation Council of South Australia (CCSA).

Thanks to Alex Gaut (CCSA), Steve Leske (Reef Watch), and all of the volunteer divers who collected the 2013 data.

Many thanks to Dr Scoresby Shepherd AO (SARDI) for providing historical data and reviewing a draft of the report.

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Non-technical summary

- The western blue groper (*Achoerodus gouldii*) is the largest resident reef fish in southern Australian coastal waters. The species is long-lived (up to 70 years), slow-growing, sex-changing and site-attached with a small home range.
- The life history traits of western blue groper (WBG) renders the species as highly vulnerable to the effects of localised over-fishing and the species has been fully protected in the central part of South Australia (SA) since the 1980s. The WBG is currently included on the Reef Watch 'Feral or In Peril' species list as a species of conservation interest.
- Historical diver surveys for WBG showed that the species is more abundant in the western parts of SA; this may have been due to a combination of natural distribution patterns and fishing effects.
- During 2013 a new set of surveys was undertaken by community divers at 25 sites across SA specifically targeting WBG. The surveys were funded by a State Community NRM Grant administered through the Conservation Council of South Australia.
- Analysis of the 2013 survey data and comparison with historical survey data revealed a number of key points in relation to their conservation status: (1) a lack of adults in areas outside of the protection zone including at sites where they had been scored previously, (2) the 'appearance' of adults at a number of sites inside the protection zone since previous surveys, and (3) juvenile recruitment at many sites across the entire State, not just in the western part of SA.
- Preliminary conclusions are that the protection zone is being effective in allowing recovery of populations at some sites and that localised depletion of adults is occurring at some sites outside of the protection zone. However, the 2013 data and historical comparisons have a number of limitations and further surveys are required to clarify the status of WBG in SA.

Introduction

The western blue groper (*Achoerodus gouldii*) is the largest resident reef fish in southern Australian coastal waters (Bryars et al. 2012). The life history traits of western blue groper (WBG) renders the species as highly vulnerable to the effects of localised over-fishing: they are long-lived, slow-growing, sex-changing (Coulson et al. 2009), and site-attached with a small home range (Bryars et al. 2012). Indeed, numbers of large WBG declined in parts of South Australia (SA) due to fishing during the 1950–70s and this led to their total protection within central SA in the 1980s. Outside of central SA there are recreational and commercial catch limits. Nonetheless, the species is still considered to be of conservation concern due to ongoing fishing interactions (Baker 2012) and because it has poor post-release survival rates (McLeay et al. 2002, Bryars et al. 2012). The WBG is currently included on the Reef Watch 'Feral or In Peril' species list as a species of conservation interest.

Shepherd and Brook (2007) reported on a spatially-comprehensive set of underwater visual census (UVC) surveys for WBG across SA. Since that time, additional UVC surveys for reef fish (including WBG) have been conducted at some of the same sites, but a more spatially-comprehensive survey specifically for WBG has not been undertaken. The Conservation Council of South Australia (CCSA) received a State Community NRM Grant for community divers to undertake a targeted survey for WBG at selected sites around SA. The results of that survey are documented in the present report which had the specific aims of (1) reporting on the current 2013 status of WBG at selected sites around SA and (2) comparing the 2013 survey data with historical data. Of particular interest to the conservation sector was whether the protection zone in central SA is having a measurable positive effect on the abundance of adult WBG in that region.

Methods

2013 survey

Twenty five sites were surveyed in SA during 2013 (Figure 1, Table 1). The sites can be grouped into five regions (after Shepherd and Brook 2007); Eyre Peninsula, Yorke Peninsula, Kangaroo Island, Fleurieu Peninsula and the South East (Figure 1, Table 1). Survey methods were as described in Shepherd and Brook (2007) using either SCUBA or snorkel (Table 1) to collect data on size and abundance of WBG. A varying number of replicate transects were undertaken at each site (Table 1). A survey was also conducted at Rapid Bay (Fleurieu Peninsula) but the data, collected by snorkelling, were considered to be unusable as the site was too deep. While size and abundance data were collected on other fish species, the present report is concerned only with WBG. Size data on WBG were scored into three categories: juvenile <20 cm total length (TL); sub-adult 20–60 cm TL; and adult >60 cm TL (after Shepherd and Brook 2007).

Abundance data were analysed using PRIMER 6 with PERMANOVA to test for differences in assemblages (juveniles, sub-adults, adults) and total abundance across sites (25 sites) and regions (five regions). An analysis was also made of adult abundance at sites inside (18 sites) versus outside (7 sites) the protection zone in the central part of SA (see Figure 1), as there has now been sufficient time (>30 years since protection) for growth to the adult stage, which is the most vulnerable to fishing.

Historical surveys

Of the 25 sites surveyed in 2013, previous surveys had been undertaken at or near to 22 of them (Table 1). As WBG are site-attached, slow-growing and long-lived, comparisons of surveys that are temporally separated by many years are considered to be valid (see Shepherd and Brook 2007). Nonetheless, the time period between the 2013 survey and historical surveys is sufficient for juveniles and sub-adults to have grown into larger size classes and this may become evident in the current analysis. Using the comparable 2013 data, a PERMANOVA test was used to investigate change to the total abundance or the age class assemblage between the previous baseline and the 2013 surveys, with an additional two-way PERMANOVA test of adult abundance across time (T1, T2) and protection zone (inside zone = 16 sites, outside zone = 6 sites).

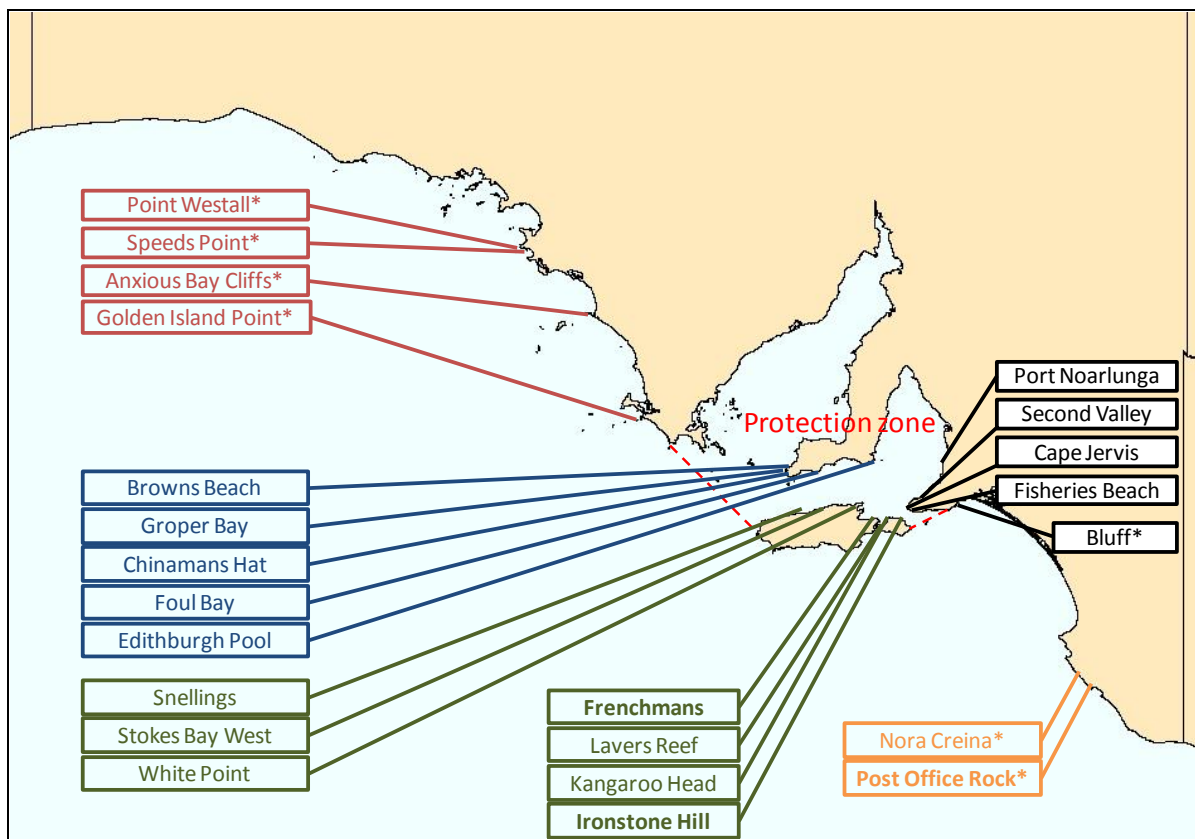


Figure 1. Map of sites surveyed in 2013 and in previous years across South Australia (except for the three sites denoted in bold which were only surveyed in 2013). Note that there are three individual sites at Port Noarlunga (Port Noarlunga North Outside, Port Noarlunga North Inside, and Port Noarlunga South Inside). * indicates site is located outside of the protection zone.

Table 1. Sites surveyed in 2013. There are no corresponding historical data for the three sites shown in bold. Note that except for Kangaroo Island sites, data on exposure, rock type and relief were unavailable and have been mainly derived from site notes with historical surveys.

Site name	Geographical region	No. replicates	SCUBA or snorkel	Depth (m)	Exposure	Inside protection zone	Rock type	Relief (m)	Shore-based access	Historical data
Point Westall	Eyre Peninsula	4	Snorkel	1-4	Moderate	No	Granite	1	Yes	Dec 2003
Speeds Point	Eyre Peninsula	12	Snorkel	1-4	Sheltered/Moderate	No	Calcrete	0.5-2	Yes	Dec 2003
Anxious Bay Cliffs	Eyre Peninsula	15	Snorkel	1-4	Sheltered/Moderate	No	Calcrete	0-2	Yes	Dec 2003
Golden Island Point	Eyre Peninsula	4	Snorkel	1-3	Moderate	No	Calcrete	1-1.5	Yes	Dec 2004
Browns Beach	Yorke Peninsula	6	Snorkel	1-3	Sheltered	Yes	Calcrete	0.5-1	Yes	Dec 2002
Groper Bay	Yorke Peninsula	4	Snorkel	1-4	Moderate	Yes	Calcrete	1.5-2	Yes	Dec 2002
Chinamans Hat	Yorke Peninsula	4	Snorkel	1-3	Moderate	Yes	Calcrete	1-1.5	Yes	Oct 2002
Foul Bay	Yorke Peninsula	12	Snorkel	1-4	Moderate	Yes	Schist	0.5-1	Yes	Oct 2002
Edithburgh Pool	Yorke Peninsula	11	Snorkel	1-4	Sheltered	Yes	Calcrete	0.5	Yes	Jan 2005
Snellings	Kangaroo Is.	4	SCUBA	6	Moderate	Yes	Schist	1.5	Yes	Dec 2008
Stokes Bay West	Kangaroo Is.	4	SCUBA	5-8	Moderate	Yes	Schist	1	No	Apr 2002
White Point	Kangaroo Is.	3	SCUBA	4-7	Moderate	Yes	Schist	0.5	No	Nov 2007
Frenchmans	Kangaroo Is.	4	SCUBA	5-6	Sheltered	Yes	Calcrete	1.5	No	n/a
Lavers Reef	Kangaroo Is.	4	SCUBA	5-7	Sheltered	Yes	Calcrete	1	No	Nov 2007
Kangaroo Head	Kangaroo Is.	4	SCUBA	5-6	Sheltered	Yes	Schist	2.5	No	Nov 2007
Ironstone Hill	Kangaroo Is.	4	SCUBA	5-6	Moderate	Yes	Schist	2.5	No	n/a
Port Noarlunga Nth Outside	Fleurieu Peninsula	2	Snorkel	2-8	Moderate	Yes	Calcrete	4	Yes	Mar 2003
Port Noarlunga Nth Inside	Fleurieu Peninsula	2	Snorkel	3	Sheltered	Yes	Calcrete	3	Yes	Mar 2003
Port Noarlunga Sth Inside	Fleurieu Peninsula	4	Snorkel	3	Sheltered	Yes	Calcrete	3	Yes	Mar 2003
Second Valley	Fleurieu Peninsula	9	Snorkel	2-6	Moderate	Yes	Schist	1-1.5	Yes	Nov 2003 Apr 2007
Cape Jervis	Fleurieu Peninsula	4	Snorkel	3	Moderate	Yes	Schist	0.5-2	Yes	Dec 2003 July 2004
Fisheries Beach	Fleurieu Peninsula	6	Snorkel	1-3	Moderate	Yes	Schist	1-1.5	Yes	Dec 2003
Bluff	Fleurieu Peninsula	4	Snorkel	1-4	Moderate	No	Granite	1-2	Yes	Dec 2002
Nora Creina	South East	8	Snorkel	1-5	Moderate	No	Calcrete	1.5-2	Yes	Oct 2002
Post Office Rock	South East	8	Snorkel	2-5	Moderate	No	Calcrete		Yes	n/a

Results

2013 survey

Total abundance of WBG (juveniles, sub-adults and adults) was highly variable across the 25 sites surveyed (Figure 2; see Appendix 1 for raw data).

WBG were recorded at all of the Eyre Peninsula sites (Point Westall, Speeds Point, Anxious Bay Cliffs, Golden Island Point), all of the Yorke Peninsula sites (Browns Beach, Groper Bay, Chinamans Hat, Foul Bay, Edithburgh Pool) and all of the Kangaroo Island sites (Snellings, Stokes Bay West, White Point, Frenchmans, Lavers Reef, Kangaroo Head, Ironstone Hill; Figure 2). WBG were recorded at only one site (Bluff) on the Fleurieu Peninsula (Figure 2). WBG were recorded at one of the two South East sites (Nora Creina, Figure 2). There was, however, no significant difference in total groper abundance between sites ($F=0.719$, $P=0.55$) or regions ($F=1.261$, $P=0.20$).

Abundances of the three separate size classes were also variable across the 25 sites and all three size classes were not always found at the sites where WBG occurred (Figure 3). Juveniles were most abundant at the Eyre Peninsula, Yorke Peninsula and South East sites, but were rare or absent at the Kangaroo Island sites. Highest abundances of juveniles occurred at Golden Island Point (Eyre Peninsula) and Foul Bay (Yorke Peninsula). Sub-adults were found at most sites where WBG were scored, with the highest abundance at Speeds Point on the Eyre Peninsula (Figure 3). There was, however, no significant difference in the groper assemblage between sites ($F=0.820$, $P=0.50$) or regions ($F=1.54$, $P=0.12$).

No adults were recorded at the Eyre Peninsula, Fleurieu Peninsula or South East sites (Figure 3). Adults were recorded at three of the five Yorke Peninsula sites (Browns Beach, Groper Bay and Edithburgh Pool) and at three of the seven Kangaroo Island sites (Stokes Bay West, Lavers Reef and Kangaroo Head). No adults were recorded at sites outside of the protection zone (Figure 3). However, the difference in adult abundance between inside and outside the protected area was not statistically significant ($F=4.0465$, $P=0.078$).

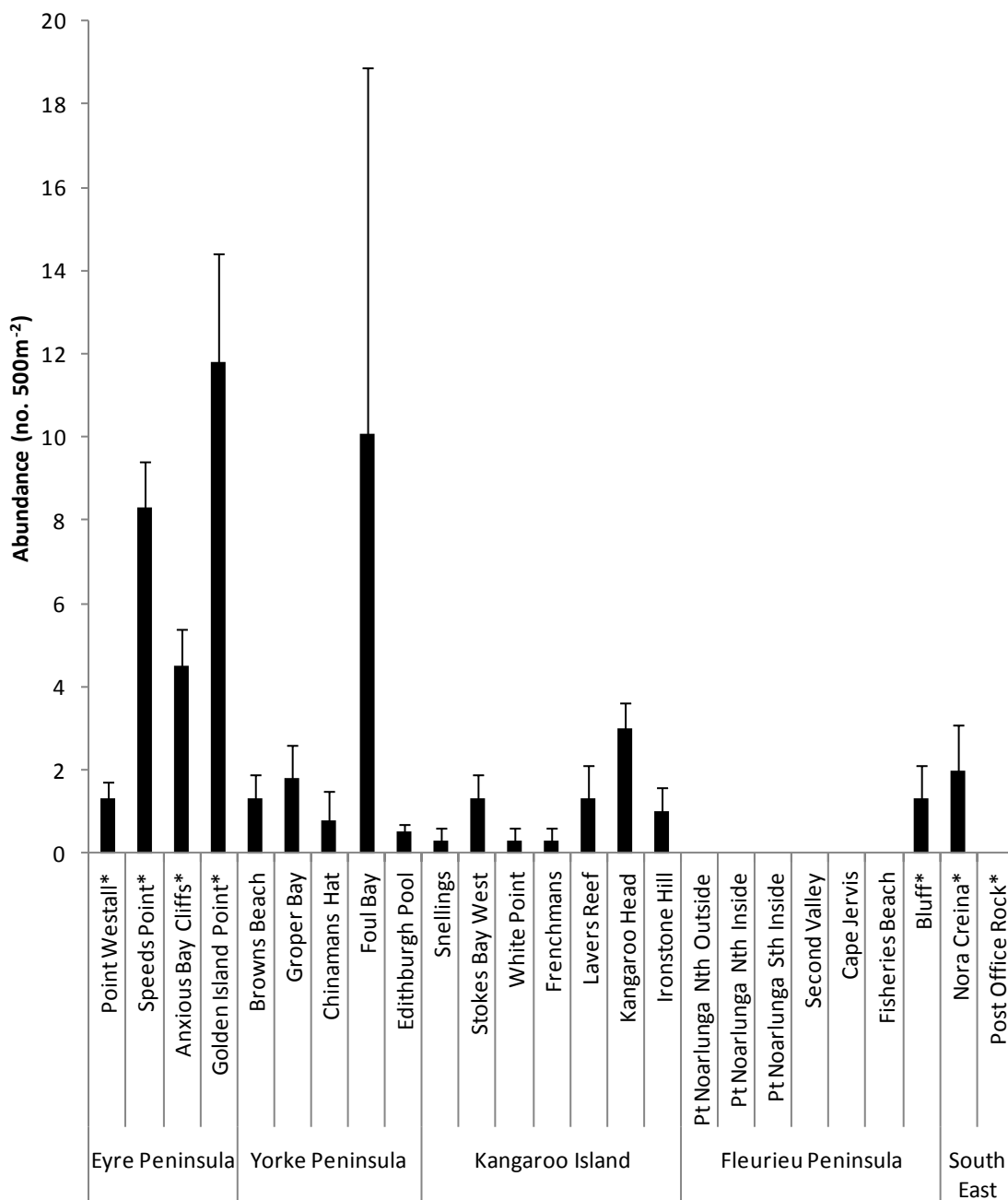


Figure 2. Total abundance (mean + standard error) of western blue groper across the 25 sites surveyed in 2013. See Figure 1 for site locations and Table 1 for site details. * indicates site is located outside of the protection zone.

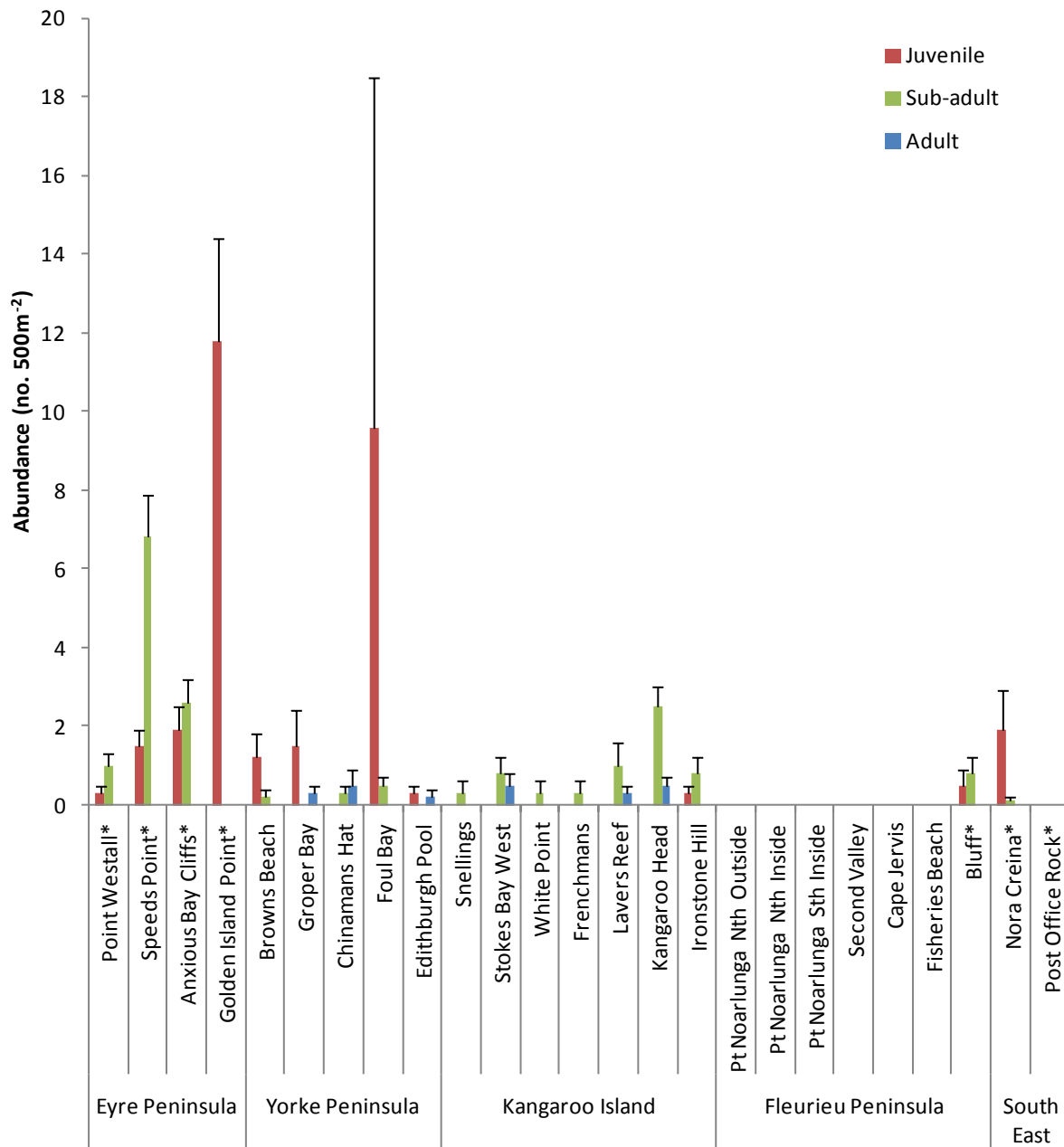


Figure 3. Abundance (mean + standard error) of juvenile, sub-adult and adult western blue groper across the 25 sites surveyed in 2013. See Figure 1 for site locations and Table 1 for site details. * indicates site is located outside of the protection zone.

2013 survey versus historical surveys

Abundances showed no clear temporal pattern between the historical and recent surveys across sites for either total abundance (Figure 4; $F=1.93$, $P=0.17$) or the size class assemblages (Figure 5; $F=1.36$, $P=0.19$). At some sites abundance was lower or higher in 2013 while at others it remained relatively constant between the two times (Figures 4, 5). However, of particular interest to the present study was the abundance of adults across the two time periods (Figure 5). Adult WBG were previously recorded at two of the Eyre Peninsula sites (Point Westall and Speeds Point – both outside of the protection zone), but were not recorded in the 2013 survey (Figure 5). Within the protection zone, five of the nine sites that had only juveniles and/or sub-adults in previous surveys had adults in the 2013 survey. The one site within the protection zone where adults had previously been recorded (Chinamans Hat) also had adults in 2013 (Figure 5). The two-way PERMANOVA showed an interaction between the protection zone and the survey event ($F=11.418$, $P=0.001$), whereby the abundance outside the protected area, which had previously been significantly higher than inside the area, was no longer significantly higher.

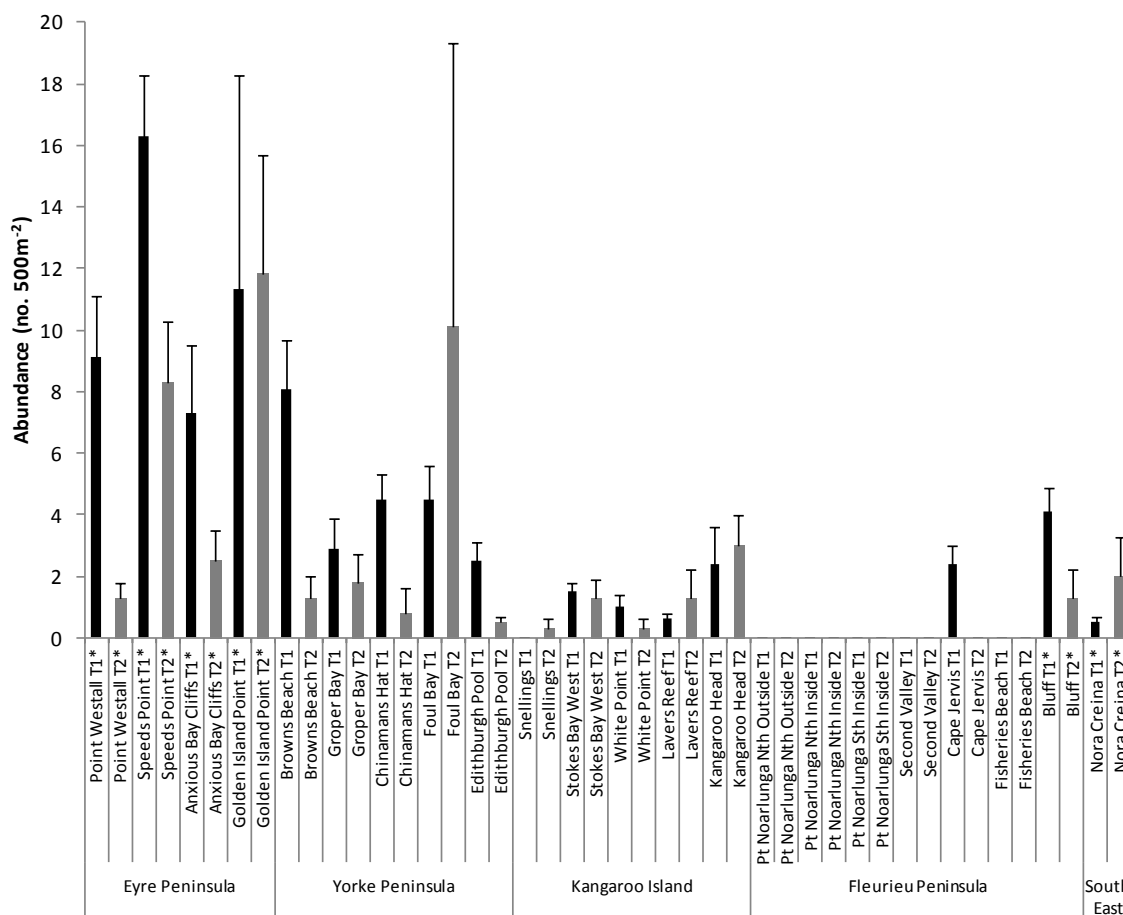


Figure 4. Total abundance (mean + standard error) of western blue groper across the 22 sites surveyed prior to 2013 (T1) and in 2013 (T2). See Figure 1 for site locations and Table 1 for details of pre-2013 survey years. * indicates site is located outside of the protection zone.

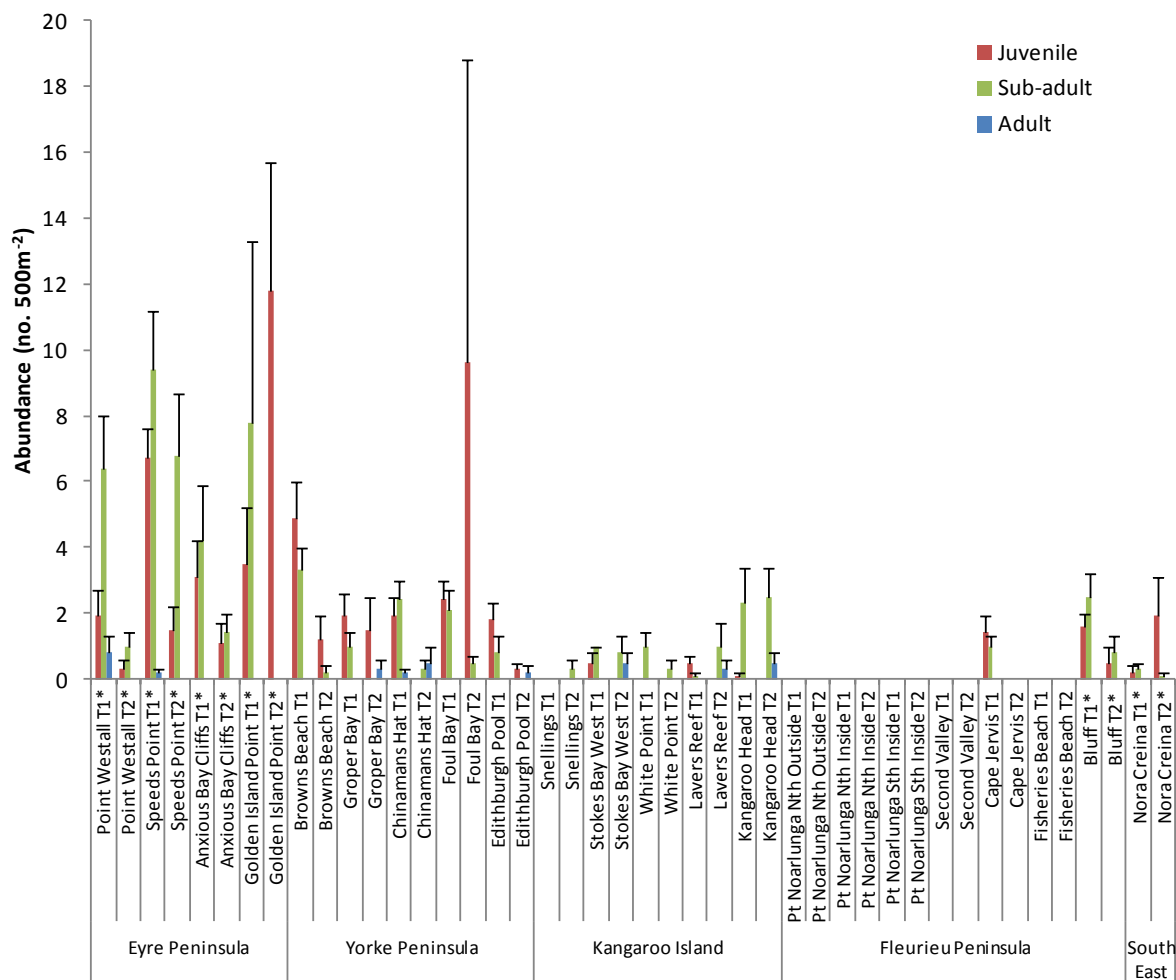


Figure 5. Abundance (mean + standard error) of juvenile, sub-adult and adult western blue groper across the 22 sites surveyed prior to 2013 (T1) and in 2013 (T2). See Figure 1 for site locations and Table 1 for details of pre-2013 survey years. * indicates site is located outside of the protection zone.

Discussion

A number of limitations of the 2013 survey data (and historical comparison) should be noted prior to discussion of the results:

- Underwater visual census (UVC) surveys have inherent biases (e.g. Edgar et al. 2004) and thus some degree of caution should be used when interpreting the 2013 and historical data. For example, while all survey participants were trained in UVC techniques and the identification of WBG life stages, different surveys were conducted by different people. In addition, surveys were a mixture of SCUBA and snorkel and this may influence results to some degree.
- Interpretation of possible temporal patterns should be treated with caution as only two time periods were available for comparison and the baseline period was spread over several years across the sites.
- Although historical transects were generally excluded from the comparison if they had been undertaken in different depths or exposures, this task was made difficult by the absence of

an estimated exposure index or species-level data on the macroalgal assemblage for the 2013 surveys. Furthermore, there may have been subtle differences in the precise geographical location between historical and 2013 surveys; an approximate site location may be inadequate where other physical conditions (and thus habitability for different WBG size classes) change dramatically over small distances, e.g. relief.

Nonetheless, in terms of conservation concerns for the WBG a number of key points have emerged from the analysis of the 2013 survey data and the comparison with historical data:

- The spatial pattern of adult abundance in the 2013 survey differs to that described in Shepherd and Brook (2007) where adult abundance declined from west to east; this was suggested to be due to a combination of fishing and natural distribution patterns where SA is at the eastern end of the species range. The current (2013) pattern could be linked to natural distribution patterns and the effect of the protection zone.
- No adults were recorded in 2013 at the Eyre Peninsula sites, which are all outside of the protection zone. Adults had previously been recorded at some of these sites. The Eyre Peninsula sites are all accessible to shore-based line fishers and spear fishers. If this is indeed a real temporal change and a real indication of current status, it is not particularly surprising given the life-history traits of WBG, i.e. the species is highly vulnerable to localised depletions (Bryars et al. 2012). The lack of adults at the South East sites is more likely explained by the natural distribution limits of the species range (see Shepherd and Brook 2007), although WBG are being recorded more frequently in Victoria (the species has recently been given total protection in that State) and juveniles/sub-adults were found at Nora Creina in 2013 and on previous surveys.
- Adults were recorded at many of the Yorke Peninsula and Kangaroo Island sites that lie inside the protection zone. Most of the Yorke Peninsula sites are accessible to shore-based line fishers and spear fishers. At many of the sites, sub-adults but no adults had been recorded previously; it is possible that with protection some of the sub-adults have grown into adults between the two survey periods. The natural conclusion from this is that the protection zone has been effective in some locations. If this is indeed a real pattern, it is not particularly surprising as protection of the eastern blue groper (*Achoerodus viridis*) in New South Wales has ensured that adult fish are abundant in readily-accessible locations around Sydney (e.g. Lee et al. submitted). Sub-adult and adult WBG are also being seen in Gulf St Vincent near metropolitan Adelaide where they were previously unseen for many years (S. Bryars, pers. obs.) and the abundance of WBG at the Penneshaw breakwater (see Shepherd and Baker 2008) indicates how rapidly the species can colonise an area if it is protected. The lack of WBG at some of the Fleurieu Peninsula sites where they have been recorded previously (i.e. Cape Jervis), was somewhat surprising and may reflect the relatively low number of transects at that site in the 2013 surveys.
- Shepherd and Brook (2007) previously recorded adult WBG at some (but not all) of the Eyre Peninsula sites that were surveyed. They hypothesized that some adults migrate to offshore islands (where they found them to be far more abundant) and that this was partly responsible for their observed pattern. However, information from old fishing and diving publications indicates that adult WBG did previously occur at many mainland Eyre Peninsula sites with shore access and where Shepherd and Brook (2007) recorded zero adults,

including Point Drummond, Memory Cove, and Smooth Pool (S. Bryars, unpublished data). For example, one account for Smooth Pool reads “Groper abound, and it is quite common to see three or four large fish slowly cruising about the bottom of the pool” (‘Where to Fish in South Australia’ by Gordon Hume). Again, the apparent ‘disappearance’ of adult WBG from such locations would not be surprising given their life history traits and the ease of shore-based access.

- Juvenile recruitment appears to be sporadic and may occur in pulse events. For example, in previous surveys, juveniles were highly abundant at Speeds Point and Browns Beach, but less so in 2013, while at Golden Island Point and Foul Bay the reverse trend was observed. Sporadic recruitment may be expected for a species with a planktonic larval phase (see Shepherd and Brook 2007). Such recruitment patterns mean that replenishment of locally-depleted populations would be dependent on a successful pulse of juvenile settlement. It is likely that juvenile recruitment is affected to some extent by the strength of the Leeuwin Current and a supply of larvae from SW Western Australia where adult WBG are far more abundant (S. Shepherd, pers. comm.). Nonetheless, it is apparent that juvenile recruitment is occurring across SA (and not just in the west) and thus a lack of adults at sites outside the protection zone cannot be attributed to a lack of juvenile recruitment.

Recommendations

- Conclusions from the present report should be treated as preliminary, with further work required to clarify the status of WBG in SA.
- All available information should be used to identify any differences in survey locations between previous surveys and a site atlas should be developed with maps, GPS marks and notes on the positioning of individual transects based on the available information.
- Future surveys should be conducted at precisely the same geographic locations as in previous surveys, and, where necessary, incorporate extra transects to ensure that all historical transects have been repeated.
- All habitat data described by Shepherd and Brook (2007) should be recorded during future surveys.
- Future surveys should focus particularly on sites outside of the protection zone on Eyre Peninsula, and include a larger number of sites, particularly targeting those with historical data on the occurrence of WBG, e.g. Smooth Pool. The area around Cape Jervis and Fisheries Beach should also be a priority area for future surveys.
- SCUBA transects should be included at sites where WBG were not recorded in 2013 but were previously recorded using SCUBA.

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Appendix 1

Raw abundance data for western blue groper at the 25 sites surveyed in 2013. * denotes blue male.

Region	Site	Survey ID	Total	<10	10-15	15-20	20-25	25-30	30-35	35-40	40-50	50-70	>70
EP	Pt Westall	84	1			1					1*		
EP	Pt Westall	85	1								1		
EP	Pt Westall	86	2				1		1				
EP	Pt Westall	87	0										
EP	Speeds Point	80	6		1		4	1					
EP	Speeds Point	81	15				5	8	2				
EP	Speeds Point	82	5			4				1			
EP	Speeds Point	83	10			6	1	2	1				
EP	Speeds Point	113	2				2						
EP	Speeds Point	114	8			1	1	1	3	2			
EP	Speeds Point	115	1					1					
EP	Speeds Point	116	3							2	1		
EP	Speeds Point	127	22				6	3	7	6			
EP	Speeds Point	128	11				5	1	4	1			
EP	Speeds Point	136	0										
EP	Speeds Point	137	16		1	5	7	1	1	1			
EP	Anxious Bay	16	3					3					
EP	Anxious Bay	17	7			2	1	3	1				
EP	Anxious Bay	18	12			6	4	2					
EP	Anxious Bay	19	6				5	1					
EP	Anxious Bay	36	8		2	5		1					
EP	Anxious Bay	37	1			1							
EP	Anxious Bay	38	0										
EP	Anxious Bay	39	0										

Region	Site	Survey ID	Total	<10	10-15	15-20	20-25	25-30	30-35	35-40	40-50	50-70	>70
EP	Anxious Bay	40	0										
EP	Anxious Bay	41	0										
EP	Anxious Bay	42	0										
EP	Anxious Bay	43	0										
EP	Anxious Bay	44	0										
EP	Anxious Bay	45	0										
EP	Anxious Bay	46	0										
EP	Golden Island Point	32	12	4	8								
EP	Golden Island Point	33	22	2	10	10							
EP	Golden Island Point	34	10	4	5	1							
EP	Golden Island Point	35	3		3								
YP	Browns Beach	2	2		2								
YP	Browns Beach	3	0										
YP	Browns Beach	4	4	4									
YP	Browns Beach	5	2	1			1						
YP	Browns Beach	6	0										
YP	Browns Beach	7	0										
YP	Groper Bay	8	4	3	1								1*
YP	Groper Bay	10	0										
YP	Groper Bay	11	2		2								
YP	Chinamans Hat	12	0										
YP	Chinamans Hat	13	0										
YP	Chinamans Hat	14	0										
YP	Chinamans Hat	15	3								1	2	
YP	Foul Bay	20	2							2			
YP	Foul Bay	21	0										
YP	Foul Bay	22	1								1*		
YP	Foul Bay	23	0										

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Region	Site	Survey ID	Total	<10	10-15	15-20	20-25	25-30	30-35	35-40	40-50	50-70	>70
YP	Foul Bay	24	0										
YP	Foul Bay	25	0										
YP	Foul Bay	26	1			1							
YP	Foul Bay	27	0										
YP	Foul Bay	28	0										
YP	Foul Bay	29	5			3	2						
YP	Foul Bay	30	1							1			
YP	Foul Bay	31	111			111							
YP	Edithburgh Pool	47	0										
YP	Edithburgh Pool	48	2	1	1								
YP	Edithburgh Pool	49	0										
YP	Edithburgh Pool	50	0										
YP	Edithburgh Pool	51	0										
YP	Edithburgh Pool	52	0										
YP	Edithburgh Pool	53	2										2
YP	Edithburgh Pool	54	0										
YP	Edithburgh Pool	55	1			1							
YP	Edithburgh Pool	56	0										
YP	Edithburgh Pool	57	0										
KI	Snellings	210	0										
KI	Snellings	211	0										
KI	Snellings	212	0										
KI	Snellings	213	1						1				
KI	Stokes Bay West	202	2						2				1*
KI	Stokes bay West	203	0										
KI	Stokes Bay West	204	1				1						
KI	Stokes bay West	205	1									1*	
KI	White point	214	1								1		

Region	Site	Survey ID	Total	<10	10-15	15-20	20-25	25-30	30-35	35-40	40-50	50-70	>70
KI	White point	215	0										
KI	White point	216	0										
KI	Frenchmans	225	0										
KI	Frenchmans	226	0										
KI	Frenchmans	227	0										
KI	Frenchmans	228	1								1		
KI	Lavers Reef	206	0										
KI	Lavers Reef	207	1							1			
KI	Lavers Reef	208	3							1	2	1*	
KI	Lavers Reef	209	0										
KI	Kangaroo Head	217	0										
KI	Kangaroo Head	218	4					2	1	1			
KI	Kangaroo Head	219	3							2	1	1*	
KI	Kangaroo Head	220	3							1	2	1*	
KI	Ironstone	221	1				1						
KI	Ironstone	222	3	1			1	1					
KI	Ironstone	223	0										
KI	Ironstone	224	0										
FP	Pt Noarlunga Nth Outside	67	0										
FP	Pt Noarlunga Nth Outside	68	0										
FP	Pt Noarlunga Nth Inside	71	0										
FP	Pt Noarlunga Nth Inside	72	0										
FP	Pt Noarlunga Sth Inside	69	0										
FP	Pt Noarlunga Sth Inside	70	0										
FP	Pt Noarlunga Sth Inside	73	0										
FP	Pt Noarlunga Sth Inside	74	0										
FP	Second Valley	75	0										

Region	Site	Survey ID	Total	<10	10-15	15-20	20-25	25-30	30-35	35-40	40-50	50-70	>70
FP	Second Valley	76	0										
FP	Second Valley	77	0										
FP	Second Valley	78	0										
FP	Second Valley	79	0										
FP	Second Valley	103	0										
FP	Second Valley	104	0										
FP	Second Valley	134	0										
FP	Second Valley	135	0										
FP	Rapid Bay Jetty	92	0										
FP	Rapid Bay Jetty	93	0										
FP	Rapid Bay Jetty	94	0										
FP	Rapid Bay Jetty	95	0										
FP	Rapid Bay Jetty	96	0										
FP	Rapid Bay Jetty	105	0										
FP	Rapid Bay Jetty	106	0										
FP	Rapid Bay Jetty	125	0										
FP	Rapid Bay Jetty	126	0										
FP	Rapid Bay Jetty	131	0										
FP	Rapid Bay Jetty	132	0										
FP	Rapid Bay Jetty	133	0										
FP	Cape Jervis	61	0										
FP	Cape Jervis	62	0										
FP	Cape Jervis	129	0										
FP	Cape Jervis	130	0										
FP	Fisheries Beach	63	0										
FP	Fisheries Beach	64	0										
FP	Fisheries Beach	65	0										
FP	Fisheries Beach	66	0										

Region	Site	Survey ID	Total	<10	10-15	15-20	20-25	25-30	30-35	35-40	40-50	50-70	>70
FP	Fisheries Beach	101	0										
FP	Fisheries Beach	102	0										
FP	Bluff	58	1					1					
FP	Bluff	59	0										
FP	Bluff	60	0										
FP	Bluff	99	4			2	1	1					
SE	Nora Creina	109	0										
SE	Nora Creina	110	1			1							
SE	Nora Creina	111	3		2	1							
SE	Nora Creina	112	0										
SE	Nora Creina	121	0										
SE	Nora Creina	122	1			1							
SE	Nora Creina	123	0										
SE	Nora Creina	124	11	1	5	4	1						
SE	Post Office Rock	88	0										
SE	Post Office Rock	89	0										
SE	Post Office Rock	90	0										
SE	Post Office Rock	91	0										
SE	Post Office Rock	117	0										
SE	Post Office Rock	118	0										
SE	Post Office Rock	119	0										
SE	Post Office Rock	120	0										