Tasmanian Recreational Dive Clubs

Subtidal Reef Monitoring and Community Awareness Project

A Project supported by the Tasmanian Government's Fishwise Fund.

Data report on the long-spined sea urchin

October 2009

Tasmanian Scuba Diving Club (co-ordinator)

With our partners
Leven Sub-Aqua Club
Oceans Dive Club
Tasmanian Marine Naturalists Association
Tasmanian Sub-Aqua Club
TDA Crabs Dive Club
University of Tasmania Dive Club

Table of Contents

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NON-TECHNICAL SUMMARY

The range extension of the long-spined sea urchin to eastern Tasmania and the resultant overgrazing of kelp beds has been of marked interest to recreational divers over past decades. Receiving financial support for a subtidal reef monitoring and community awareness project from the Tasmanian Government's *Fishwise* fund, the Tasmanian recreational dive clubs decided that re-surveying the abundance of this ecologically important sea urchin, relative to baselines established in 2001/02, should be the key priority of their project. Dive club volunteers were trained to identify sea urchins and assess sea urchin abundance using basic subtidal reef monitoring techniques.

Based on the re-survey of a subset of eastern Tasmanian sites, there was a slight overall trend of increasing density of the sea urchin between the 2001/02 to 2008/09 sampling periods. However, due to high variability in density estimates within and among sites (reflecting the very patchy nature of the sea urchin) this increase was not statistically significant, i.e. the null hypothesis of a static urchin population could not be rejected. Demonstrating consistency over time, relative patterns in abundance of the sea urchin across eastern Tasmanian sites were similar between sampling periods as sites observed to contain high densities in 2001/02 also contained high densities in 2008/09. A similar pattern emerged with respect to the extent of the sea urchins barrens habitat which also increased slightly, but not significantly. Again there were similar patterns in the distribution of barrens across sites between sampling periods. Also reflecting the findings of the prior survey were general patterns in the depth distribution of the sea urchin; a strong relationship between long-spined sea urchin density and the cover of barrens habitat (but very weak relationship between the local short-spined sea urchin and barrens habitat on swell exposed reefs); and broadly negative associations between the abundance of black-lipped abalone plus southern rock lobster with increasing abundance of the long-spined sea urchin and increasing cover of its' barrens habitat. That is, high densities of abalone and rock lobster were not associated with high densities of the long-spined sea urchin or extensive cover of its barrens habitat.

Supplementing the quantitative survey, the collation of qualitative diver observations on the long-spined sea urchin in Tasmania was also a focus of the project. Notably, incipient barrens patches surrounding aggregations of sea urchins or single individuals (typically observed as 0.5-10 m^{-2} holes grazed within kelp beds) were observed to be common along the east coast and were reported as far south as Bruny Island. Because of the major impacts of widespread sea urchin barrens on fisheries productivity and biodiversity, the presence of incipient barrens and the possibility of coalescence of these features into widespread barrens habitat poses a significant threat to the structure and functioning of rocky reefs across large areas of eastern Tasmania. Based on thermal conditions suitable for successful development of the sea urchins' larvae, continued warming of eastern Tasmanian coastal waters appears to be favouring ongoing recruitment of the sea urchin. In support of this prediction, the strongest recruitment of juvenile long-spined sea urchins (<60 mm shell width) was observed across eastern Tasmanian reefs during 2008. While such small individuals remain largely cryptic, providing that the adult population remains stable, growth and emergence of these individuals will increase overall rates of grazing and may ultimately lead to expansion and/ or coalescence of incipient barrens patches. Importantly, the data contained in this report contributes to a baseline of information that will allow trends in the population dynamics of the long-spined sea urchin to be assessed over subsequent years.

PROJECT MOTIVATION

Background

Many divers have seen disturbing changes in the oceans over the last few decades including the loss of Giant Kelp beds, declines in some marine species, more invasive marine pests and the effects of climate change warming the East Coast of Tasmania. The prevalence of long-spined sea urchins barrens in the North of the State was a catalyst for the decision to initiate this project.

Local recreational dive clubs have decided that they want to do more to assist scientists in gaining a better understanding of our changing marine environment. In consultation with the scientific community it was decided that subtidal reef monitoring is an activity where recreational divers with suitable training can do vital work to add to the body of knowledge on subtidal reef ecosystems and the threats to these systems.

Monitoring the spread of long-spined sea urchin barrens down Tasmania's East Coast has been selected as the priority task for this project. This project initially focussed on mobilising, training and educating volunteers. It also provided useful sea urchin density data from initial surveys.

Regular monitoring, which it is hoped will be assisted by the skills gained during this project, will provide further long-term data on the sea urchin threat. This information will become a valuable management tool in determining the long-term changes in the reef ecosystem. It is hoped that following these urchin surveys divers will gradually learn to add more complex measurements and be able to participate in a wider variety of scientific surveys in the longer-term.

It is also hoped that the project will encourage ongoing engagement between recreational divers and the scientific community and this will ensure that scientific, educational and training benefits flow on beyond the initial life of the project.

Project aims and objectives

- Monitor the effect of invasive marine species, particularly the long-spined sea urchin *Centrostephanus rodgersii* at representative sites.
- Identify major shifts in biodiversity at representative sites (main focus initially will be on the formation of urchin barrens) and provide an 'early warning system' for threats to that biodiversity.
- Educate divers and the general community about the marine environment.
- Provide other information collected during surveys, such as seaweed samples and photographs of unique animals to scientific bodies for further research.
- Provide reliable data (initially on sea urchin barrens) that will complement any studies planned to be undertaken by scientific bodies.
- Provide reliable observational reports that can supplement the known distribution of *C. rodgersii* and its grazing impacts.
- Analyse and refine methods for volunteer participation in volunteer research projects.
- Build up a volunteer skills base for further community research projects.

Approach

The recreational dive clubs consulted with the local scientific community to create an education and training program. A survey methodology was refined that would maximise the benefits to be obtained from the limited resources, in a manner that took into account the skills and limitations of the participant organisations.

Divers were invited to marine awareness and survey methodology training that achieved a solid penetration within the local recreational diving community. At training days run at St Helens in the North and Tinderbox in the south of the State, representatives from all of Tasmanian's dive clubs attended the training, with approximately 50 divers attending overall. This became a core of trained divers that later led the transect survey dives in the next phase of the project.

After training, participants adopted responsibility for different regions along Tasmania's East Coast. These regional boundaries corresponded with the regions identified in an earlier Fisheries Research and Development Corporation (FRDC) survey (Project No. 2001/044; *refer to* Johnson et al. 2005).

The clubs took responsibility for the following areas;

1. Eddystone Point – Leven Sub-Aqua Club (Devonport)
2. St Helens – joint survey on training day (later dropped to avoid overlaps with TAFI programs)
3.4 Mile/ Chain of Lagoons area – TSDC (Hobart)
4. Bicheno - ODP (Launceston)
5. Cape Tourville - ODP (Launceston)
6. Schouten – ODP & TSDC (Hobart)
7. Eastern Maria TSAC and TUDC – (Hobart)
8. Lagoon Bay-Cape Surville - TSDC (Hobart) (later dropped to avoid overlap with TAFI programs)
9. Fortescue - TDA Crabs and TSDC (Hobart)
10. Wedge/Salters - TUDC (University)
11. North Bruny – joint survey on training day
12. Adventure Bay/Fluted Cape - TUDC
13. Recherche Bay/Actaeons – not proceeded with due to apparent lack of urchin activity in favour of duplication further north

It was envisioned that the surveys would be split into two types with density counts along transect lines being done north of Tasman Island where the Eastern Australian Current (EAC) is strongest. South of Tasman Island the surveys were planned to be undertaken as free-range dives looking for barrens patches, rather than as full survey counts along transect lines. A decision was taken to attempt to re-survey some of the sites from the earlier FRDC study in 2001/02, so that participants could obtain immediate comparative information. Other new sites were selected largely to investigate a deeper depth range (>18 m) that was not previously surveyed by divers. Participants were also encouraged to collect and report further information on barrens encountered during regular social dives across Tasmania. A website was created to store the information for public dissemination, and also to advertise the need for social dive reports. Information on urchin biology and project aims was also displayed. This site can be accessed at www.otsweb.net/divesurveys.

METHODS

Monitoring of sea urchins, barrens habitat and other important benthic invertebrates.
Dive club volunteers were trained to identify long-spined sea urchins (*Centrostephanus rodgersii*), native short-spined sea urchins (*Heliocidaris erythrogramma*) and sea urchin barrens habitat. Common targets of recreational fishers and well known among marine naturalists, club divers were already familiar with important benthic invertebrates such as the black-lipped abalone (*Halitis rubra*) and southern rock lobster (*Jasus edwardsii*). Divers were trained to undertake two basic benthic survey techniques, i.e. belt transects and timed swims. Giving credence to volunteer divers collecting scientifically valid data, recent work by Edgar & Stuart-Smith (2009) demonstrate that volunteer divers trained in benthic transect techniques can provide reliable estimates of the abundance of benthic taxa.

Distribution of Centrostephanus rodgersii populations
Recreational divers attempted to repeat transect surveys in areas previously targeted in the 2001/02 FRDC survey (Johnson et al. 2005). Sites additional to the prior survey were also surveyed. GPS units were used to locate both the start and end positions of the previously surveyed sites. Belt transects were originally set perpendicular to the shore, extending from approx. 3 m depth to a maximum depth of 18 m or a maximum total length of 100 m if the maximum seaward depth was less than 18 m. The current survey used transects of a standard 50 m length and overlapped as much as practicable with the existing survey positions. On each transect line, a pair of buddy divers (or occasionally individual divers) worked to 1 m each side of the line, and for each 5 m section of the transect recorded depth, the abundance of sea urchins (*Centrostephanus rodgersii* and *Heliocidaris erythrogramma*), rock lobster (*Jasus edwardsii*) and abalone (*Haliotis rubra*). Each diver used a 1 m pole to define the 1 m swath width along the transect line and held a slate with printed data sheet on which all data were recorded.

Distribution of Centrostephanus rodgersii barrens
Along the same belt transects used to assess the abundance of sea urchins and other benthic invertebrates, the percentage cover of sea urchin barrens and brown macroalgae was estimated to the nearest 5 % for each of the 5 x 1 m sections (i.e. quadrats).

Supplementary information on the distribution of *Centrostephanus rodgersii* and the occurrence of barrens habitat in Tasmanian coastal waters was obtained by collating observational accounts by recreational divers (*see* Appendix IV).

Data analysis
Densities (no. individuals m^{-2}) of sea urchins and other benthic invertebrates were averaged across transects which provided replicate samples within each survey site. Data were analysed using analysis of variance (ANOVA) using a 2-factor fixed effects model structure testing the effects of "Time", i.e. 2001/02 versus 2008/09 and "Site", i.e. spatial variability across the Tasmanian eastcoast, plus the interactive term of "Time" by "Site", i.e. variability among sites between sampling periods. Percentage cover of *Centrostephanus* barrens was also averaged across transects and analysed with the same ANOVA model. Note that only a subset of transects were resurveyed during 2008/09 relative to the original 2001/02 survey (FRDC – Johnson et al. 2005), thus only transects with reasonable spatial overlap (~1000s m) between sampling periods were included in the analysis. Further note that the number of replicate

transects per site that were surveyed during both periods ranged between 2-7 replicate transects per site resulting in an unbalanced ANOVA design. Therefore, Type III Sums of Squares were used for all tests.

Depth distributions of sea urchins, barrens habitat and relationships between *C. rodgersii*, sea urchin barrens and other benthic invertebrates were explored.

RESULTS

Patterns in Centrostephanus rodgersii abundance & barrens habitat 2001/02–2008/09

Average density of *Centrostephanus rodgersii* increased from 2001/02 to 2008/09 (Fig. 1a), however analysis of variance revealed no evidence of significant variability between sampling periods (Table 1a). Analysis of variance revealed significant variability between sites (Table 1a) with highest density found at St. Helens and lowest density found at the North Bruny site where no urchins were recorded on transects (Fig. 1a). Importantly, there was a lack of significant variability for the Time by Site interaction term, thus patterns in variability between sites were not different between the 2001/02 and 2008/09 sampling periods (Table 1a).

Average percentage cover of *Centrostephanus rodgersii* barrens also increased from 2001/02 to 2008/09 (Fig. 1b), however analysis of variance again revealed no evidence for a statistically significant increase in barrens habitat between sampling periods (Table 1b). Analysis of variance revealed significant variability between sites (Table 1b) with highest cover of barrens found at St. Helens and nil barrens cover observed on transects at 3 of 9 survey sites (Fig. 1b). Importantly, there was a lack of significant variability for the Time by Site interaction term, thus patterns in variability between sites were not different between the 2001/02 and 2008/09 sampling periods (Table 1b).

The depth distribution of *Centrostephanus rodgersii* as assessed by diver transects showed peak abundances between depths of 12 and 20 metres; notably *C. rodgersii* was not observed in depths shallower than 10 m on transects and densities appeared to decline in depths > 20 m (Fig. 4a). The depth distribution of the barrens habitat broadly reflected the depth distribution of *C. rodgersii*, however in deeper water (>15 m) high percentage covers of barrens habitat appeared to occur with lower abundances of sea urchins relative to shallow distribution of the barrens habitat (Fig. 4b). As ascertained from a limited number of timed swims (N=13), the incidence of incipient *Centrostephanus rodgersii* barrens (barrens patches observed per minute of diving) declined from north to southeast Tasmania (Fig. 5). Examination of barrens cover versus sea urchin density revealed a significant positive relationship, of good fit, between *C. rodgersii* density and the extent of barrens habitat (Fig. 6a). In contrast, while a positive relationship was revealed between *H. erythrogramma* density and the extent of barrens, this relationship was of very poor fit (Fig. 6b).

Associations between Centrostephanus rodgersii & other benthic invertebrates

Plotting *H. erythrogramma* density against that of *C. rodgersii* revealed evidence of a negative factor-ceiling type distribution whereby high densities of each species is generally associated with lower densities of the other (Fig. 6c). Evidence of such negative distributions were also apparent for black-lipped abalone (*Haliotis rubra*) versus *Centrostephanus rodgersii* (Fig. 7a) plus abalone versus barrens (Fig7b); and rock lobster (*Jasus edwardsii*) versus *C. rodgersii* (Fig.7c) plus rock lobster versus barrens (Fig. 7d). That is, high densities of abalone and rock lobster are generally not associated with high densities of *C. rodgersii* or its barrens habitat.

Table 1. Analysis of variance table for unbalanced 2-factor fixed effects ANOVA testing the effects of "Time", i.e. 2001/02 versus 2008/09 ; and "Site", plus the interactive term of "Time" by "Site" for a. variability in *Centrostephanus rodgersii* density; and b. variability in the cover of *Centrostephanus rodgersii* barrens habitat. Note to meet the assumption of homogeneity of variances *C. rodgersii* density and percent barrens cover estimates (Y) were transformed $Y^{0.4}$ and $\log(Y+0.001)$ respectively. Further note that due to the unbalanced nature of the ANOVA design all tests are based on Type III Sums of Squares. Tests highlighted in bold indicate significance at the $\alpha=0.05$ level.

a.

Source	df	*F* value	*Pr>F*
Time	1	$F_{1,56}$=1.23	P=0.272
Site	8	**$F_{8,56}$=9.17**	**P<0.0001**
Time*Site	8	$F_{8,56}$=1.09	P=0.381
error	56		

b.

Source	df	*F* value	*Pr>F*
Time	1	$F_{1,56}$ = 0.99	P=0.3230
Site	8	**$F_{1,56}$ = 8.04**	**P<0.0001**
Time*Site	8	$F_{1,56}$ = 1.21	P=0.3120
error	56		

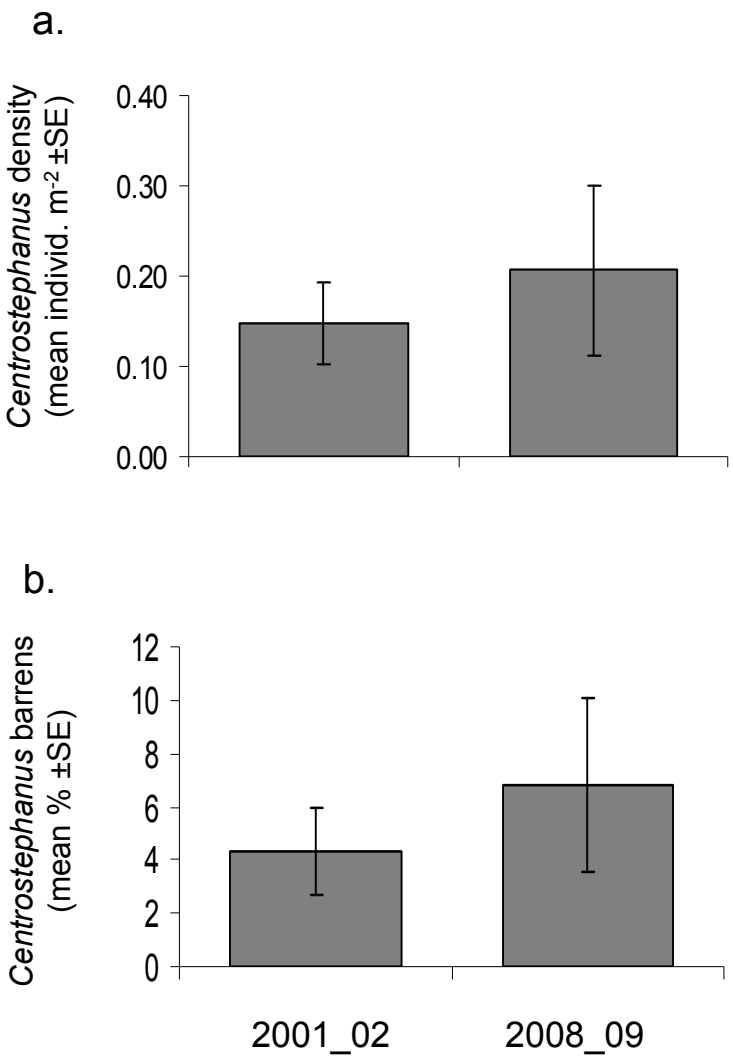

Figure 1. Patterns in *Centrostephanus rodgersii* density (a.) and associated barrens habitat between the 2001/02 (*redrawn from* Johnson et al. 2005) and 2008/09 sampling periods as assessed by recreational club diver transects.

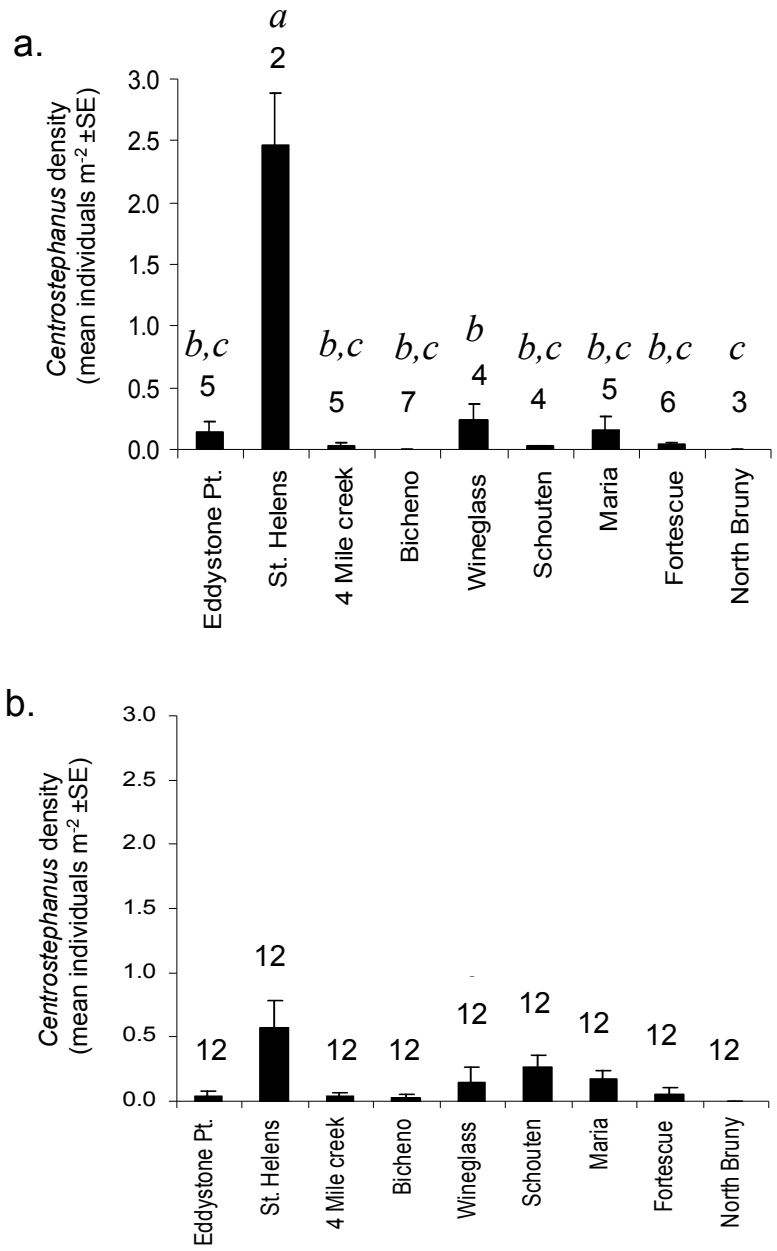

Figure 2. Density of *Centrostephanus rodgersii* across the 9 eastern Tasmanian survey sites. a.) Tasmanian recreational dive club survey 2008-09. b.) FRDC survey 2001-02 (*redrawn from* Johnson et al. 2005). The number of transects surveyed at each site is shown above each bar. Letters above each bar in (a.) indicate REGWQ groupings based on data pooled across sampling periods, i.e. shared letters indicate sites that are not significantly different.

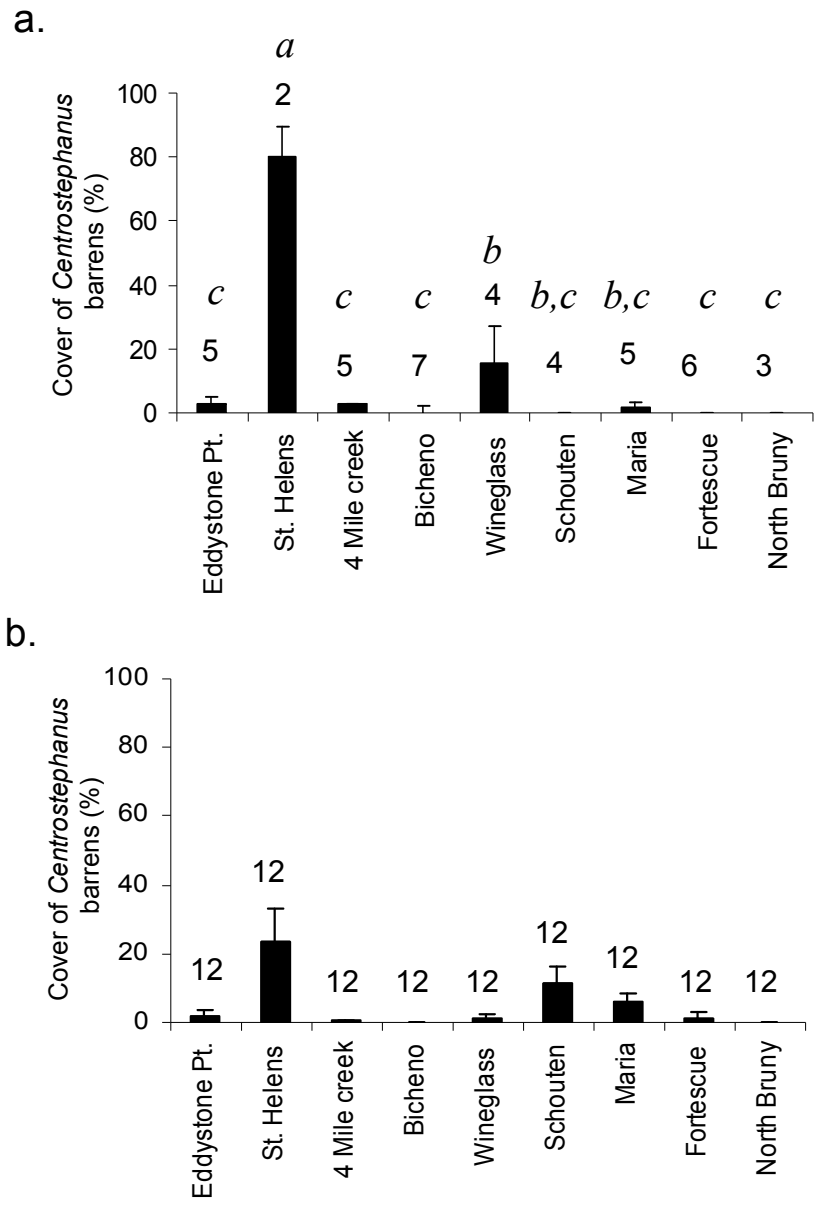

Figure 3. Percentage of rocky reef as *Centrostephanus rodgersii* barrens across the 9 eastern Tasmanian survey sites as assessed by diver transects. a) Tasmanian recreational dive club survey 2008-09. b) FRDC survey 2001-02 (Johnson et al. *unpublished data*). The number of transects surveyed at each site is shown above each bar. Letters above each bar in (a.) indicate REGWQ groupings based on data pooled across sampling periods, i.e. shared letters indicate sites that are not significantly different.

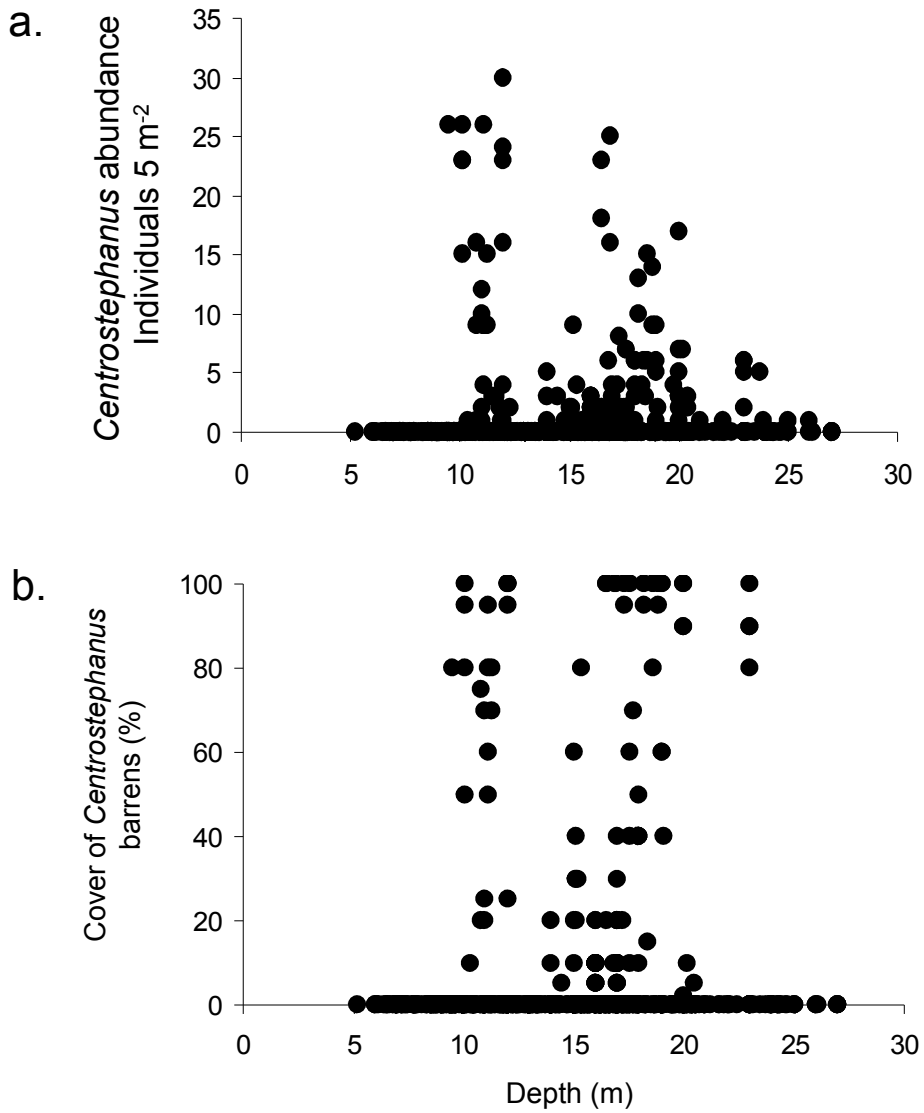

Figure 4. Depth distribution of *Centrostephanus rodgersii* (a.) and sea urchin barrens (b.) in eastern Tasmania as assessed by diver transects during the 2008/09 survey. Data are for each 5 by 1 m quadrat pooled across all transects.

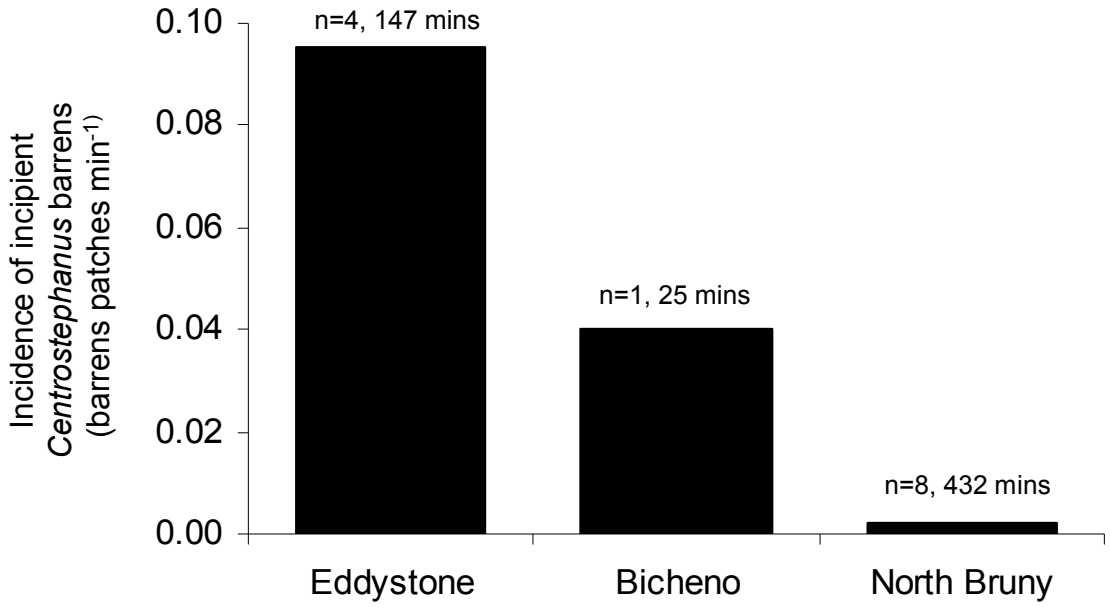

Figure 5. Incidence of incipient *Centrostephanus rodgersii* barrens on reefs from north (Eddystone) to south (North Bruny) east Tasmania as assessed during a total of 10 hrs of free-ranging timed swims by club divers during 2008/09. The number of swims and time spent searching is shown above each bar.

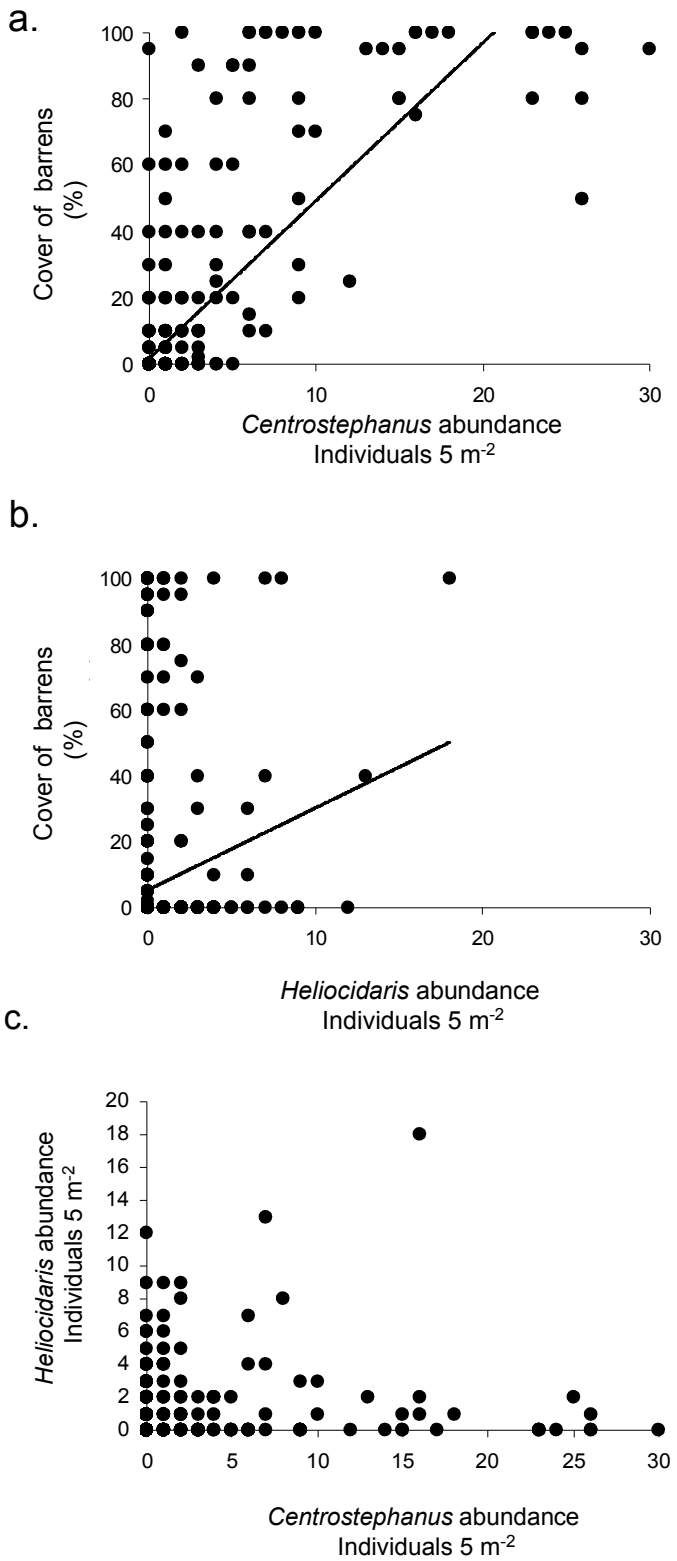

Figure 6. Relationships between sea urchin density and cover of sea urchin barrens habitat on exposed eastern Tasmanian reefs as assessed by diver transects during 2008/09. (a.) Relationship between *Centrostephanus rodgersii* and barrens habitat (linear regression, $\boldsymbol{F_{1,771}=1371.05;\ P<0.0001}$, $y = 4.76x + 1.84$, $R^2 = 0.64$). (b.) Relationship between *Heliocidaris erythrogramma* and barrens habitat (linear regression, $\boldsymbol{F_{1,771}=25.28\ ;\ P<0.0001}$; $y = 2.49x + 5.45$, $R^2 = 0.03$). (c.) Relationship between *H. erythrogramma* and *C. rodgersii*.

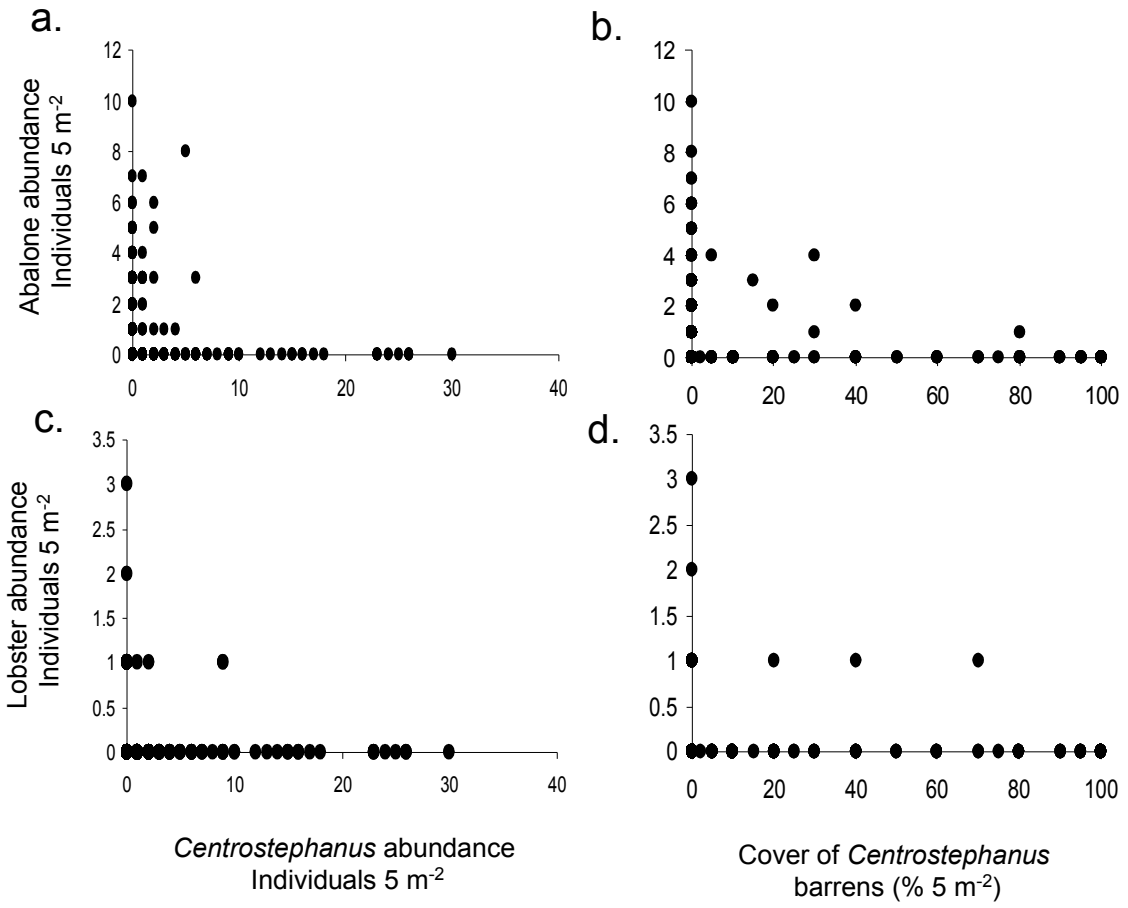

Figure 7. Relationships between abundances of black-lipped abalone (*Haliotis rubra*) and *Centrostephanus rodgersii* (a.), plus barrens habitat (b.); Southern rock lobster (*Jasus edwardsii*) and *Centrostephanus rodgersii* (c.), plus barrens habitat (d.) at a scale of 5 m^2. Data are pooled across all eastern Tasmanian sites surveyed during 2008/09.

DISCUSSION

Patterns in Centrostephanus rodgersii abundance & barrens habitat 2001/02–2008/09

Average density of *Centrostephanus rodgersii*, as assessed along belt transects by Tasmanian dive club volunteers in 2008/09, was slightly higher than compared with the prior 2001/02 survey (FRDC 2001/044). While a slight increase was apparent, which may be interpreted as a slight increasing trend in the urchin population over the past 7 years, because of high variability in density estimates within sites (reflecting the very patchy nature of the sea urchin in space) analysis of variance revealed no evidence for a statistically significant increase in sea urchin density. That is, the null hypothesis of a static urchin population could not be rejected. Demonstrating consistency over time, relative patterns in abundance of the sea urchin across eastern Tasmanian sites were similar between sampling periods as sites observed to contain high densities in 2001/02 also contained high densities in 2008/09. A similar pattern emerged with respect to the extent of the sea urchins barrens habitat which also increased slightly, but not significantly.

Clearly, for the sea urchin population to increase in size recruitment rates of new individuals to the population must exceed rates of mortality within the population. In eastern Tasmania, *C. rodgersii* is long lived (> 30 years, Ling et al. 2009) and there is no evidence of major disease driven mortality events (S. Ling *pers. obs.*) as observed for sea urchins in the northern hemisphere (*see review by* Steneck et al. 2002). Interestingly, the most notable appearance of small *C. rodgersii* on Tasmanian reefs (<60 mm shell width), in over 10 years of observations, occurred during 2008 (S. Ling *pers. obs.*). Re-survey of population size and age structure across a range of eastern Tasmanian sites relative to baselines established in 2005 (*see* Ling et al. 2009) would inform any change in population structure over recent years and determine the relative strength of the apparently strong 2008 recruitment pulse. Interestingly, new recruits were seemingly most abundant at sites where *C. rodgersii* had already established large populations, e.g. St. Helens, suggesting either differential supply of larvae to these sites (Ling et al. 2009) and/ or preferential settlement of larvae and/ or greater recruitment success on grazed habitats. Based on this observation, if barrens were to increase then the expectation would be for a pattern of increase in size of existing barrens patches rather than the continual establishment of new barrens patches.

Clearly a more robust test of possible change in sea urchin density and grazed area between the 2001/02 and 2008/09 sampling periods would have been achievable if a greater number of transects were surveyed relative to the initial baseline study (FRDC #044/2001). Given the extremely patchy nature of *C. rodgersii*, ideally all previously assessed transects would be re-surveyed to provide the best chances of detecting any real change in sea urchin density and grazed area. Nevertheless, the budget and time requirements to achieve such a task were well beyond the scope of the current project. Such a task, to be reasonably completed within 18 months, would require a dedicated team unconstrained by opportunistic sampling on weekends only.

Trained to identify and count sea urchins along transect lines, estimates of sea urchin abundance performed by the dive club volunteers were considered robust particularly as this task is considered relatively straightforward. Indicating the validity of this volunteer generated data set, general trends in the depth distribution of *C. rodgersii* and relationships with the cover of barrens habitat plus other benthic invertebrates were qualitatively identical to that described

previously in the scientific baseline survey by Johnson et al. 2005 (FRDC 2001/044). That is, similar patterns in the distribution of sea urchins and barrens habitat were observed across sites and there was a strong relationship between long-spined sea urchin density and cover of barrens habitat plus high abundances of abalone and rock lobster were not associated with high abundances of the sea urchin or extensive cover of its' barrens habitat. On this basis, the data contained in this report was considered robust. This agrees with recent findings by Edgar & Stuart-Smith (2009) who found that dive volunteers can indeed generate reliable data from transect surveys of diverse temperate and sub-tropical fish communities. Clearly for the scientific validity of volunteer collected data to hold, the level of training must increase with increasing complexity of the sampling task. As the task of counting sea urchins and broadly estimating cover of barrens habitat along transect lines was considered simple, a brief 1-day training course was deemed a sufficient level of training as all divers demonstrated competency by the completion of this course (S. Ling *personal observation*).

Supplementing quantitative transect surveys, the collation of qualitative reports on the long-spined urchin by Tasmanian recreational dive club members was also a focus of the project (*see* Appendix IV). Notably, incipient barrens patches surrounding aggregations of sea urchins or single individuals (typically observed as 0.5-10 m^{-2} holes grazed within kelp beds) were observed to be common along the east coast and were reported as far south as Bruny Island. Because of the major impacts of widespread sea urchin barrens on fisheries productivity and biodiversity, the presence of incipient barrens and the possibility of coalescence of these features into widespread barrens habitat poses a significant threat to the structure and functioning of rocky reefs across large areas of eastern Tasmania. Based on thermal conditions suitable for successful development of the sea urchins' larvae, continued warming of eastern Tasmanian coastal waters appears to be favouring ongoing recruitment of the sea urchin. Providing that the adult population remains stable, growth and emergence of these individuals will increase overall rates of grazing and may ultimately lead to expansion, development of new barrens patches and/ or coalescence of barrens patches in to larger scale features of greater ecological importance.

Conclusions

The range extension of the long-spined sea urchin to eastern Tasmania and the resultant overgrazing of kelp beds has been of marked interest to recreational divers over past decades. Based on the re-survey of a subset of eastern Tasmanian sites by recreational dive club volunteers, there was a slight but non-significant trend of increasing densities of the sea urchin and its' associated barrens habitat between the 2001/02 to 2008/09 sampling periods. The data contained within this report (*see* Appendices I-III) contributes to a baseline of information that will allow trends in the population dynamics of the ecologically important long-spined sea urchin to be assessed in Tasmania over coming years.

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APPENDIX I. Averaged abundance of invertebrates and percentage cover of *Centrostephanus rodgersii* barrens and kelp cover by eatsern Tasmanian site, 2008-2009.

			Mean individuals m^{-2} and percentage cover					
Site	**Subsite**	**Transect**	***C. rodgersii***	***H. erythrogramma***	**Rock Lobster**	**Abalone**	**Barrens Cover (%)**	**Kelp cover (%)**
Eddystone Pt.	SE Eddystone	1	0.05	0.05	0.00	0.04	0.13	99.82
	SE Eddystone	2	0.01	0.03	0.00	0.07	0.00	100.00
	SE Eddystone	3	0.01	0.03	0.00	0.07	0.00	100.00
	SE Eddystone	4	0.42	0.65	0.00	0.00	6.00	94.00
	Halftide Rock	5	0.24	0.16	0.02	0.02	9.00	88.75
St. Helens	Elephant Rock	1	2.88	0.10	0.02	0.00	70.53	32.50
	Elephant Rock	2	2.04	0.46	0.00	0.00	89.75	5.25
Four-Mile Crk.	Ironhouse Pt 3	1	0.14	0.32	0.02	0.22	14.44	71.11
	Saltwater Inlet	2	0.00	0.00	0.00	0.42	0.00	100.00
	Ironhouse Pt 2	3	0.03	0.07	0.00	0.05	0.00	81.58
	Ironhouse Pt 1	4	0.00	0.03	0.00	0.09	0.00	100.00
	Ironhouse Pt 4	5	0.00	0.03	0.00	0.00	0.00	83.00
Bicheno	Governors	1	0.01	0.07	0.02	0.13	0.00	83.50
	Governors	2	0.01	0.00	0.01	0.07	0.00	14.29
	Governors	3	0.00	0.00	0.00	0.04	0.00	100.00
	Governors	4	0.00	0.00	0.00	0.04	0.00	100.00
	Lodi	5	0.00	0.00	0.00	0.00	0.00	98.50
	Lodi	6	0.00	0.00	0.00	0.00	0.00	100.00
	Lodi	7	0.00	0.03	0.00	0.00	0.00	100.00
Wineglass	Cape Tourville	1	0.05	0.01	0.00	0.01	0.75	99.25
	Cape Tourville	2	0.12	0.03	0.05	0.05	2.75	94.25
	Cape Tourville	3	0.61	0.00	0.00	0.00	49.00	51.00
	Cape Tourville	4	0.18	0.00	0.00	0.00	10.25	89.75
Schouten Is.	Taleffer Rocks	1	0.03	0.05	0.00	0.11	0.00	100.00
	Sarah-Anne Bay S1	2	0.03	0.03	0.01	0.00	0.50	99.50
	Sarah-Anne Bay S2	3	0.04	0.06	0.01	0.06	0	74.5
	Sarah-Anne Bay S3	4	0.00	0.00	0.02	0.02	0.00	100.00
Maria Is.	Mistaken Cape	1	0.58	0.00	0.01	0.16	8.25	75.75
	Mistaken Cape	2	0.20	0.02	0.00	0.16	0.00	85.00
	Beaching Bay	3	0.00	0.00	0.00	0.32	0.00	100.00
	Beaching Bay	4	0.00	0.06	0.00	0.21	0.50	88.00
	Mistaken Cape	5	0.01	0.00	0.02	0.11	0.00	83.75
Fortescue Bay	Fortescue Bay	1	0.10	0.58	0.00	0.32	0.00	100.00
	Fortescue Bay	2	0.00	0.00	0.00	0.06	0.00	100.00
	Lanterns 1	3	0.05	0.20	0.00	0.14	0.00	85.00
	Lanterns 2	4	0.00	0.00	0.01	0.00	0.00	100.00
	Lanterns 3	5	0.06	0.28	0.00	0.04	0.00	100.00
	The Thumbs	6	0.06	0.29	0.01	0.31	0.00	99.00
North Bruny	North Bruny 1	1	0.00	0.22	0.02	0.05	0.00	90.50
	North Bruny 2	2	0.00	0.00	0.00	0.00	0.00	69.23
	North Bruny 3	3	0.00	0.18	0.04	0.22	0.00	100.00

APPENDIX II. Raw transect data for eastern Tasmanian surveys 2008-2009. Note transects are grouped north to south by site, i.e. Eddystone to North Bruny, page 1 of 20.

Date	Diver	Site	Transect Start Longitude	Transect Start Latitude	Transect End Longitude	Transect End Latitude	Trans (No./Side)	Depth at 0m	Transect Distance	Depth	Centro	Helio	Rock Lobster	Abalone	% Barrens	kelp cover
18/04/2009	G.Close	Eddystone Point	148 21.080	40 59.286	148 21.034	40 59.277	1L	20	0-5	20.0	0	0	0	0	0	100
									5-10	20.0	3	0	0	0	2	98
									10-15	20.0	0	0	0	0	SAND	0
									15-20	20.0	0	0	0	0	SAND	0
									20-25	20.0	0	0	0	0	SAND	0
									25-30	20.0	0	0	0	0	SAND	0
									30-35	20.0	0	0	0	0	SAND	0
									35-40	19.0	0	0	0	0	0	100
									40-45	18.0	0	1	0	2	0	100
									45-50	18.0	0	1	0	0	0	100
18/04/2009	P.Clancy	Eddystone Point	148 21.080	40 59.286	148 21.034	40 59.277	1R	20	0-5	20.0	0	0	0	0	0	100
									5-10	20.0	0	0	0	0	0	100
									10-15	20.0	0	0	0	0	0	100
									15-20	20.0	0	0	0	0	0	SAND
									20-25	20.0	0	0	0	0	0	SAND
									25-30	20.0	0	0	0	0	0	SAND
									30-35	20.0	0	0	0	0	0	SAND
									35-40	19.0	0	0	0	0	0	100
									40-45	18.0	0	1	0	0	0	100
									45-50	18.0	0	0	0	0	0	100
19/04/2009	P.White	Eddystone SE	148 21.392	40 59.732	148 21.398	40 59.758	1L	20.1	0-5	20.1	0	0	0	0	0	100
									5-10	20.6	0	0	0	0	0	100
									10-15	20.3	0	1	0	2	0	100
									15-20	26.1	0	0	0	4	0	100
									20-25	19.0	0	0	0	0	0	100
									25-30	17.5	0	1	0	1	0	100
									30-35	19.0	0	0	0	0	0	100
									35-40	19.1	0	0	0	0	0	100
									40-45	19.6	0	0	0	0	0	100
									45-50	20.1	0	0	0	0	0	100
19/04/2009	K.Hicks	Eddystone SE	148 21.392	40 59.732	148 21.398	40 59.758	1R	20.1	0-5	17.0	0	0	0	0	0	100
									5-10	19.0	0	1	0	0	0	100
									10-15	15.0	0	0	0	0	0	100
									15-20	20.0	0	0	0	0	0	100
									20-25	19.0	0	0	0	0	0	100
									25-30	17.0	0	0	0	0	0	100
									30-35	17.0	1	0	0	0	0	100
									35-40	18.0	0	0	0	0	0	100
									40-45	19.0	0	0	0	0	0	100
									45-50	19.5	0	0	0	0	0	100

Date	Diver	Site	Transect Start Longitude	Transect Start Latitude	Transect End Longitude	Transect End Latitude	Trans (No./Side)	Depth at 0m	Transect Distance	Depth	Centro	Helio	Rock Lobster	Abalone	% Barrens	kelp cover
19/04/2009	P.White	Eddystone SE	148 21.392	40 59.732	148 21.398	40 59.758	1L	20	0-5	20.2	0	0	0	0	0	100
									5-10	20.6	0	0	0	0	0	100
									10-15	20.3	0	1	0	2	0	100
									15-20	20.7	0	0	0	4	0	100
									20-25	19.0	0	0	0	0	0	100
									25-30	17.5	0	1	0	1	0	100
									30-35	19.0	0	0	0	0	0	100
									35-40	19.1	0	0	0	0	0	100
									40-45	19.6	0	0	0	0	0	100
									45-50	20.2	0	0	0	0	0	100
19/04/2009	K.Hicks	Eddystone SE	148 21.392	40 59.732	148 21.398	40 59.758	1R	20.1	0-5	17.0	0	0	0	0	0	100
									5-10	19.0	0	1	0	0	0	100
									10-15	15.0	0	0	0	0	0	100
									15-20	20.0	0	0	0	0	0	100
									20-25	19.0	0	0	0	0	0	100
									25-30	17.0	0	0	0	0	0	100
									30-35	17.0	1	0	0	0	0	100
									35-40	18.0	0	0	0	0	0	100
									40-45	19.0	0	0	0	0	0	100
									45-50	19.5	0	0	0	0	0	100
19/04/2009	P.Clancy	Eddystone SE	148 20.023	40 55.706	148 19.442	40 55.706	1L	19.9	0-5	20.2	0	0	0	0	0	100
									5-10	20.4	2	0	0	0	0	100
									10-15	19.8	4	2	0	0	0	100
									15-20	18.3	4	2	0	0	0	100
									20-25	17.6	0	0	0	0	0	100
									25-30	17.7	1	4	0	0	0	100
									30-35	17.6	7	13	0	0	40	60
									35-40	17.6	2	9	0	0	0	100
									40-45	16.2	1	9	0	0	0	100
									45-50	15.2	0	0	0	0	0	100
19/04/2009	D.Humphries	Eddystone SE	148 20.023	40 55.706	148 19.942	40 55.704	1R	19.9	0-5	20.2	0	0	0	0	0	100
									5-10	20.4	3	0	0	0	0	100
									10-15	19.8	0	0	0	0	0	100
									15-20	18.3	0	0	0	0	0	100
									20-25	17.6	2	8	0	0	0	100
									25-30	17.7	0	5	0	0	0	100
									30-35	17.6	1	6	0	0	10	90
									35-40	17.2	4	2	0	0	20	80
									40-45	16.5	2	2	0	0	20	80
									45-50	15.2	9	3	0	0	30	70

Date	Diver	Site	Transect Start Longitude	Transect Start Latitude	Transect End Longitude	Transect End Latitude	Trans (No./Side)	Depth at 0m	Transect Distance	Depth	Centro	Helio	Rock Lobster	Abalone	% Barrens	kelp cover
24/02/2009	P. Clancy	Elephant Rock	148 20.219	41 16.813	148 20.377	41 15.132	1L	12	0-5	12.0	23	0	0	0	100	0
									5-10	12.0	16	1	0	0	100	0
									10-15	11.1	9	0	0	0	80	20
									15-20	10.1	23	0	0	0	80	20
									20-25	10.1	23	0	0	0	100	0
									25-30	11.0	10	3	0	0	70	30
									30-35	11.1	4	2	0	0	60	40
									35-40	11.3	9	0	1	0	70	30
									40-45	10.8	9	0	1	0	20	80
									45-50	10.8	1	1	0	0	<5	100
24/02/2009	P.White	Elephant Rock	148 20.219	41 56.813	148.20.377	41 15.132	1R	12	0-5	12.0	30	0	0	0	95	5
									5-10	12.0	24	0	0	0	100	0
									10-15	11.1	26	1	0	0	95	5
									15-20	10.1	26	0	0	0	50	50
									20-25	10.1	15	0	0	0	95	5
									25-30	11.0	0	0	0	0	20	80
									30-35	11.1	9	0	0	0	50	50
									35-40	11.3	15	0	0	0	80	20
									40-45	10.8	16	2	0	0	75	15
									45-50	10.8	0	0	0	0	0	100
24/02/2009	Mike.T	Elephant Rock	148 20.520	41 15.030	148 20.495	41 15.015	1L	18.4	0-5	16.5	18	1	0	0	100	0
									5-10	16.9	16	18	0	0	100	0
									10-15	17.3	8	8	0	0	100	0
									15-20	18.2	10	1	0	0	100	0
									20-25	17.6	7	1	0	0	100	0
									25-30	17.7	0	0	0	0	0	0
									30-35	0.0	9	0	0	0	100	0
									35-40	20.0	7	4	0	0	100	0
									40-45	19.0	6	7	0	0	100	0
									45-50	18.6	6	0	0	0	100	0
24/02/2009	D.Humpries	Elephant Rock	148 20.520	41 15.030	148 20.495	41 15.015	1R	18.4	0-5	16.5	23	0	0	0	100	0
									5-10	16.9	25	2	0	0	100	0
									10-15	17.3	0	0	0	0	95	5
									15-20	18.2	13	2	0	0	95	5
									20-25	17.6	0	0	0	0	60	40
									25-30	17.7	1	1	0	0	70	30
									30-35	0.0	14	0	0	0	95	5
									35-40	20.0	17	0	0	0	100	0
									40-45	19.0	9	0	0	0	100	0
									45-50	18.6	15	1	0	0	80	20

Date	Diver	Site	Transect Start Longitude	Transect Start Latitude	Transect End Longitude	Transect End Latitude	Trans (No./Side)	Depth at 0m	Transect Distance	Depth	Centro	Helio	Rock Lobster	Abalone	% Barrens	kelp cover
19/04/2009	D.Humphries	Half Tide Rock East	148 20.610	40 58.786	148 20.579	40 58.803	1R	20.8	0-5	20.4	0	0	0	1	0	100
									5-10	19.5	0	0	0	0	0	100
									10-15	18.0	0	0	0	0	0	100
									15-20	16.8	6	4	0	0	10	90
									20-25	18.0	3	0	0	0	40	60
									25-30	19.1	2	3	1	0	40	60
									30-35	19.0	0	0	0	0	0	100
									35-40	20.4	0	0	0	0	0	100
									40-45	20.0	0	0	0	0	0	50% SAND 50% REEF
									45-50	19.9	0	0	0	0	0	50% SAND 50% REEF
26/04/2009	Drew Burt	Ironhouse 3	148 19.227	41 34.491	no data	no data	L	16	0-5	16	1	4	1	0	0	100
									5-10	15.5	0	4	0	0	0	100
									10-15	15.4	0	0	0	0	0	100
									15-20	15	2	1	0	0	60	40
									20-25	15.1	0	6	0	1	30	70
									25-30	15.1	0	0	0	0	0	SAND
									30-35	15.1	1	0	0	4	30	70
									35-40	15.1	1	7	0	2	40	60
									40-45	15.1	1	2	0	2	20	80
									45-50	15.2	0	0	0	0	0	SAND
26/04/2009	Brendan Armstrong	Ironhouse 3	148 19.227	41 34.491	no data	no data	R	16	0-5	16	0	0	0	0	0	60
									5-10	15.5	0	1	0	1	0	70
									10-15	15.4	4	1	0	1	80	20
									15-20	15	0	0	0	0	0	70
									20-25	15.1	0	0	0	2	0	60
									25-30	15.1	2	1	0	6	0	70
									30-35	15.1	0	0	1	0	0	100
									35-40	15.1	1	1	0	1	0	70
									40-45	15.1	0	0	0	0	0	70
									45-50	15.2	0	1	0	0	0	70
25/03/2009	Michael Jaques	Saltwater Inlet	148 19.353	41 36.378	no data	no data	L	16.5	0-5	16.5	0	0	0	0	0	100
									5-10	16.3	0	0	0	3	0	100
									10-15	16.3	0	0	0	1	0	100
									15-20	16.9	0	0	0	1	0	50% SAND
									20-25	16.9	0	0	0	0	0	25% SAND
									25-30	17.2	0	0	0	0	0	50% SAND
									30-35	16.5	0	0	0	7	0	50% SAND
									35-40	17.2	0	0	0	5	0	50% SAND
									40-45	16.2	0	0	0	3	0	50% SAND
									45-50	15.8	0	0	0	0	0	50% SAND

Date	Diver	Site	Transect Start Longitude	Transect Start Latitude	Transect End Longitude	Transect End Latitude	Trans (No./Side)	Depth at 0m	Transect Distance	Depth	Centro	Helio	Rock Lobster	Abalone	% Barrens	kelp cover
25/03/2009	Bruno Cengia	Saltwater Inlet	148 19.353	41 36.378	no data	no data		16.5	0-5	16.5	0	0	0	1	0	100
									5-10	16.9	0	0	0	2	0	100
									10-15	16.7	0	0	0	2	0	100
									15-20	17.2	0	0	0	0	0	100
									20-25	16.6	0	0	0	0	0	100
									25-30	16.8	0	0	0	6	0	100
									30-35	17	0	0	0	4	0	100
									35-40	16.4	0	0	0	0	0	100
									40-45	16.3	0	0	0	0	0	100
									45-50	16.7	0	0	0	0	0	100
25/03/2009	Grace Dallas	Ironhouse 2	148 19.382	41 34.763	no data	no data		14	0-5	14	0	0	0	0	0	50
									5-10	14	0	0	0	0	0	50
									10-15	14	0	0	0	0	0	50
									15-20	14	0	0	0	0	0	50
									20-25	13	0	0	0	0	0	50
									25-30	13	0	0	0	0	0	100
									30-35	13	0	1	0	0	0	100
									35-40	12	0	0	0	0	0	100
									40-45	12	1	0	0	0	0	50
									45-50	13	0	0	0	0	0	50
25/03/2009	R. Mason	Ironhouse 2	148 19.382	41 34.763	no data	no data		13.5	0-5	13.5	0	0	0	0	0	SAND
									5-10	13.5	0	0	0	0	0	100
									10-15	13.4	0	0	0	1	0	100
									15-20	13.1	0	0	0	0	0	100
									20-25	13.3	0	0	0	0	0	100
									25-30	12.6	0	2	0	0	0	100
									30-35	12.3	2	1	0	3	0	100
									35-40	11.5	0	0	0	0	0	100
									40-45	11.8	0	2	0	0	0	100
									45-50	12.2	0	1	0	1	0	100
25/03/2009	R. Mason	Ironhouse 2	148 19.084	41 34.206	no data	no data		13	0-5	13	0	0	0	0	0	100
									5-10	13	0	0	0	1	0	100
									10-15	13.2	0	1	0	1	0	100
									15-20	12.9	0	1	0	1	0	100
									20-25	11.6	0	0	0	1	0	100
									25-30	12	0	0	0	2	0	100
									30-35	12.9	0	0	0	0	0	SAND
									35-40	13.2	0	0	0	0	0	SAND
									40-45	13.4	0	0	0	0	0	SAND
									45-50	12.8	0	0	0	0	0	SAND

Date	Diver	Site	Transect Start Longitude	Transect Start Latitude	Transect End Longitude	Transect End Latitude	Trans (No./Side)	Depth at 0m	Transect Distance	Depth	Centro	Helio	Rock Lobster	Abalone	% Barrens	kelp cover
25/03/2009	Grace Dallas	Ironhouse 4	148 19.084	41 34.206	no data	no data		13	0-5	13	0	0	0	0	0	100
									5-10	12	0	3	0	0	0	100
									10-15	12	0	0	0	0	0	50
									15-20	13	0	0	0	0	0	50
									20-25	12	0	0	0	0	0	50
									25-30	12	0	0	0	0	0	80
									30-35	12	0	0	0	0	0	100
									35-40	12	0	0	0	0	0	100
									40-45	12	0	0	0	0	0	100
									45-50	13	0	0	0	0	0	100
17/05/2009	M.Greenwood	Governor Island 1			no data	no data	1L	14	0-5	14.0	0	0	0	5	no data	no data
									5-10	14.8	0	2	0	0	no data	no data
									10-15	15.0	0	0	0	0	no data	no data
									15-20	15.7	0	1	0	0	no data	no data
									20-25	14.8	1	0	0	0	no data	no data
									25-30	16.6	0	0	0	0	no data	no data
									30-35	17.0	0	0	0	0	no data	no data
									35-40	17.2	0	0	0	0	no data	no data
									40-45	17.4	0	0	0	0	no data	no data
									45-50	17.6	0	0	0	0	no data	no data
17/05/2009	S.D	Governor Island 1			no data	no data	1R	14	0-5	14.0	0	0	0	0	0	85
									5-10	13.0	0	0	1	1	0	80
									10-15	15.0	0	3	0	2	0	80
									15-20	14.0	0	1	0	0	0	80
									20-25	14.8	0	0	0	0	0	80
									25-30	16.0	0	0	1	5	0	80
									30-35	17.0	0	0	0	0	0	80
									35-40	19.0	0	0	0	0	0	90
									40-45	19.5	0	0	0	0	0	90
									45-50	17.6	0	0	0	0	0	90
17/05/2009	Phil .T	Governor Island 2			no data	no data	1L	23	0-5	23.0	0	0	0	0	0	no data
									5-10	23.0	0	0	0	1	0	no data
									10-15	23.0	0	0	1	0	0	no data
									15-20	24.0	0	0	0	0	0	no data
									20-25	24.0	0	0	0	1	0	no data
									25-30	24.0	0	0	0	1	0	no data
									30-35	25.0	0	0	0	0	0	no data
									35-40	26.0	1	0	0	0	0	no data
									40-45	27.0	0	0	0	0	0	no data
									45-50	27.0	0	0	0	0	0	no data

Date	Diver	Site	Transect Start Longitude	Transect Start Latitude	Transect End Longitude	Transect End Latitude	Trans (No./Side)	Depth at 0m	Transect Distance	Depth	Centro	Helio	Rock Lobster	Abalone	% Barrens	kelp cover
17/05/2009	J.Bryan	Governor Island 2			no data	no data	1R	21.2	0-5	23.0	0	0	0	0	0	20
									5-10	23.0	0	0	0	0	0	20
									10-15	23.0	0	0	0	0	0	20
									15-20	24.0	0	0	0	0	0	20
									20-25	24.0	0	0	0	0	0	20
									25-30	24.0	0	0	0	2	0	0
									30-35	25.0	0	0	0	1	0	0
									35-40	26.0	0	0	0	0	0	30% KELP 70%SAND
									40-45	27.0	0	0	0	0	0	50% KELP 50% SANE
									45-50	27.0	0	0	0	0	0	30% KELP 70% SANE
17/05/2008	Michael G.	Governor Island 3			no data	no data	3	14	0-5	14.0	0	0	0	0	0	100
									5-10	15.0	0	0	0	0	0	100
									10-15	15.0	0	0	0	0	0	100
									15-20	16.0	0	0	0	0	0	100
									20-25	16.0	0	0	0	0	0	100
									25-30	17.0	0	0	0	2	0	100
									30-35	17.3	0	0	0	0	0	100
									35-40	17.9	0	0	0	0	0	100
									40-45	17.4	0	0	0	0	0	100
									45-50	17.6	0	0	0	2	0	100
17/05/2008	Craig Harris	Governor Island 4			no data	no data	4	13	0-5	13.0	0	0	0	0	0	100
									5-10	13.4	0	0	0	0	0	100
									10-15	13.7	0	0	0	0	0	100
									15-20	14.1	0	0	0	0	0	100
									20-25	14.4	0	0	0	0	0	100
									25-30	14.8	0	0	0	0	0	100
									30-35	15.1	0	0	0	0	0	100
									35-40	15.5	0	0	0	2	0	100
									40-45	15.8	0	0	0	0	0	100
									45-50	16.1	0	0	0	0	0	100
17/05/2008	Craig Harris	Governor Island 4			no data	no data	4	13	0-5	13.0	0	0	0	0	0	100
									5-10	13.4	0	0	0	0	0	100
									10-15	13.7	0	0	0	0	0	100
									15-20	14.1	0	0	0	0	0	100
									20-25	14.4	0	0	0	0	0	100
									25-30	14.8	0	0	0	0	0	100
									30-35	15.1	0	0	0	0	0	100
									35-40	15.5	0	0	0	2	0	100
									40-45	15.8	0	0	0	0	0	100
									45-50	16.1	0	0	0	0	0	100

Date	Diver	Site	Transect Start Longitude	Transect Start Latitude	Transect End Longitude	Transect End Latitude	Trans (No./Side)	Depth at 0m	Transect Distance	Depth	Centro	Helio	Rock Lobster	Abalone	% Barrens	kelp cover
17/05/2008	Michael Greenwood	Cape Lodi site 1			no data	no data	1	15	0-5	13.4	0	0	0	0	0	90
									5-10	13.1	0	0	0	0	0	100
									10-15	12.8	0	0	0	0	0	100
									15-20	12.6	0	0	0	0	0	100
									20-25	12.3	0	0	0	0	0	100
									25-30	12	0	0	0	0	0	100
									30-35	14	0	0	0	0	0	100
									35-40	16	0	0	0	0	0	100
									40-45	13	0	0	0	0	0	90
									45-50	9	0	0	0	0	0	90
17/05/2008	Peter Kuhlenbecker	Cape Lodi site 1			no data	no data	1	15	0-5	13.4	0	0	0	0	0	100
									5-10	13.1	0	0	0	0	0	100
									10-15	12.8	0	0	0	0	0	100
									15-20	12.6	0	0	0	0	0	100
									20-25	12.3	0	0	0	0	0	100
									25-30	12	0	0	0	0	0	100
									30-35	14	0	0	0	0	0	100
									35-40	16	0	0	0	0	0	100
									40-45	13	0	0	0	0	0	100
									45-50	9	0	0	0	0	0	100
17/05/2008	Ken Saville	Cape Lodi site 3			no data	no data		14	0-5	14	0	0	0	0	0	100
									5-10	13	0	0	0	0	0	100
									10-15	13	0	0	0	0	0	100
									15-20	13	0	0	0	0	0	100
									20-25	13	0	0	0	0	0	100
									25-30	13	0	0	0	0	0	100
									30-35	13	0	0	0	0	0	100
									35-40	13	0	0	0	0	0	100
									40-45	13	0	0	0	0	0	100
									45-50	12.4	0	0	0	0	0	100
17/05/2008	Ken Saville	Cape Lodi site 3			no data	no data		14	0-5	14	0	0	0	0	0	100
									5-10	13	0	0	0	0	0	100
									10-15	13	0	0	0	0	0	100
									15-20	13	0	0	0	0	0	100
									20-25	13	0	0	0	0	0	100
									25-30	13	0	0	0	0	0	100
									30-35	13	0	0	0	0	0	100
									35-40	13	0	0	0	0	0	100
									40-45	13	0	0	0	0	0	100
									45-50	12.4	0	0	0	0	0	100

Date	Diver	Site	Transect Start Longitude	Transect Start Latitude	Transect End Longitude	Transect End Latitude	Trans (No./Side)	Depth at 0m	Transect Distance	Depth	Centro	Helio	Rock Lobster	Abalone	% Barrens	kelp cover
17/05/2008	John Bryan	Cape Lodi site 4			no data	no data		16	0-5	16	0	0	0	0	0	100
									5-10	16	0	0	0	0	0	100
									10-15	16	0	1	0	0	0	100
									15-20	16	0	0	0	0	0	100
									20-25	15	0	0	0	0	0	100
									25-30	13	0	0	0	0	0	100
									30-35	13	0	1	0	0	0	100
									35-40	14	0	0	0	0	0	100
									40-45	13	0	0	0	0	0	100
									45-50	13	0	1	0	0	0	100
17/05/2008	Phil Tresize	Cape Lodi site 4			no data	no data		16	0-5	16	0	0	0	0	0	100
									5-10	16	0	0	0	0	0	100
									10-15	16	0	0	0	0	0	100
									15-20	16	0	0	0	0	0	100
									20-25	15	0	0	0	0	0	100
									25-30	13	0	0	0	0	0	100
									30-35	13	0	0	0	0	0	100
									35-40	14	0	0	0	0	0	100
									40-45	13	0	0	0	0	0	100
									45-50	13	0	0	0	0	0	100
6/12/2008	Craig Harris	Cape Tourville 1	148 20.132	42 07.691	no data	no data		12	0-5	12	0	0	0	0	0	100
									5-10	13	0	0	0	0	0	100
									10-15	13	0	0	0	0	0	100
									15-20	14	0	0	0	0	0	100
									20-25	14	0	0	0	0	0	100
									25-30	14	0	0	0	0	0	100
									30-35	15	0	1	0	0	0	100
									35-40	15	0	0	0	0	0	100
									40-45	16	0	0	0	0	0	100
									45-50	16	0	0	0	0	0	100
6/12/2008	Pete Heathcote	Cape Tourville 1	148 20.132	42 07.691	no data	no data		12	0-5	12	0	0	0	0	0	100
									5-10	13	0	0	0	0	0	100
									10-15	13	0	0	0	0	0	100
									15-20	14	0	0	0	1	0	100
									20-25	14	0	0	0	0	0	100
									25-30	14	0	0	0	0	0	100
									30-35	15	0	0	0	0	0	100
									35-40	15	0	0	0	0	0	100
									40-45	16	2	0	0	0	5	95
									45-50	16	3	0	0	0	10	90

Date	Diver	Site	Transect Start Longitude	Transect Start Latitude	Transect End Longitude	Transect End Latitude	Trans (No./Side)	Depth at 0m	Transect Distance	Depth	Centro	Helio	Rock Lobster	Abalone	% Barrens	kelp cover
6/12/2008	Ken Saville	Cape Tourville 2	148 20.31.22	42 07.28.46	no data	no data		7	0-5	7	0	0	0	1	0	100
									5-10	9	0	0	1	0	0	100
									10-15	10	0	0	0	0	0	100
									15-20	10	0	0	0	2	0	10
									20-25	11	0	0	0	0	0	100
									25-30	14	0	0	0	0	0	100
									30-35	14	5	0	0	0	20	100
									35-40	17	1	0	0	0	5	100
									40-45	17	0	0	0	0	0	100
									45-50	17	1	0	0	0	5	100
6/12/2008	Mark Hately	Cape Tourville 2	148 20.31.22	42 07.28.46	no data	no data		7	0-5	7	0	0	0	1	0	100
									5-10	9	0	2	0	0	0	100
									10-15	10	0	0	0	1	0	100
									15-20	10	0	0	3	0	0	100
									20-25	11	0	1	0	0	0	100
									25-30	14	0	0	1	0	0	100
									30-35	14	3	0	0	0	10	90
									35-40	17	0	0	0	0	5	95
									40-45	17	0	0	0	0	0	100
									45-50	17	2	0	0	0	10	90
6/12/2008	Craig Harris	Cape Tourville 3	148 20.50.62	42 07.02.48	no data	no data		15	0-5	15	1	0	0	0	20	80
									5-10	17	2	0	0	0	20	80
									10-15	17	0	0	0	0	40	60
									15-20	18	6	0	0	0	40	60
									20-25	18	4	0	0	0	40	60
									25-30	18	6	0	0	0	40	60
									30-35	19	5	0	0	0	60	40
									35-40	20	3	0	0	0	90	10
									40-45	23	6	0	0	0	90	10
									45-50	23	2	0	0	0	100	0
6/12/2008	Pete Heathcote	Cape Tourville 3	148 20.50.62	42 07.02.48	no data	no data		15	0-5	15	0	0	0	0	10	90
									5-10	17	1	0	0	0	10	90
									10-15	17	3	0	0	0	10	90
									15-20	17	4	0	0	0	30	70
									20-25	18	1	0	0	0	50	50
									25-30	18	0	0	0	0	10	90
									30-35	19	1	0	0	0	60	40
									35-40	20	5	0	0	0	90	10
									40-45	23	5	0	0	0	90	10
									45-50	23	6	0	0	0	80	20

Date	Diver	Site	Transect Start Longitude	Transect Start Latitude	Transect End Longitude	Transect End Latitude	Trans (No./Side)	Depth at 0m	Transect Distance	Depth	Centro	Helio	Rock Lobster	Abalone	% Barrens	kelp cover
6/12/2008	Mark Hately	Cape Tourville 4	148 21.347	42 07.170	no data	no data		15	0-5	15	0	0	0	0	0	100
									5-10	16	0	0	0	0	5	95
									10-15	16	1	0	0	0	10	90
									15-20	16	2	0	0	0	10	90
									20-25	16	1	0	0	0	5	95
									25-30	16	2	0	0	0	10	90
									30-35	16	3	0	0	0	20	80
									35-40	17	1	0	0	0	10	90
									40-45	17	0	0	0	0	10	90
									45-50	17	0	0	0	0	10	90
6/12/2008	Ken Saville	Cape Tourville 4	148 21.347	42 07.170	no data	no data		15	0-5	15	0	0	0	0	0	100
									5-10	16	0	0	0	0	10	90
									10-15	16	1	0	0	0	10	90
									15-20	16	1	0	0	0	5	95
									20-25	16	3	0	0	0	10	90
									25-30	16	0	0	0	0	20	80
									30-35	17	2	0	0	0	20	80
									35-40	17	0	0	0	0	10	90
									40-45	17	1	0	0	0	10	90
									45-50	17	0	0	0	0	20	80
27/11/2008	R. Mason	Sarah Anne -Schouten SAB2			no data	no data		20	0-5	20	0	0	0	0	0	60
									5-10	21	0	0	0	0	0	60
									10-15	19	0	0	0	0	0	50
									15-20	17	0	0	0	0	0	50
									20-25	15	0	0	0	1	0	30
									25-30	15	0	0	0	2	0	20
									30-35	14	0	1	0	0	0	30
									35-40	14	0	3	1	2	0	60
									40-45	12	0	0	0	0	0	60
									45-50	10	0	0	0	0	0	70
27/11/2008	Grace Dallas	Sarah Anne -Schouten SAB2			no data	no data		20	0-5	20	0	0	0	0	0	100
									5-10	18	0	0	0	0	0	100
									10-15	17	0	0	0	0	0	100
									15-20	17	1	2	0	1	0	100
									20-25	16.5	0	0	0	0	0	100
									25-30	16	0	0	0	0	0	100
									30-35	11	2	0	0	0	0	100
									35-40	14	1	0	0	0	0	100
									40-45	12	0	0	0	0	0	100
									45-50	10	0	0	0	0	0	100

Date	Diver	Site	Transect Start Longitude	Transect Start Latitude	Transect End Longitude	Transect End Latitude	Trans (No./Side)	Depth at 0m	Transect Distance	Depth	Centro	Helio	Rock Lobster	Abalone	% Barrens	kelp cover
27/11/2008	Gail Friswell	Tallefer Rocks	148.31144	42.3581	no data	no data		17.8	0-5	17.8	0	0	0	0	0	100
									5-10	17	0	0	0	0	0	100
									10-15	17.2	0	0	0	0	0	100
									15-20	17	0	0	0	0	0	100
									20-25	17.3	0	0	0	0	0	100
									25-30	16.3	0	4	0	1	0	100
									30-35	16.3	0	0	0	10	0	100
									35-40	16.3	0	0	0	0	0	100
									40-45	16.3	0	0	0	0	0	100
									45-50	15.7	0	0	0	0	0	100
27/11/2008	Michael Jaques	Tallefer Rocks	148.31144	42.3581	no data	no data		16.5	0-5	16.5	0	0	0	0	0	100
									5-10	17	0	0	0	0	0	100
									10-15	17.2	0	0	0	0	0	100
									15-20	17	1	1	0	0	0	100
									20-25	17.3	0	0	0	0	0	100
									25-30	16.3	2	0	0	0	0	100
									30-35	16.3	0	0	0	0	0	100
									35-40	16.3	0	0	0	0	0	100
									40-45	16.3	0	0	0	0	0	100
									45-50	15.7	0	0	0	0	0	100
27/11/2008	Michael Jaques	Sarah Anne -Schouten SAB3			no data	no data		16.5	0-5	16.5	0	0	0	0	0	SAND
									5-10	16.4	0	0	0	0	0	SAND
									10-15	16.1	0	0	0	0	0	SAND
									15-20	16	0	0	0	0	0	SAND
									20-25	16.4	0	0	0	0	0	SAND/ reef
									25-30	16.2	0	0	0	0	0	100
									30-35	16.2	0	0	1	0	0	100
									35-40	15.5	0	0	0	0	0	100
									40-45	15.7	0	0	0	0	0	100
									45-50	17.1	0	0	0	0	0	100
27/11/2008	Gail Friswell	Sarah Anne -Schouten SAB3			no data	no data		15.9	0-5	15.9	0	0	0	0	0	SAND
									5-10	16.4	0	0	0	0	0	SAND
									10-15	16.1	0	0	0	0	0	SAND
									15-20	16	0	0	0	0	0	SAND
									20-25	16.4	0	0	0	0	0	SAND/ reef
									25-30	16.2	0	0	0	0	0	100
									30-35	16.2	0	0	0	0	0	100
									35-40	15.5	0	0	0	0	0	100
									40-45	15.7	0	0	0	1	0	100
									45-50	17.1	0	0	0	0	0	100

Date	Diver	Site	Transect Start Longitude	Transect Start Latitude	Transect End Longitude	Transect End Latitude	Trans (No./Side)	Depth at 0m	Transect Distance	Depth	Centro	Helio	Rock Lobster	Abalone	% Barrens	kelp cover
27/11/2008	Grace Dallas	Sarah Anne -Schouten	148.28681	42.33351	no data	no data		19	0-5	19	0	0	0	0	0	100
									5-10	17	0	0	0	0	0	100
									10-15	17	0	0	0	0	0	100
									15-20	17	2	2	0	0	0	100
									20-25	16	0	1	0	0	0	100
									25-30	17	0	0	0	0	0	100
									30-35	12	0	0	0	0	0	100
									35-40	12	0	0	0	0	0	100
									40-45	10	0	0	0	0	0	100
									45-50	10	0	0	0	0	0	100
27/11/2008	R. Mason	Sarah Anne -Schouten	148.28681	42.33351	no data	no data		19	0-5	19	0	0	0	0	0	100
									5-10	17	0	0	0	0	0	100
									10-15	17	0	0	0	0	0	100
									15-20	17	0	0	0	0	0	100
									20-25	16	1	0	0	0	10	90
									25-30	17	0	0	0	0	0	100
									30-35	12	0	0	0	0	0	100
									35-40	12	0	0	0	0	0	100
									40-45	10	0	0	0	0	0	100
									45-50	10	0	0	1	0	0	100
4/04/2009	Alan Lane	Mistaken Cape 4	148 09.090	42 38.431	no data	no data		8	0-5	8	0	0	0	0	0	85
									5-10	9	0	0	0	0	0	85
									10-15	9.5	26	0	0	0	80	20
									15-20	10	0	0	0	2	0	85
									20-25	10.5	0	0	0	0	0	80
									25-30	11	0	0	0	1	0	80
									30-35	11	12	0	0	0	25	75
									35-40	12	4	0	0	0	25	75
									40-45	15	0	0	0	0	0	65
									45-50	15	0	0	0	0	0	65
4/04/2009	Jak Denny	Mistaken Cape 4	148 09.090	42 38.431	no data	no data		10.2	0-5	10.2	0	0	0	0	0	85
									5-10	10.6	0	0	0	1	0	95
									10-15	14.4	0	0	1	2	0	90
									15-20	14.5	3	0	0	0	5	80
									20-25	13.4	0	0	0	0	0	90
									25-30	15.6	0	0	0	1	0	90
									30-35	17.2	0	0	0	2	0	70
									35-40	18.4	6	0	0	3	15	70
									40-45	20.2	7	0	0	0	10	60
									45-50	20.5	0	0	0	4	5	70

Date	Diver	Site	Transect Start Longitude	Transect Start Latitude	Transect End Longitude	Transect End Latitude	Trans (No./Side)	Depth at 0m	Transect Distance	Depth	Centro	Helio	Rock Lobster	Abalone	% Barrens	kelp cover
4/04/2009	Bob Blaauw	Mistaken Cape 1	148 09.806	42 38.730	no data	no data		17	0-5	17	1	0	0	3	0	85
									5-10	18.5	3	1	0	0	0	85
									10-15	20	1	0	0	0	0	85
									15-20	20	2	0	0	0	0	85
									20-25	21	1	0	0	0	0	85
									25-30	22	1	0	0	0	0	85
									30-35	23	0	0	0	3	0	85
									35-40	23	0	0	0	0	0	85
									40-45	24	0	0	0	1	0	85
									45-50	25	1	0	0	1	0	85
4/04/2009	Bob Blaauw	Mistaken Cape 2 - Bea	148 07.790	42 35.950	no data	no data		16	0-5	16	0	0	0	0	0	100
									5-10	16	0	0	0	0	0	100
									10-15	16.3	0	0	0	0	0	100
									15-20	16.7	0	0	0	2	0	100
									20-25	16.7	0	0	0	4	0	100
									25-30	17	0	0	0	0	0	100
									30-35	17.5	0	0	0	5	0	100
									35-40	18.3	0	0	0	0	0	100
									40-45	19	0	0	0	3	0	100
									45-50	19.7	0	0	0	2	0	100
4/04/2009	Alan Lane	Beaching Bay 1	148 07.853	42 36.168	148 07.891	42 36.154		6	0-5	6	0	0	0	0	0	95
									5-10	7	0	0	0	0	0	85
									10-15	9	0	0	0	0	0	85
									15-20	9	0	0	0	1	0	80
									20-25	10	0	0	0	0	0	80
									25-30	11	0	0	0	0	0	70
									30-35	11	0	0	0	0	0	70
									35-40	12	0	0	0	0	0	70
									40-45	11	0	0	0	0	0	70
									45-50	12	0	0	0	0	0	70
4/04/2009	Jak Denny	Beaching Bay 1	148 07.853	42 36.168	148 07.891	42 36.154		7.2	0-5	7.2	0	0	0	1	0	100
									5-10	9.1	0	0	0	1	0	100
									10-15	9.5	0	0	0	2	0	100
									15-20	9	0	0	0	1	0	100
									20-25	10.5	0	0	0	6	0	100
									25-30	10.1	0	0	0	0	0	100
									30-35	10.3	0	0	0	0	0	90
									35-40	12	0	0	0	2	0	95
									40-45	12.2	0	0	0	1	0	100
									45-50	12.8	0	6	0	6	0	100

Date	Diver	Site	Transect Start Longitude	Transect Start Latitude	Transect End Longitude	Transect End Latitude	Trans (No./Side)	Depth at 0m	Transect Distance	Depth	Centro	Helio	Rock Lobster	Abalone	% Barrens	kelp cover
25/03/2009	Emma Flukes	Mistaken Cape 1	148 10.067	42 39.024	no data	no data		6.5	0-5	6.5	0	0	0	1	0	100
									5-10	9.1	0	0	0	0	0	95
									10-15	8.3	0	0	0	4	0	100
									15-20	9.4	0	0	0	0	0	90
									20-25	10.9	0	0	0	0	0	90
									25-30	12.4	0	0	2	0	0	60
									30-35	13	0	0	0	0	0	80
									35-40	11.8	0	0	0	0	0	40
									40-45	11.9	0	0	0	0	0	80
									45-50	9.8	0	0	0	0	0	90
25/03/2009	Stephen Baker	Mistaken Cape 1	148 10.067	42 39.024	no data	no data		6	0-5	6	0	0	0	0	0	100
									5-10	7	0	0	0	0	0	100
									10-15	9	0	0	0	3	0	100
									15-20	10	0	0	0	3	0	100
									20-25	11	0	0	0	0	0	100
									25-30	12	0	0	0	0	0	80
									30-35	12	0	0	0	0	0	60
									35-40	13	0	0	0	0	0	60
									40-45	12	0	0	0	0	0	60
									45-50	11.9	1	0	0	0	0	90
25/03/2009	Sarah Pyke	Mistaken Cape 2	148 09.951	42 39.021	no data	no data	R	8.7	0-5	8.7	0	0	0	0	0	100
									5-10	6.2	0	0	0	0	0	100
									10-15	5.2	0	0	0	0	0	100
									15-20	9.4	0	0	0	0	0	100
									20-25	7.8	0	0	0	0	0	100
									25-30	10.1	0	0	0	0	0	100
									30-35	8.6	0	0	0	0	0	100
									35-40	6.4	0	0	0	0	0	60
									40-45	13.2	0	0	0	0	0	100
									45-50	13.2	0	0	0	0	0	100
25/03/2009	Andrew Bain	Mistaken Cape 2	148 09.951	42 39.021	no data	no data	L	8.5	0-5	8.5	0	0	0	0	0	100
									5-10	9.3	0	0	0	0	0	100
									10-15	7.7	0	0	0	0	0	90
									15-20	6.6	0	0	0	0	0	90
									20-25	9.1	0	0	0	0	0	90
									25-30	6.7	0	0	0	0	0	100
									30-35	7.8	0	0	0	0	0	100
									35-40	9.5	0	0	0	0	0	100
									40-45	6.1	0	0	0	0	0	60
									45-50	11.4	0	0	0	0	0	40

Date	Diver	Site	Transect Start Longitude	Transect Start Latitude	Transect End Longitude	Transect End Latitude	Trans (No./Side)	Depth at 0m	Transect Distance	Depth	Centro	Helio	Rock Lobster	Abalone	% Barrens	kelp cover
25/03/2009	Emma Flukes	Beaching Bay 1	148 09.019	42 36.291	no data	no data		10.5	0-5	10.5	0	0	0	3	0	100
									5-10	9.4	0	0	0	0	0	90
									10-15	8.7	0	0	0	0	0	80
									15-20	9.7	0	0	0	0	0	90
									20-25	8.6	0	0	0	0	0	100
									25-30	8.4	0	0	0	1	0	100
									30-35	9.4	0	0	0	0	0	90
									35-40	9.7	0	0	0	0	0	70
									40-45	9.1	0	0	0	0	0	100
									45-50	9.7	0	0	0	3	0	100
25/03/2009	Stephen Baker	Beaching Bay 1	148 09.019	42 36.291	no data	no data		10.5	0-5	10.5	0	0	0	3	0	100
									5-10	11	0	0	0	2	0	100
									10-15	11	0	0	0	0	0	100
									15-20	11	0	0	0	0	0	100
									20-25	11	0	0	0	0	0	100
									25-30	10.5	0	0	0	0	0	100
									30-35	11	0	0	0	5	0	100
									35-40	10	0	0	0	0	0	100
									40-45	10	0	0	0	2	0	100
									45-50	11	0	0	0	4	0	100
25/03/2009	Sarah Pyke	Beaching Bay 2	148 08.002	42 36.317	no data	no data		11	0-5	11	0	0	0	1	0	90
									5-10	10.4	0	0	0	1	0	100
									10-15	10	0	0	0	0	0	100
									15-20	10	0	0	0	0	0	100
									20-25	9.5	0	0	0	0	0	100
									25-30	9.4	0	0	0	0	0	100
									30-35	9.6	0	0	0	2	0	100
									35-40	9.7	0	0	0	1	0	100
									40-45	9.7	0	0	0	1	0	100
									45-50	9.4	0	0	0	3	0	100
25/03/2009	Andrew Bain	Beaching Bay 2	148 08.002	42 36.317	no data	no data		8.9	0-5	8.9	0	0	0	0	0	80
									5-10	9.1	0	0	0	3	0	70
									10-15	8.8	0	0	0	2	0	90
									15-20	8.1	0	0	0	1	0	100
									20-25	7.9	0	0	0	3	0	100
									25-30	8.9	0	0	0	3	0	100
									30-35	8.6	0	0	0	1	0	95
									35-40	8.4	0	0	0	2	0	90
									40-45	8.5	0	0	0	1	0	100
									45-50	8.8	0	0	0	2	0	100

Date	Diver	Site	Transect Start Longitude	Transect Start Latitude	Transect End Longitude	Transect End Latitude	Trans (No./Side)	Depth at 0m	Transect Distance	Depth	Centro	Helio	Rock Lobster	Abalone	% Barrens	kelp cover
15/06/2008	S. Mitchell	Fortescue	147 57.066	43 08.058	no data	no data		11	0-5	11	1	1	0	3	0	100
									5-10	10.5	0	1	0	0	0	100
									10-15	10.6	0	7	0	1	0	100
									15-20	10.6	0	0	0	0	0	100
									20-25	11.3	0	3	0	1	0	100
									25-30	11.2	0	3	0	0	0	100
									30-35	11.3	0	0	0	1	0	100
									35-40	11.3	0	1	0	2	0	100
									40-45	11.1	0	0	0	2	0	100
									45-50	11.2	0	2	0	1	0	100
15/06/2008	R. Anderson	Fortescue	147 57.066	43 08.058	no data	no data		11	0-5	12.3	0	4	0	4	0	100
									5-10	11.9	0	4	0	1	0	100
									10-15	11.5	3	2	0	0	0	100
									15-20	11.7	3	0	0	1	0	100
									20-25	11.7	0	2	0	1	0	100
									25-30	11.7	0	4	0	3	0	100
									30-35	11.9	0	12	0	1	0	100
									35-40	12	0	4	0	2	0	100
									40-45	11.8	2	5	0	5	0	100
									45-50	11.9	1	3	0	3	0	100
15/06/2008	R. Anderson	Fortescue	147 58.132	43 08.303	no data	no data		9	0-5	9.6	0	0	0	0	0	100
									5-10	9.3	0	0	0	1	0	100
									10-15	8.7	0	0	0	0	0	100
									15-20	7.8	0	0	0	0	0	100
									20-25	7.1	0	0	0	0	0	100
									25-30	7.9	0	0	0	0	0	100
									30-35	7.7	0	0	0	4	0	100
									35-40	7.9	0	0	0	0	0	100
									40-45	7.4	0	0	0	0	0	100
									45-50	7.5	0	0	0	0	0	100
15/06/2008	S. Mitchell	Fortescue	147 58.132	43 08.303	no data	no data		9	0-5	9	0	0	0	0	0	SAND
									5-10	8.5	0	0	0	0	0	100
									10-15	8.5	0	0	0	0	0	100
									15-20	7	0	0	0	0	0	100
									20-25	7	0	0	0	0	0	100
									25-30	7.3	0	0	0	0	0	100
									30-35	7.2	0	0	0	1	0	100
									35-40	7	0	0	0	0	0	100
									40-45	7.4	0	0	0	0	0	100
									45-50	6.6	0	0	0	0	0	100

Date	Diver	Site	Transect Start Longitude	Transect Start Latitude	Transect End Longitude	Transect End Latitude	Trans (No./Side)	Depth at 0m	Transect Distance	Depth	Centro	Helio	Rock Lobster	Abalone	% Barrens	kelp cover
29/03/2009	Eric Filisca	Fortescue - Lantern 3	no data	no data	no data	no data		24.4	0-5	24.4	0	0	0	1	0	60
									5-10	23.5	0	0	0	0	0	50
									10-15	21.9	0	0	0	0	0	60
									15-20	21.6	0	0	0	1	0	60
									20-25	20.1	0	3	0	1	0	70
									25-30	18.3	0	3	0	0	0	80
									30-35	17.4	2	1	0	1	0	80
									35-40	16.8	1	4	0	0	0	80
									40-45	16.7	0	0	0	1	0	80
									45-50	16.6	1	0	0	3	0	80
29/03/2009	E. Fillisch	Fortescue - Lantern 3	no data	no data	no data	no data		24.4	0-5	24.3	0	0	0	0	0	100
									5-10	23.2	0	0	0	2	0	100
									10-15	21.2	0	0	0	0	0	100
									15-20	21.6	0	0	0	0	0	100
									20-25	20.1	0	0	0	0	0	100
									25-30	17.9	1	4	0	0	0	100
									30-35	17.7	0	3	0	0	0	100
									35-40	16	0	2	0	0	0	100
									40-45	16	0	0	0	3	0	100
									45-50	16	0	0	0	1	0	100
29/03/2009	Gail	Fortescue - Lantern 2	no data	no data	no data	no data		17.9	0-5	17.9	0	0	0	0	no data	no data
									5-10	17.2	0	0	1	0	no data	no data
									10-15	16.4	0	0	0	0	no data	no data
									15-20	16	0	0	0	0	no data	no data
									20-25	15.3	0	0	0	0	no data	no data
									25-30	15.2	0	0	0	0	no data	no data
									30-35	14.3	0	0	0	0	no data	no data
									35-40	14.2	0	0	0	0	no data	no data
									40-45	14	0	0	0	0	no data	no data
									45-50	no data	no data	no data	no data	no data	no data	no data
29/03/2009	Kristel	Fortescue - Lantern 2	no data	no data	no data	no data		17.9	0-5	no data	0	0	0	0	0	no data
									5-10	no data	0	0	0	0	0	no data
									10-15	no data	0	0	0	0	0	no data
									15-20	no data	0	0	0	0	0	no data
									20-25	no data	0	0	0	0	0	no data
									25-30	no data	0	0	0	0	0	no data
									30-35	no data	0	0	0	0	0	no data
									35-40	no data	0	0	0	0	0	no data
									40-45	no data	0	0	0	0	0	no data
									45-50	no data	no data	no data	no data	no data	no data	no data

Date	Diver	Site	Transect Start Longitude	Transect Start Latitude	Transect End Longitude	Transect End Latitude	Trans (No./Side)	Depth at 0m	Transect Distance	Depth	Centro	Helio	Rock Lobster	Abalone	% Barrens	kelp cover
29/03/2009	A. Greenhill	Fortescue - Lantern 1						19.4	0-5	19.4	0	4	0	0	0	100
									5-10	18.7	0	1	0	0	0	100
									10-15	18.8	0	0	0	0	0	100
									15-20	18.2	0	0	0	0	0	100
									20-25	16.7	1	5	0	0	0	100
									25-30	15.6	1	2	0	0	0	100
									30-35	14.2	0	2	0	2	0	100
									35-40	13.6	0	0	0	0	0	100
									40-45	11.8	0	0	0	0	0	100
									45-50	10.4	1	0	0	0	0	100
29/03/2009	E. Fillisch	Thumbs?	148 00.446	43 08.120				24.3	0-5	24.3	0	0	0	0	0	100
									5-10	24.7	0	0	0	1	0	90
									10-15	24.4	0	0	0	0	0	90
									15-20	23.9	1	0	0	7	0	100
									20-25	22.4	0	3	0	0	0	100
									25-30	22	0	3	0	3	0	100
									30-35	21	0	2	0	0	0	100
									35-40	20.6	0	3	0	3	0	100
									40-45	19.4	0	4	0	5	0	100
									45-50	18.7	0	6	0	0	0	100
29/03/2009	E. Fillisch	Thumbs?	148 00.446	43 08.120				24.3	0-5	24.3	0	0	0	0	0	100
									5-10	24.6	0	0	0	1	0	100
									10-15	24.1	0	0	0	1	0	100
									15-20	23.7	5	2	0	8	0	100
									20-25	23.1	0	0	0	0	0	100
									25-30	22.1	0	3	0	1	0	100
									30-35	20.6	0	0	1	1	0	100
									35-40	20.4	0	1	0	0	0	100
									40-45	19.1	0	2	0	0	0	100
									45-50	18.7	0	0	0	0	0	100
15/03/2008	Chris Hobler	North Bruny Is.1	147.36736	43.07501					0-5	10.2	0	0	0	0	0	90
									5-10	10.1	0	0	0	0	0	90
									10-15	10	0	0	0	0	0	90
									15-20	10	0	0	0	1	0	100
									20-25	10	0	9	0	1	0	80
									25-30	9.5	0	2	1	0	0	90
									30-35	8.5	0	1	0	0	0	80
									35-40	6.8	0	2	1	0	0	90
									40-45	7.8	0	2	0	0	0	90
									45-50	8.8	0	2	0	0	0	90

Date	Diver	Site	Transect Start Longitude	Transect Start Latitude	Transect End Longitude	Transect End Latitude	Trans (No./Side)	Depth at 0m	Transect Distance	Depth	Centro	Helio	Rock Lobster	Abalone	% Barrens	kelp cover
15/03/2008	Chris Hobler	North Bruny Is.1	147.36736	43.07501					0-5	10.2	0	0	0	0	0	90
									5-10	10.1	0	0	0	0	0	90
									10-15	10	0	0	0	0	0	90
									15-20	10	0	0	0	0	0	50
									20-25	10	0	0	0	3	0	100
									25-30	9.5	0	0	0	0	0	100
									30-35	8.5	0	0	0	0	0	100
									35-40	6.8	0	2	0	0	0	100
									40-45	7.8	0	2	0	0	0	100
									45-50	8.8	0	0	0	0	0	100
15/03/2008	Erika Avellaneda	North Bruny Is.2	147.22075	43.04389					0-5	10	0	0	0	0	0	SAND
									5-10	11	0	0	0	0	0	60
									10-15	11	0	0	0	0	0	30% SAND
									15-20	11	0	0	0	0	0	80% SAND
									20-25	11	0	0	0	0	0	80
									25-30	11	0	0	0	0	0	60
									30-35	11	0	0	0	0	0	40% SAND
									35-40	11	0	0	0	0	0	10% SAND
									40-45	10	0	0	0	0	0	80
									45-50	10	0	0	0	0	0	80
15/03/2008	Emma Flukes	North Bruny Is.2	147.22075	43.04389					0-5	10	0	0	0	0	0	SAND
									5-10	11	0	0	0	0	0	75
									10-15	11	0	0	0	0	0	60
									15-20	11	0	0	0	0	0	20
									20-25	11	0	0	0	0	0	80
									25-30	11	0	0	0	0	0	40% SAND
									30-35	11	0	0	0	0	0	70
									35-40	11	0	0	0	0	0	70
									40-45	10	0	0	0	0	0	90
									45-50	10	0	0	0	0	0	75
15/03/2008	John Butterworth	North Bruny Is. 3	147.36748	43.07521					0-5	10	0	0	0	0	0	SAND
									5-10	10.5	0	0	0	0	0	100
									10-15	10.3	0	0	0	0	0	100
									15-20	9.9	0	0	0	0	0	100
									20-25	9.6	0	0	0	6	0	100
									25-30	9.2	0	0	0	0	0	100
									30-35	8.4	0	0	0	0	0	100
									35-40	7.2	0	1	1	1	0	100
									40-45	7.8	0	4	1	2	0	100
									45-50	7.5	0	3	0	1	0	100

APPENDIX III. Results of free-ranging swims assessing incidence of incipient sea urchin barrens.

Date	Location	Site	Swim No.	Diver	Start Latitude	Start Longitude	End Latitude	End Longitude	Time In	Time Out	Swim time	Centro patch./min	Helio patch/min	Depth Start	Depth Finish	Incipient patch No.	Depth	Centrostephanus co	Centro barren patch	Helio	Helio barren patch si
10/01/09	Eddystone Pt	Ansons Bay	1	Ruth Arkle	41°00.920 S	148°20.084 E	41°00.881 S	148°20.201 E	10:50	11:40	0:50	0:16	0:00	22.5	17.0	1	18.4	9	6	0	0
																2	18.6	13	3	0	0
																3	17.7	11	3	0	0
11/01/09	Eddystone Pt	Lipstick Rock	1	Ruth Arkle	40°57.132 S	148°19.752 E	40°57.234 S	148°19.701 E	9:40	10:11	0:31	0:05	0:00	25.0	17.0	1	22.0	4	1	0	0
																2	22.0	6	5	0	0
																3	22.0	13	3	0	0
																4	21.0	3	1.5	0	0
																5	20.5	18	12	0	0
																6	20.0	10	10	0	0
11/01/09	Eddystone Pt	Lipstick Rock	2	Tony Soblewski	40°57.132 S	148°19.752 E	no data	no data	9:40	10:11	0:31	0:06	0	25.0	20.0	1	21.0	5	10	0	0
																2	22.0	5	2	0	0
																3	21.2	3	3	0	0
																4	20.6	10	5	0	0
																5	20.4	10	5	0	0
11/01/09	Eddystone Pt	Elephant Rock	1	Phillip White	40°58.325 S	148°19.640 E	40°58.502 S	148°19.607 E	11:16	11:51	0:35	no data	no data	17.0	14.0	0	no data	no data	no data	no data	no data
27/04/09	Bicheno	Hairy Wall - Govenors Is.	1	Michael Jacques	Hairy Wall	Hairy Wall	Hairy Wall	Hairy Wall			0:25	0:25	0:00	18.0	15.0	0:00	26.7	6	12	0	0
1/02/09	North Bruny	Adventure Bay North	1	Ben Cashman	43.33995 S	147.32548 E	Swum in NE direction		12:10	13:20	1:10	0:00	0:23	6.0	5.0	1	7.0	0	0	12	0.5
																2	8.0	0	0	6	0.5
																3	8.0	0	0	16	1
1/02/09	North Bruny	Adventure Bay North	2	Ben Cashman	43.35612 S	147.33003 E	Swum in NE direction		16:15	17:15	1:00	1:00				1	6.0	1	<0.25	0	0
																2	5.0	0	0	10	0.5
																3	6.0	0	0	24	1
																4	6.5	0	0	7	1
1/02/09	North Bruny	Adventure Bay North	3	Paul Wembridge	43.35612 S	147.33003 E	no data	no data	16:00	17:05	1:05	no data	no data	6	6	0	no data	no data	no data	no data	no data
1/02/09	North Bruny	Adventure Bay Far North	1	Paul Wembridge	43.3395 S	147.32548 E	no data	no data	12:30	13:21	0:51	no data	0:51	4.5	5.0	1	4.0	0	0	1	no data
1/02/09	North Bruny	Adventure Bay Far North	2	Kirsten Kuns	43.3395 S	147.32548 E	Swum in E to W direction		12:20	13:10	0:50	no data	0:12	4.7	6	1	8.9	0	0	8	2
																2	6.5	0	0	1	1.5
																3	5.9	0	0	20	2
																4	7.8	0	0	2	0.5
1/02/09	North Bruny	Adventure Bay Far North	3	Kirsten Kuns	43.35612 S	147.33003 E	Southern side of headland		16:15	16:45	0:30	no data	0:10	4.4	7.0	1	8.0	0	0	3	0.25
																2	7.1	0	0	6	0.25
																3	7.1	0	0	2	0.25
1/02/09	North Bruny	Adventure Bay Far North	4	Emma Flukes	43.33995 S	147.32548 E	no data	no data	12:30	13:21	0:51	no data	0:25	4.7	4.4	1	4.5	0	0	2	0.5
																2	4.5	0	0	2	<0.25
																3	4.5	0	0	7	0.75
																4	4.5	0	0	9	1
1/02/09	North Bruny	Adventure Bay North	4	Emma Flukes	43.33995 S	147.32548 E	no data	no data	16:10	17:05	0:55	no data	0:13	21:36	4:48	1	6.0	0	0	7	<0.25
																2	6.0	0	0	3	<0.25
																3	6.0	0	0	4	<0.25
																4	6.0	0	0	8	0.5

APPENDIX IV. Diver club volunteer observational reports of *Centrostephanus rodgersii* in Tasmania (reverse chronological order).

1. Bicheno: Report on Blue Waters Reef Bicheno, By Greg Close, Leven Scuba Club 8/6/2008

50 minute dive 12-15.1M
Good coverage of Macro Kelp and medium cray weed. 80/20%.
Huge anchor concreted into reef south of the break 20 Metres in upper level.
No evidence of general urchin grazing, but significant quantities of mature Centrostephanus in ledges and crevices. Smashed 50 plus within reach. Hope to reduce the foothold.
Generally the bottom cover is boulder rock and the patches where urchins exist is beginning to reveal small areas of barrens.

2. Cape Tourville: By Ken Saville, Ocean Divers Plus 6/12/2008

On Saturday 4 ODP members ventured out to the remote Cape Tourville for an Urchin Survey.
Weather was looking OK so we punched down from Bicheno and took us about 45 minutes. We decided that Tourville would be our target, but had a back up plan of Cape Sonnerat off Shouten should the weather be no good. The day was very pleasent behind the cliffs with a 1-2 metre North easterly swell going so diving in front of the "nuggets" was definetly off! Narced@50's boat is big and easy to dive off, so Pete & Harry Who go in first and did dive site one from the original co-ordinates, which was on the wall under Cape Tourville it's self. Their transect showed few Urchins and good bottom, but after the Transect was done they then continued around for a look and found small urchin Barrens down deeper in 18-20m outside the Transect line zone.
Next up Narced & I got in and did another run this time pretty well directly under the lighthouse, we found much the same, nice bottom, a few small crays a couple of abs and few urchins. Again we went for swim round after the transit and found patches of Urchins in deeper water one patch was at least 5-10m meters square of barren with very little life and plenty of Urchins, although again this doesnt reflect in our data as it was outside the transit line.

After a bit of lunch around in Wineglass Bay we headed back to do the transects on the inside of the biggest "Nugget" on the end of Cape Tourville.
Dive 3 was probably the most remarkable. Harry and Pete, dropped in and found the bottom dropped quickly away to 15 metres with the end of the line in 23m heading out into the channel. They found a stark difference and a whole heap of Urchins on the transect run. Some weed was still there but not a lot else. No abs no crays with a total bare patch at the end. They too went for a scoot round and found a huge area that was barren! Although not all joined together they found patches of barrens from the size of a car to the size of a house block that was basically bare!

The last dive was on the old coordinate near the southern end of the inner Nugget, Narced and I dropped in and found a similar story but not quite as bad.
Our Transect runs showed some urchins, but weed was still mostly there. Not a whole heap more but we too saw the devastation out further.

All in all a good days diving, the wind though had sprung up and we had a nasty 90 min punch back to Bicheno.
This was the worst I have seen of Urchins and Barrens since Elephant Rock near St. Helens. I think this site needs more dives to be looked at seriously as what has been done up at St. helens and maybe a total lock down of the area perhaps. I'd loved to have had a look at the outer "Nuggets" to see what it was like on the outside of the islands, but the weather just didn't give us a chance, but is worth investigating.
cheers
Ken

3. Cape Sonnerat: By Justin Vogelaar, Ocean Divers Plus
7/2008
We dropped into 35 and headed east into 42 metres. This area was packed with fish and massive bombies covered in growth and a few Urchins which was a worry! Soon our deco time was getting low so we turned around and headed north west back into the bay and to where the shot line was. Vis was 30-40 metres and just brilliant, but a little dark as the sun was below the high cliffs that surounds the bay. Soon we were back up doing our deco stops and back in Mickys boat waiting beside the shot line.

After a lunch break back around the other northern side in Chain Locker bay, we decided to drop into 20 metres for the second dive. Mark H and I dived here the day we found the lost prop and we had a great dive. Today the vis was at least 40 metres and to make things even better it was lit by a sunny sky and there was even a beautiful big 20m high kelp tree right next to the boat. So do the math... 40 metre vis, kelp tree, divers below you and sunny clear water, this was about as good as it gets!!

We headed north west into 30 metres and the site just got better and better, plenty of fish and growth, overhangs, little swim throughs, but unfortuantly a lot of urchins!!

Mark H & I turned around and headed south east and back up into 8 metres where we found the large cave with the air pocket, and sure enough I found it and yep I stuck my head out of the water into the pocket at 8 metres.. great stuff!!!

Soon my tank was getting low, so we went back and did our deco around the large kelp tree. Once we got on board we just went on and on how great that dive was!
The decision was made to come back soon and do some more exploratory dives in that area!!
A fantastic day, with a good bunch of blokes... Micky Davis ya a bloody legend!

4. Eaglehawk Neck - Fallen Cliffs, By Ben Cashman, University Underwater Club 14/9/08

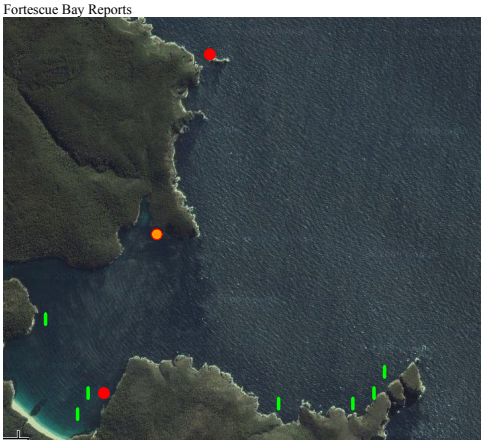
45 min dive at 8-8.5 metres
4ig boulders, phyllospora
no evidence of urchin grazings, but 4 large urchins found under boulders and in cracks. 2 medium-sized crayfish sighted - below legal size, couldn't tackle urchins

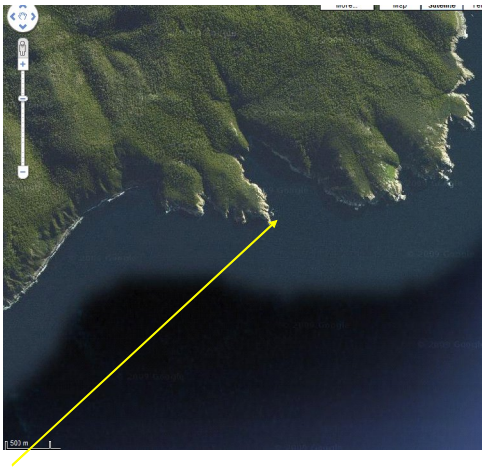
5. Fortescue Bay: By Ben Cashman and Tom Berli, University Underwater Club 22/9/08

2 Hr dive at 4-12.2 metres
Generally bottom cover is kelp, ranging from bull kelp in the shallows through to off shoots of the giant kelp seedlings.
Although not a rare sighting, draughtboard sharks swim freely and possibly breed in the bay. This mission saw no less than 3 sharks.
Total number of around 20 non-native urchins alongside 15 local urchins. Small barren patches stretching around 1.5 square metres in ~8m of water.

6. Fortescue Bay: Survey positions

Fortescue Bay Reports





Light green = low urchin densities
Orange = high densities of concern not yet barren
Red = incipient barren formation has commenced
White = large areas of continuous urchin barren

Line = line survey (approx location)
Circle = spot check/ free ranging dive

7. Maria Island: By John Cocker 3/2008

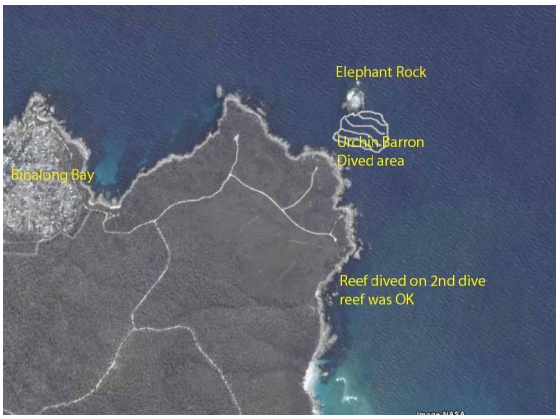
John Cocker dived Haunted bay SE Maria in about March 08 on reef slope from 20 M to sand in 30 M. Area heavily exposed with limited algal growth, hard to tell if actual barrens formed, but consistent densities of urchins on a very bouldery bottom. Estimates 5x5 M footprint (would have a higher surface area due to boulders), but normally about 8 urchins would be found in this area.

8. Maria Island: Southern Maria, By John Butterworth 14/10/2008

I thought you might like to know I did a dive on Saturday near the southern tip of Maria Island near a small reef, not the Boy in the Boat, its the reef closest to the southern tip. We were about 20-30mts off the reef which started at 5mts and went to a depth of 20mts. Very pretty dive no barrens as such but I did count 10 urchins in one small area 3mts square in about 10-12mts depth i did kill two more for fish food? I trust this helps, regards J.B.

9. St. Helens: By Ken Saville
2008

When we dive these days on the east coast it is hard not to find a spot that doesn't have the pest black sea urchin in it. We have listened and read all the info on the subject and some I know seem to think that its all pie in the sky stuff and "that will never happen here" sort of thing. Word is that big crays are the only predator to these black beasts, so what do we do when ever we get the chance…. We catch them and show everyone our takings, not giving a care what it may have done to the eco-system of the reef. Well if you want proof of what Urchins are doing to the east coast take a trip to St. Helens and do a dive on the south western end of Elephant Rock, and simply head west. THIS AREA IS DECIMATED BY URCHINS!!! Absolutely no life on the rocks what so ever and urchins in their thousands to be seen and nothing else. Just bare rocks that's all, a few bits of kelp here and there, but nothing in the way of growth. I remember diving here about 10 years ago with Colin Locke, it's where his home made video camera imploded, there is a photo at the compressor station, have a look behind him and you'll notice a nice reef and there was heaps of kelp, but alas no more! Everything was just covered with a slight algae and some rocks had a red algae about 25mm high. Saw heaps of fish mainly bulls eyes, vis was at least 20 metres, but no sea growth at all which is really sad! Meanwhile we went 400 metres south west on our 2nd dive and it was normal, heaps of weed, crays, some urchins, abs and plenty of fish. Funny isn't it, and I hope something can be done one day. Diving over the barren site was very sad. As the bottom was excellent, heaps of swim throughs large bommies on top of each other very pretty, but barren. Sad thing is these Urchins are in the Bicheno marine reserve, and its only the big crays that's keeping them at bay! So next time you are doing a cray bash on a reef with a few black urchins around, just have a think is it really worth it in the long run?



Ken

10. Eddystone Pt.: By Phil White, Leven Scuba Club
2008

Well we did manage to get in and do some survey work. The methodology was determined by the conditions and diver experience. Unfortunately we did not go anywhere near Musselroe bay and had to survey around Eddystone. Saturday 10th we only managed one survey there was a strong N. Easterly and seas were extremely choppy and confused. Mick put us in to the south of Eddystone where there was some shelter. We dropped in to a rocky bottom at 22 M. 2 divers aborted straight away. Vis was abysmal and it was decided to swim in a straight line in a northerly direction.

The algal cover is good with 100% coverage over most of the survey but there is definitely some evidence of centrostephanus damage. We came across 1 sizeable barren and 2 smaller ones with urchin infestations but the actual urchin numbers were fairly low . A barren at 18 M estimated in size at 50 sqM which was not yet stripped bare had <30 visible centrostephanus. The other 2 had <20 There were also a number of what could be incipient barrens but no centrostephanus present. One lobster and zero short spined urchins noted on this dive. No further diving possible due to treacherous seas and seasick crew

Sunday 11 was better but only because the seas had settled down into a 3 metre swell things looked grim with 1 kwell to share between 6 (true).
Mick did not want to risk a long trip up the coast so we did another location around lipstick rock. We managed all 5 divers this time and decided to adopt the same division of labour with a broad sweep in a specific direction. The vis was even worse than the day before at around 4 M. Dropped in at 25 M on sand. swam about 30 Metres till encountering rocky reef rising to 20 M 6 Barrens counted with centrostephanus density ranging from 4 - 10 individuals. very good algal cover. Some indication of incipient barren with kelp cover but little ground cover but no visible urchins. Numerous bluethroat wrasse, barber perch, flathead, 2 lobster, zero short spined urchin.

2nd dive Sun 11 In vicinity of Elephant rock. av depth 16 M Extremely poor vis and surgy. 3 divers. Adopted zig zag search pattern over largely flat rocky bottom with boulders. No barrens, incipient barrens or urchins

It would seem that the Eddystone area is extremely patchy with barrens and those that are there have yet to grow substantially. The last survey we did had significant activity in the immediate vicinity of lipstick rock but to the south it is limited. Not much above 15 Metres either. Despite the conditions the area didn't seem too bad but as you know it's hit and miss. Unfortunately the conditions were not ideal and we lost a diver on 2 of the dives due to the extremely poor vis (not literally thankfully) but I was swimming from one person to the other trying to keep everyone together!

Cheers
Phil White

11. Maria Is.: By Mick Davis (dive charter operator based at Triabunna)
2006?-2009
I had seen quite a few (maybe a lot) urchins on the north face of the lanterns at approx 20m. These dives were research dives with the uni, and a lot of urchins were collected from there. Maybe this is why no extensive barrens have developed, they were all removed for experiments. Also, Abalone divers heavliy frequent this area and I know they have a kill on

sight policy. Mistaken cape has a few urchins, but no major barrens yet. Inside, along the northern shore of Mistaken Cape is known for barrens. South of Cape Peron, "Boy in the Boat" is known for urchins and there is a Barren on the NE/E side at about 15m. Also, back on the "mainland", Freestone Point (lighthouse at the mouth of spring bay) is also known to have urchin barrens as this is another area where urchins were collected for research. The northern side of Cape Sonnerat and Chain Locker Bay is another spot that I have known of, and this was surveyed by ODP so that has been covered. I would expect Tallifer Rocks to hold urchins also, although this is a tricky place to dive, let alone survey. There are certainly " a lot" of Urchins showing up along the coast, but I have not seen any catastrophic barren sites like the ones described up at St Helens, although smaller barrens have appeared around Maria. Hope this helps a little,
Cheers
Michael Davis

12. St Helens: By Richard Mason, TSDC - June Long Weekend
June 2007
Well, here it was, the long awaited trip to St Helens; TSDC were last up there in October 1999 and as far as is known by James Parkinson (and if he didn't go, no one else did), we haven't visited since. …all systems go to dive The Merricks, a reef which doesn't quite break the water out a couple of clicks off-shore. Going out of Burns Bay. Anyway, we found something we were happy with, the shotline and buoy went in onto the reef in about 10M or so and the first group, James, Peter and Michael went in. There was quite a good tide running and it was against the wind, so the shot buoy was pulling one way and the divers were drifting the other. Reports from the recovered divers were to the effect that the reef had been badly hammered by the Centrostephanus (spelling?) urchins, the very spiny purple black things we are also seeing some of down in the South of the State. Bruno and I dropped in, the vis on the descent wasn't too bad but nothing like our recent Bicheno trip, maybe 15M tops but what a shock on hitting bottom! It was just like the rocky desert you may have seen in one of Michael J's recent emails. I hadn't dived this site previously but knew of it's previous reputation. Hardly a stalk of kelp to be seen, barely an abalone and I saw no crays, every granite boulder was cleaned down to the crystalline structure, no encrusting life at all, not even algal slime. The only places spared were steeply overhanging areas that the urchins couldn't hang onto, a few areas with yellow zooanthids and that was pretty well it. Despite all this, the fish life was profuse, with huge mixed schools of the ubiquitous butterfly perch, bastard trumpeter, morwong and many other sizeable varieties etc. James later told us that they were probably attracted to food brought up by the deep water upwellings, rather than the reef itself, which was bare. Water temp was 15ºC, or 2 degrees less than at Bicheno, only two weeks before. At this point, I discovered I could use my side slung pony as an urchin crusher, which gave us some pretty good fish feeding frenzies but apart from this, given the environmental devastation around us, the dive was distinctly lacking, and after 25 mins of following the reef down the slope to about 25M, we headed back up, I sent up my DSMB and we ascended to carry out our safety stop. At the prearranged time, I headed into Binalong to meet Pete and some more empty cylinders at the BB ramp, which we took to Bay of Fires Dive Centre and had a chat with Peter Paulsen, the centre operator and proprietor of half a dozen other St H businesses. Pete told me that the dives off Binalong (Sloop Rock area) were, if anything worse than the Merricks dive, the whole area being just one big urchin barren. Next morning (Sunday) James was champing at the bit to be there early, we'd made tentative arrangements to meet up with Bay of Fires Dive Centre boat at St Helens Island and did in fact meet them out there, after

the obligatory half hour of sounding various bits of reef on the Middle Ground which we hoped to dive later that weekend.

WE found the site, on the southern end of the island, and sheltered from the building NW swell and wind. Once again, James & Pete were first in the water, Michael diving with Bruno and me in the second wave. Once again, after 40 minutes or so, a pair of DSMBs popped up in the expected position, so we edged in close with the boat so that upon surfacing, the divers could virtually reach out and touch the boat. Both reported a great dive to over 35M; James had the proof in the form of a monster cray and some great photos. Second wave, being myself Bruno and Michael dropped in, me with my camera, and hit bottom in approximately 30M, in a blizzard of fish, one of the biggest schools of Butterfly Perch I've seen. After a few minutes at this depth, me snapping and videoing and taking some frankly awful photos, we were approaching our NDL, so we headed gradually up the slope as per normal practice. Once again, the urchin barren became more evident as we headed up the slope, although, thankfully nothing like as badly affected as the Merricks dive. Once again, it was up with the DSMBs and the boat close by to pick us up. After a decent interval, our next target was Doughboy Reef, of which I had very fond memories as it was my first proper dive, back in April 1999, which marked the end of a long diving drought. The reef is marked by three or four white guano encrusted granite rocks, (hence the name), which stand on the reef and mark the edge of a wall dropping down onto sand at over 25M.
Again, Pete and James dived first and returned to report a reasonable dive with plenty
The bottom in this area consisted of the wall itself, with long sandy gutters and broken ground, with quite prolific sea life and sponge gardens in many places, mostly unaffected by the ubiquitous urchins. Once again, we followed the usual pattern, heading along what we thought was the top of the wall but it really seemed to peter out into a series of bare boulders (hammered by the urchins again) with little of interest to be seen. A dive which Michael rated as a 9/10 in his Dive Tasmania was really a shadow of it's former self. The dive finished with all three of us popping DSMBs but unfortunately, too close for comfort to a large rock, calling for some deft manoeuvering on James' part. Back to the ramp, amid fairly rough seas, out of the water, back to the digs, hot showers all round with Bruno heading home shortly after we got back.

Next morning, I couldn't be bothered diving again, nor could Michael but the remaining pair of Team Scubie were up for it, (actually James told Pete he had to), so it was zoom out to the Middle Ground, while Michael went for a walk; chuck in the shotline and away they went, both surfacing at the shotline at dives end to report, as I remember, a not particularly exciting dive. Thus ended the weekend's diving, so it was back to the house, pack away, wash the boat out, flush the motor, before returning to the Big Smoke, via Fish n Chips in St Helens. Michael and I took the long way home by driving through Upper Scamander on the gravel road to St Marys, where we saw first hand the devastation wrought by the December 2006 Bushfires, a fairly sobering trip with massive devastation in the forest in some ways mirroring that seen on some of my formerly much loved dive sites.
Lessons I took home from this weekend?

1. I was amazed by the devastation of the marine reef environment by the Centrostephanus urchins; it really has to be seen to be believed, nowhere was unaffected. I doubt I'll be returning to dive there anytime soon. In the meantime, we should be doing something about it. Quite what that something is, I don't know, although Michael has some good ideas; I don't doubt that if the general public had

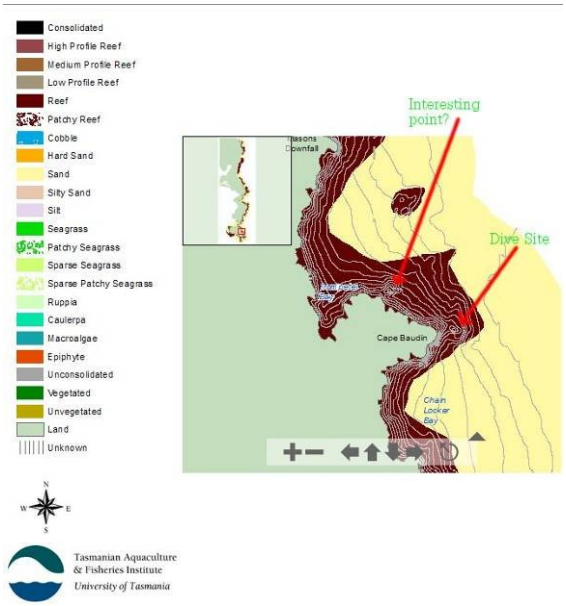
any appreciation of the loss of this beautiful ecosystem, it would generate almost as much controversy as the forestry debate.

2. DSMBs – (Delayed Surface Marker Buoys), really are a great piece of kit; carrying and using one ensures the boat crew know exactly where you are, ensuring they can be in close to pick you up straight away as soon as you surface. From the boat crews' angle, it really takes a lot of the stress out of looking for that elusive black clad head popping up in a rough grey ocean; you can't beat a bright fluoro orange bag for broadcasting your exact location. Personally, I think they are a must and that all club divers should be carrying one and learning to use it (practice makes perfect) – it could be a real life saver if you are doing your precautionary stop in any kind of current and the boat crew isn't sure of your exact location, especially when there's any sort of swell running. This should be an item that all dive shops should carry and strongly encourage their clients to buy.

3. Don't f__k around with the blinds in rented houses.
Richard Mason

13. Schouten Island: Sarah Ann Bay, By Eric Fillisch, TSDC 1/2009

On Sunday 8 TSDC divers took 2 boats to dive Schouten Island. Narcosis and Big Bite with 4 divers apiece. For the first dives the boats separated with Myself, Andrew, MM and Grace diving in the bay NW of Sarah Ann Rock (at least that's where I think we were).Dive in amongst kelp and large boulders on the edge of the sand at about 30m. Plenty of butterfly perch and a couple of banded morwong. Andrew managed to pick up a cray and the one I saw scooted back into the rock before I could get all my gear of my left arm in order to have a go at him. On the way up I spotted another red velvetfish with a white patch on him (photo is too blurry to bother posting), followed by a small patch of zoanthids hidden in amongst the kelp.



Mickeys pinnacle

Again diving with the same buddies. This time down a shotline to the top of the bommie at about 16m. We proceded over the bommie which was covered in a layer of kelp about 1m tall and down the side into a gully. Getting close to 30m we were able to swim across to a second bommie, this one presenting us with a wall of zoanthids and unfortunately **some long spined sea urchins**. About 10 minutes around 30 m and then it was a matter of following the bommie profile slowly ascending keeping the no-deco limits between 1-2 minutes.

A spectacular dive with some current running. Probably should have taken the opportunity to run this as a drift dive rather than finning into the current, though the second bommie was the more impressive of the two we saw. Would love to see this in 30m of vis, especially as there were at least 3 large baitballs swimming at the surface which we couldn't see on the dive.

13. Schouten Island: Chain Locker Bay, By James Parkinson

1/2009

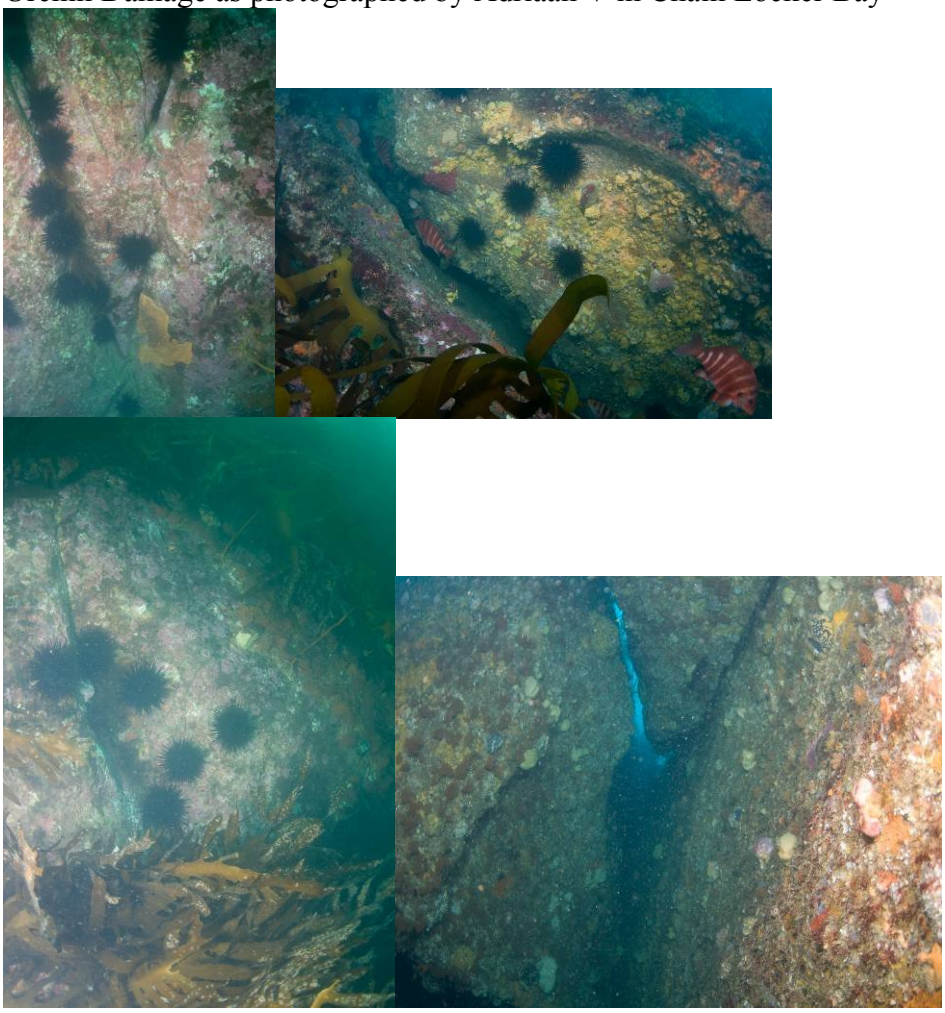
A fantastic day of diving. Those in my boat (Kim R, Brendan A and Adriaan VH) dived the western side of Cape Sonnerat, unfortunately a 1m NE swell did not allow us to dive directly off the Cape but we ducked around the corner and got a nice dive along the western wall. We dropped in on a narrow canyon that was filled with a few large boulders creating some nice swim throughs, a small pinnacle on top of the ridge had a mass of fish schooling around it including a large school of real bastard trumpeter. We dropped over the western side of the canyon which dropped shear away to 40+m, here we were soon joined by a mass of butterfly perch which streamed in to check us out. I finished the dive following the steep wall into the small bay. Many huge banded morwong were seen swimming amongst the large boulders and swim throughs. Two things surprised me about this dive one was the **lack of urchin barren's, but many urchins were seen packed in cracks** the second being the lack of crays, despite extensively searching many cracks, over hangs and ledges. A nice dive and was great to explore the other side of the cape.

Dive Time: 50 minutes
Depth: 32m
Vis: 15
Water Temp: 14
As rodent mentioned we met at a pinnacle off Chain Locker Bay for a second dive which I will call Micky D's pinnacle, after a bit of sounding around we found the pinnacle came up steeply from 40+m to within 11m of the surface. Mick told me about this some time ago and since then have been keen to check it out. We set a shot on top of the bommy in 13m. Descending down the shot we found the vis to be much lower than the first dive at around 5m, the top was covered in thick ecklonia and a large school of pike patrolled the reef. We descended down the eastern side which dropped away at a moderate rate, first we swam north around the bommy where we encountered current around the north side we then cut back and headed towards the southern side. Here we found the bommy dropped away to a vertical wall, by this stage bottom time was running out I had enough time to have a look over the edge and I was pleasantly surprised to find the wall plunging way and covered in a

mass of colourful invertebrate life. Below swirled a mass a butterfly perch and few thumping jackass morwong swam up to greet me. According to the sounder this wall plunged away vertically to 45m. This will be a must do dive for another day.

Dive Time: 36 minutes
Depth: 31m
Vis: 5
Water Temp: 14

Urchin Damage as photographed by Adriaan V in Chain Locker Bay



14. St. Helens – Skeleton Bay: By Robert Shephard
10/3/2009

I dived at Skeleton Rock on Sunday and happened across a huge baron. Spent about 15 minutes at between 10 and 12 meters and would have seen 100 – 150 urchins, no crays and even more depressing for me absolutely no abalone. The only things left on the bottom were a few patches of Yellow Zoanthids in those hard to get to places. I've attached a quick map with the area I dived marked in red. Hope this info helps.

Best regards
Shep

15. Fortescue Bay, Test Urchin Survey, By Michael Jacques
12/1/2008

John Cocker, Jeff Knight, Adriaan Van Huissteden and I turned up at a blustery Fortescue Bay to run out a trial survey line near the boat ramp. I had spent a full ten minutes that day sawing up a couple of white measuring sticks and James supplied a DPIW survey line. Not much in the way of sophisticated equipment, but it all works just the same.

We had got reports of urchin damage appearing near the boat ramp and we were also keen to see what the urchins had been up to in the bay.

I was pleased to see that everyone got the concept pretty easily and the main trouble was with buoyancy in these very shallow test depths. Everyone also had trouble finding the slates and sticks when they needed them, but by the end of the line everyone had a strategy pretty much sorted out. Both Jeff and John played guinea pig, and finished a 50 metre run in 35-40 minutes. This was in really thick weed, thicker than we are likely to encounter and the last 15 metres took no time really when they got into a rhythm. The dive proves that the depths and methods we have selected are going to be achievable. We did them in good time despite rough weather, abnormally thick weed and inexperience.

We did seem to get mixed up somewhere and count an extra 5 metres, but the results were basically similar between the divers. There were very few long spined urchins, but quite a few short-spined urchins. Nearly no crays and few abalone.

Adriaan and I supported the first dive and then went for a free-range dive. We had time to play with Gummy Sharks and take a few photos and look around. Pretty easy work. We saw a few areas of bare ground with a few urchins in them (say one long-spine and 3 short-spined, usually 1-2 metres x 0.5 metres in area – about 1 patch out deep seen in 30 minutes –lots of small patches in shallow). Hard to say if they were even urchin barrens. The shallow barrens could even have been caused by storm damage.

16. St Helens: Survey training course, By Mike Jacques
1/2008

Thanks to all the divers from Oceans and Leven clubs who turned up as keen as mustard to join in. We rented a beaut 3 storey house by Georges Bay with a glorious view, but couldn't stop the 30 knot winds from blowing. I warned everyone not to drink too much, before knocking off a bottle of red wine while we made up some survey lines. Mike Reid gave us a class on rope splicing too.

As a result of the wind we spent Saturday listening to the results of Scott Ling's PhD research. Scott followed this up later with an equally interesting talk on marine processes that affect reefs, including human disturbances. I think everyone got the general idea, but we did ask Scott to use more profanity to emphasise points. This he did, even referring to "perturbation", which I haven't done since I was a teenager.

Then we went out to brave the weather. There was some hypothermia, some lost gear, fudged results, and that was just in the back yard! We did identify a density of 2 introduced items of confectionery every metre of lawn. In some areas, barren gravel had appeared on 50% of the driveway.

We then talked about what everyone needed to/wanted to do and thanks for your input. I obviously got the budget all wrong so we'll have to have a rethink. Leven turned up to the training with the most divers, but Oceans then recovered by offering to do all the hard areas.

Early night and early start Saturday, with 4 of the stayers deciding the offshore winds permitted a shore-hugger dive off Elephant Rock. We had a few mix ups, current, buoy line and weight problems, I had 3 pieces of broken gear to deal with, but Leven club completed 2 survey dives.

We found a density of about 2 urchins per square metre and 100% barren almost everywhere. Ken Saville's recent dive in the area (see last Oceans newsletter) also suggests almost total barren coverage near this side of the rock. By my calculations, if the frontage of the rock is about 100metres and the shelf in 15-20 metres is about 50 metres wide, then there are more than 10,000 black urchins on the south side of Elephant Rock, just in this depth alone. As typical of much of eastern Tasmania, the urchins on the eastern side of the rock extend into much deeper water (25 m plus) and the barrens extended as far as we could see.

We'll run an inter-club premiership ladder, probably with a pathetic prize. At the moment the northern clubs are consistently topping the bill, lets see what the southerners can do on 15th March at Tinderbox for their training day.

16. Summary of reports received and placed on urchin website
(http://www.otsweb.net/divesurveys/ResultsSummary/tabid/671/language/en-AU/Default.aspx)

Kent Group
Earlier research programs have shown that barrens began forming in the late 1970s at least and up to 50% of the reef slope around these islands has now been taken over by urchin barrens.

Flinders Is
NRM survey of the shallows (5-10M) showed variable densities of urchins, but no surveys have been deeper. Still no known areas of extensive barrens as yet, perhaps due to vagaries of the local currents.

NE Bass Strait
Four dives in the area by the TSDC in January 2008 at Fosters Reef, Fosters Is, Macleay and Baines Is, Papanui Rock and NW Waterhouse Is revealed no evidence of black urchins. Dives around Macleay and Baines Is in 2009 revealed no black urchins.

Eddystone Region
This area is affected by areas of urchin damage and remains of concern. Some extensive barrens have formed around Lipstick Rocks and Georges Rocks. Incipient 'swiss cheese' barrens are appearing in many areas.

Eddystone 1 survey line – Eddystone Pt (Leven Scuba Club)

Eddystone 2 survey line – Eddystone SE (Leven Scuba Club)

Eddystone 3 survey line- Half Tide Rk (Leven Scuba Club)

Eddystone 4 survey line – Lipstick Rock (Leven Scuba Club)

Lipstick Rock free ranging dive (Leven Scuba Club)

Summary of free range dives at Eddystone Jan 09 (Leven Scuba Club)

Elephant Rock free ranging dive 1 Jan 09 (Leven Scuba Club)
Elephant Rock free ranging dive 2 Jan 09 (Leven Scuba Club)
Bay of Fires free ranging dive 1 Jan 09 (Leven Scuba Club)
Bay of Fires free ranging dive 2 Jan 09 (Leven Scuba Club)
Lipstick Rock free ranging dive 2 Jan 09 (Leven Scuba Club)
Lipstick Rock free ranging dive 3 Jan 09 (Leven Scuba Club)

Four Mile Creek
This area is not subjected to heavy barrens damage, although one site shows an increase in urchin density. As an inshore site this area was not expected to show intensive damage.

Ironhouse 4 Line survey (TSDC)

Ironhouse 2 Line survey (TSDC)

Ironhouse 3 Line survey (TSDC) - increase in urchin density, although only a small number seen

Saltwater Inlet 4 Line survey (TSDC) - no urchins sighted

St Helens Region

This area has been known to have had black urchins since at least 1978. In the late 1990s the damage was confined to some limited areas, but densities increased dramatically only a few years later until in recent years most rocky reef between 15metres to 40 metres depth has been destroyed by urchin barrens. In shallower depths, it appears that the sweeping action of kelp has restrained urchin numbers.

This area is being surveyed by TAFI as part of an urchin management program and a closed research area has now been proclaimed near Elephant Rock.

Training survey line dive – Elephant Rock (Leven Scuba Club)

Training survey line Dive – Elephant Rock (Leven Scuba Club)

Free Ranging dive Elephant Rock and barrens history (Ken Saville)

Free ranging dive report (TSDC) 2007

Shep's Skeleton Rock Dive (TSDC) March 2009

Barrens History, Bicheno area (Peter Paulsen), - has seen an increase in density and barrens from Gardens to St Helens Island in recent decades, although when he started diving in the early 80's he remembers Sloop Rock was already quite barren then on the eastern side. Increases have been more dramatic in recent years

Barrens History, Skeleton Rock urchin removal experiment (Col Lester) - conducted an experiment to remove the urchins from half a reef in Skeleton Rock area, which quickly recovered its kelp cover. Does not have the resources to remove a larger area.

Bicheno Region

The area is not widely affected but spot damage has been appearing in some areas. Disturbingly there is evidence of some small incipient barrens appearing within the Governor Island Marine Reserve. Some comments that the avergae size of crayfish may also have been declining in recent years due to boundary fishing effects.

Bicheno line survey 1 (Oceans Divers Plus)

Bicheno line survey 3 (Oceans Divers Plus)

Bicheno line survey 4 (Oceans Divers Plus)

Cape Lodi line survey 1 (Oceans Divers Plus)

Cape Lodi line survey 3 (Oceans Divers Plus)

Cape Lodi line survey 4 (Oceans Divers Plus)

Free ranging dive report Blue Waters Reef (Greg Close)

General Bicheno free range report via Meriloy Horsham - Local divers report incipient barrens at Blue Waters, south of Muirs Rk, Traps Reef.

Dive Report free range report Mitchell Rolls (TSAC) - has a comparison photo of a crack at Mt Everest showing complete removal of life by urchins who have established a barren area in the crack.

Dive report - Mike Jacques(TSDC/TMNA) - rock face approx 10 metres by 4 metres near the Castle is barren in a depth of 28 Metres, lots of individuals seen throughout the dive.

Cape Tourville

The shallower depth do not appear to be heavily affected by barrens damage, although it appears that larger barrens have begun to appear in deeper depths. A large area heavily impacted by small barrens was detected between the mainland and the lee side of the largest "Nugget" in 20+ metres.

Cape Tourville Survey line 1 (Oceans Divers Plus)

Cape Tourville Survey line 2 (Oceans Divers Plus)

Cape Tourville Survey line 3 (Oceans Divers Plus)

Cape Tourville Survey line 4 (Oceans Divers Plus)

Schouten Island

The area is not showing consistently high urchin densities, but again there is evidence of incipient barrens formation in many localities, particularly on the eastern side of the Island, perhaps because this side faces into the Eastern Australian Current.

Cape Sonnerat free ranging dive report (Justin Vogelaar) -

Schouten Is free ranging dive report 2 (TSDC)

Sarah Anne Bay line survey 1 (TSDC)

Sarah Anne Bay line survey 2 (TSDC)

Sarah Anne Bay line survey 3 (TSDC)

Taillefer Rks line survey (TSDC)

Social Dive report Chain Locker Bay and Pinnacle (TSDC)

Maria Island

The SE and Eastern side of Maria is beginning to show signs of incipient barren formation.

Mistaken Cape TUDC (UNI) survey transect 1A

No black urchins found on line but follow up free range dive found a small incipient barren in 12 M. Area scoured by wave action and vegetation sparse.

Mistaken Cape TUDC (UNI) survey transect 2A
No black urchins found on line but follow up free range dive found two 10sqm incipient barrens in 17 M just around the northern headland of Mistaken Cape.

Beaching Bay TUDC (UNI) survey transect 1A
No black urchins found on line but follow up free range dive found a small incipient barren in 10 M off the end of the survey line.

Beaching Bay TUDC (UNI) survey transect 2
No black urchins found on line but follow up free range dive found small incipient barrens of 1-2sqm in 10 M in some crevices.

Mistaken Cape TSAC survey transect 1B
Black urchins found on line in densities of approx 0.05 per sqm, predominantly in the shallow end of the survey line in 17-20M.

Mistaken Cape TSAC survey transect 4
Black urchins found on line in densities of approx 0.52 per sqm, predominantly in 9-18M causing small incipient barrens in some crevices where densely packed.

Beaching Bay TSAC survey transect 1
No black urchins found on line. Shallow and surgy site but nice dive with plenty of juvenile kelp stalks and smaller seaweeds.

Beaching Bay TSAC survey transect 4
No black urchins found on line but follow up free range dive adjacent to the survey line found 5sqm barrens in approx 16M on the face of larger bommies rather than small rocks. Zoanthid (sea daisies) but mostly eaten away down to polished rock.

Free Ranging dive report, Boy in the Boat (John Butterworth)

Free Ranging Dive report, SE cliffs (TSDC), a barren area has been located in deeper water near the scenic site known as the "Vanilla Slice"

Free Ranging dive report Painted Cliffs Maria Is & Isle De Phoque (Jane Elek - Crabs/TMNA), Jane saw urchins at both the Isle De Phoque and Painted Cliffs, Maria Is, in clusters of 3-4 but widely scattered. Kelp cover was still good with a few abs and no crays.

Free Range Dive report John Butterworth - Isle De Phoque. Saw incipent barrens forming during dive off the cave area to SW side of island . Barren at Isle- De- Phoque. 42*- 24.714" S. 148*- 09.671" E . In 9-10m, barren on side of rock face. Approx. 3m high x 4m long. Upwards of a dozen or more urchins.

John Cockers Haunted Bay Report

Mike Davis' Maria Island report

In Great Oyster Bay scattered numbers of black urchins have been found by the TSDC in 15 M off Boltons Bch.

Urchins also seen at Freestone Pt at Spring Bay by Mike Davis.

Forestier Peninsula Region

This area is showing some densities of urchins but barrens do not yet appear to be forming. This area is being surveyed by TAFI as part of an urchin management program and a closed research area has now been proclaimed at North Bch area near Visscher Is.

Free ranging dive report- Fallen Cliffs (TUDC)

Free Ranging Dive report – Reef Life Survey results - TAFI reef life survey particiants have seen scattered individual urchins against the cliffs in shallow water at Cape Surville and also along the cliffs a few kilometres further south.

Fortescue Bay

This area shows some spot damage around the boat ramp in quite shallow waters. In other areas there are only low densities of urchins, or interestingly in Bivouac Bay, higher densities which have not yet resulted in extensive urchin barrens damage. The areas around the Lanterns has been known for small barrens but line surveys in this area did not encounter any barren patches. Mike Davis reports urchins have been removed from the Lanterns from time to time in by uni students and researchers and also by abalone divers. Other divers report that there are , or have been, barren areas on the Lanterns.

Fortescue summary map

Line survey – penguin rookery (TDA Crabs)

Line Survey – near boat ramp in kelp (TDA Crabs)

Free Ranging Dive report Jan 09 – TAFI Reef Life Survey members, in 5M in nth side of Bivouac Bay high urchin densities were found in a boulder field along the shoreline. Urchins do not appear to be currently affecting the kelp overstorey at present.

Free Range Dive report Feb 09 - TSDC reports incipient barrens on NW side of the Thumbs.

Training dive – boat ramp shallows (TSDC)

Free Range dive report TUDC

TSDC Line Survey 1 Lanterns - no barrens found and low densities of urchins encountered

TSDC Line Survey 2 Lanterns - no barrens found and low densities of urchins encountered

TSDC Line Survey 3 Lanterns - no barrens found and low densities of urchins encountered

TSDC Line Surveys Lanterns - no barrens found and low densities of urchins encountered

Wedge Is- Cape Raoul
This area is not heavily influenced by the Eastern Australian Current and has not shown any evidence of urchin damage.

Wedge Is Sth, kelp cove -Free ranging dive survey 1 (TUDC), no urchins found

Wedge Is West - Free ranging dive survey 2 (TUDC), no urchins found

North Bruny
Only isolated individual urchins have ever been reported from this area. It is both inshore and isolated from warm currents, so is not expected t show extensive urchin damage in the near future.

Training dive results 1, no urchins found

Training dive results 2, no urchins found

Adventure Bay
Isolated individuals have been seen on the Friars .

Adventure Bay free range dives TUDC - one area of incipient damage has been recorded in shallow water near Adventure Bay

Recherche Bay
Isolated individuals have been seen in earlier research programs but there is no current evidence of barrens formation.

Port Davey
Isolated individuals have been seen in earlier research programs but no evidence of barrens.

Additional sightings of *Centrostephanus rodgersii* (sorted chronologically)

In 1975Alan Lane (TSAC) saw two urchins south of Settlement Pt on Flinders Is.

In the mid 1980s Jak Denny (TSAC) dived the Isle De Phoques and found one black urchin in the Northern swim-through cave.

In about 1990 Mike Jacques saw a small number of black urchins in a native (*Heliocidaris erythrogramma*) urchin barren on the Eastern side of Frying Pan Is, Pt Arthur.

In 2006/7, Jak Denny dived the back (NE side) of Bird Rock at Bicheno in the channel between the rocks saw big numbers of black urchins. Craig Harris dived Bird Rock at Bicheno (date unknown) on the drop-off on the North side, (marked on map very close to Jaks earlier sighting) and saw lots of black urchins.

In 2007 Jak Denny (TSAC) observed an area of barrens around Lanterns (already known to TAFI), barren still there. Mick Barron of EHDC has also observed small urchin barrens near the Lanterns in 12-16M under Ecklonia, about 5-6 per m^2, mostly in crevices. Close to a seal haulout.

In about 2007 Craig Harris dived Paddys Is and St Helens Is and saw no urchins? There are now barrens on the SW (inshore side) of St Helens Is.

In March 2008 Craig Harris dived the NE bommie of NE Maria Is and saw no black urchins, he returned in March 2009 and there were a lot on the Northern wall of the rock.

In 2008 Alan Lane TSAC observed a native urchin barren at Troubridge/Trousens Pt? just south of Spring Beach on the East Coast

In 2008 Mark Franks dived the southern cliffs of Schouten, about half way between Sarah Anne Bay and Taillefer Rks and saw no black urchins.

In 2008 Mark Franks dived Trumpeter Bay and found no barrens

In 2008, Mark Franks dived on the Eastern side of Schouten near Black Patch Bay and found a barren ridge top in 15-30M in Chain Locker Bay.

In December 2008 Craig Harris dived on Chain Locker Bay and saw no black urchins".

In December 2008 Craig Harris dived on the Southern cliffs near Cape Sonnerat and saw "a few" urchins".

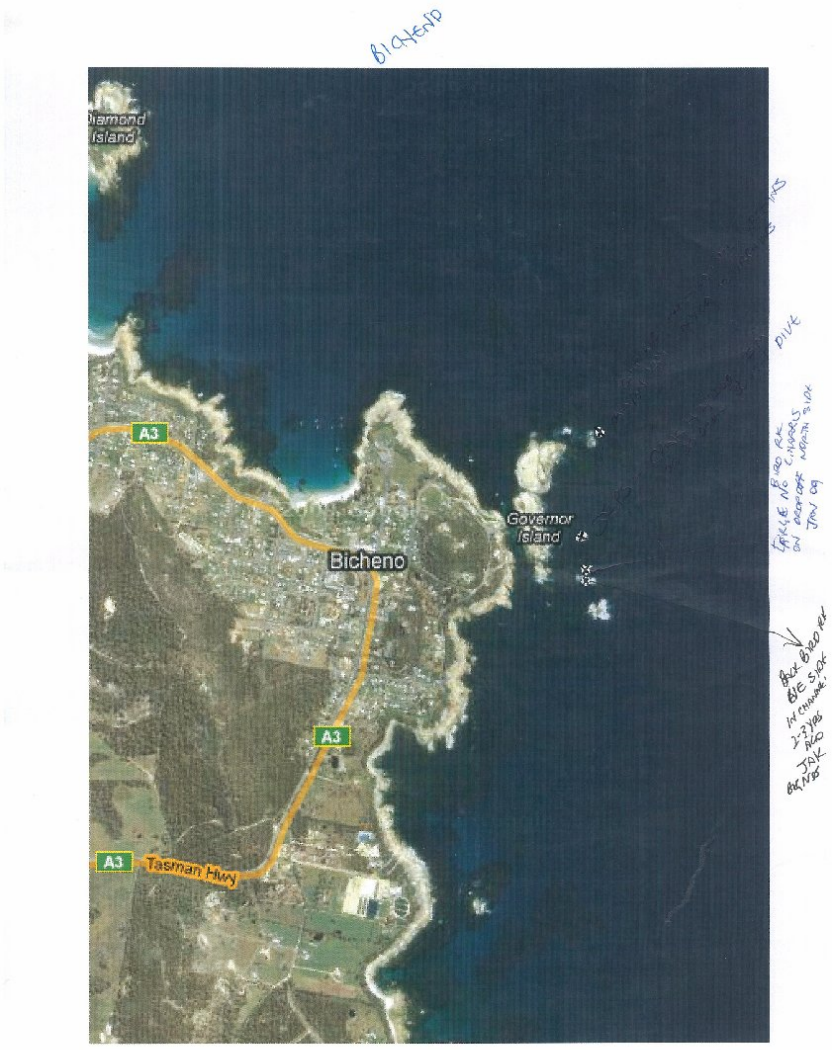
In January 2009 Craig Harris did a shore dive in Bluestone Bay, Freycinet and saw no Black urchins.

In Feb 2009 Craig Harris dived "The Steps" on the Eastern side of Governor Island (slightly north of Bird Rock), in 25M saw 20-30 black urchins on a 30 Minute dive.

In about March 2009 TSDC found 1-2 black urchins on a shore dive on the southern side of Spring Beach in shallow water.

In May 2009 Craig Harris Dived "The Canyons" off the NE tip of Governor Island and in 14M and saw 12 urchins, in March 09 he saw no urchins in a similar area.

In 2009 TSAC dived off the pipeline at Louisville, Spring Bay and saw no black urchins



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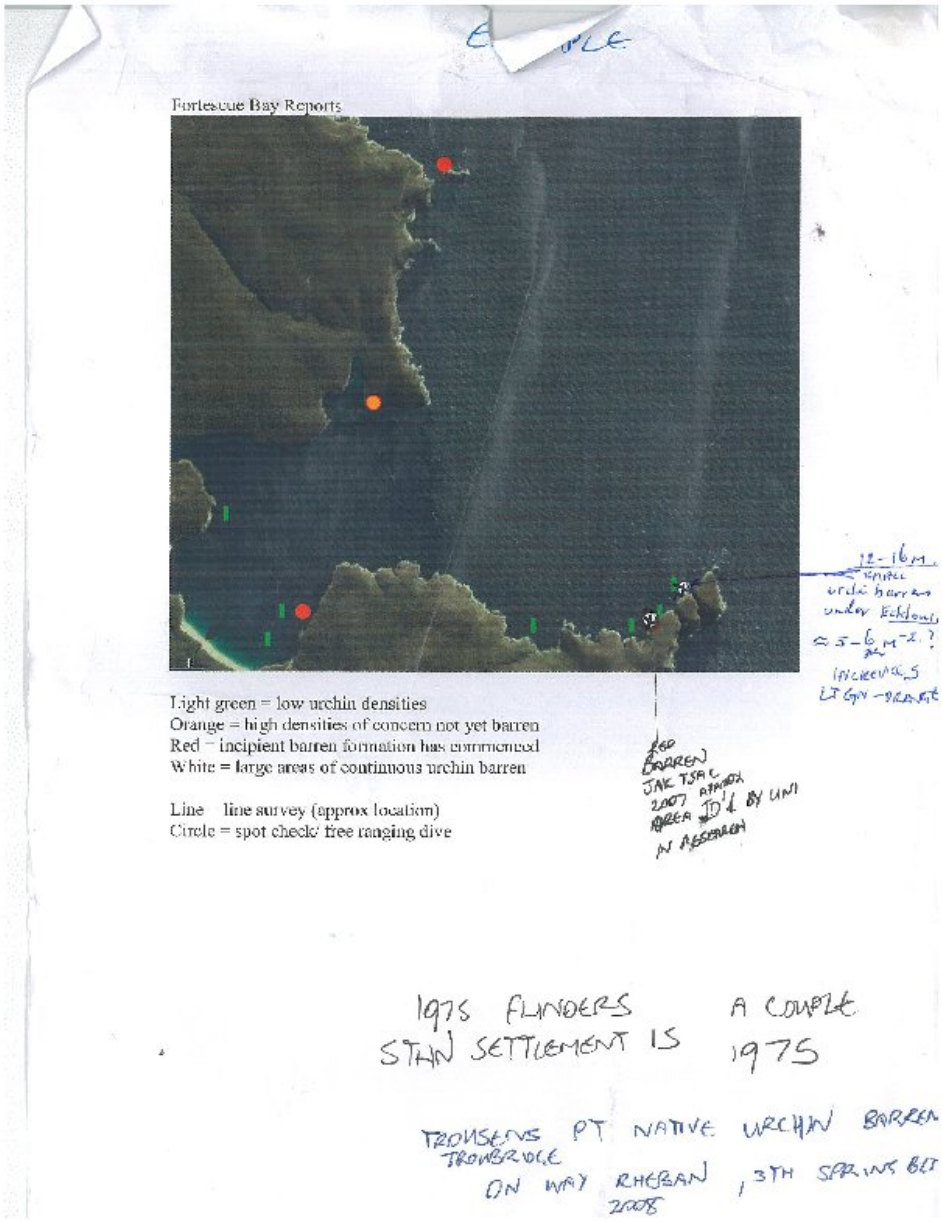

Fortescue Bay.

Southern Freycinet Peninsula and Schouten Island.