SURVEY FINAL REPORT

Bass Strait Central Zone Scallop Fishery: 2009 Scallop Surveys Final Report

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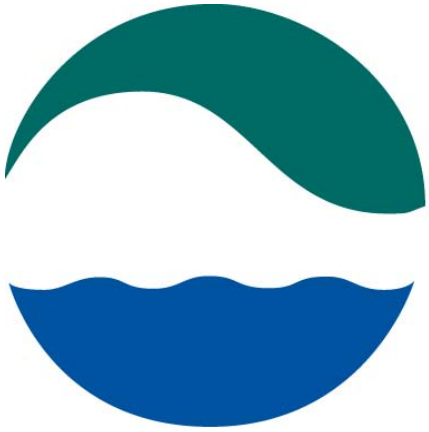

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1. Executive Summary

Three surveys were conducted within the Commonwealth Bass Strait Central Zone Scallop Fishery (BSCZSF) between June and December 2009. These surveys targeted the data poor western zone fishery (King Island region), the known scallop resource within the eastern zone fishery, and data poor regions of the eastern zone fishery.

No commercially viable scallop resource was identified within the western zone fishery near King Island. In fact, only seven individual scallops were caught during this survey. Scallops remain abundant and healthy within the unfished portion of the known beds within the eastern zone fishery. Furthermore, residual scallops remain within those regions fished during the 2009 commercial season. Three new areas (beds) of scallops were located within the eastern zone fishery. Scallops predominately in the 80 mm to 114 mm size range, were found within two of these new beds. The third area, to the north of Babel Island, contained high abundances of newly recruited scallops in the 44 mm – 62 mm size range. These scallops would most likely have settled during the 12 – 24 month period prior to discovery.

Biomass estimates for part of the known resource of scallops located within the eastern zone fishery were conducted at 33% dredge efficiency. Results suggest sufficient quantities of scallops are available for a commercial season during 2010.

2. Introduction

An industry-based survey conducted during late 2008 identified substantial recovery of scallops stocks within the eastern zone of the BSCZSF (see Harrington, Semmens and Haddon 2008). The data obtained during this survey was sufficient to fulfil the decision rule and harvest strategy processes for this fishery, and subsequently, the fishery was reopened during 2009 after a three year closure. However, under the rules of the management plan and harvest strategy, continued monitoring of the known scallop resource, and exploration for new commercial quantities of scallops is required. Subsequently, a number of scallop surveys were conducted during 2009.

Since the May 2009 pre-season scallop survey, there have been three key surveys conducted within the BSCZSF, these being:

1) Exploratory survey within the western zone of the BSCZSF.
2) Targeted survey looking at impacts of fishing and dredge efficiency; conducted within the western closed zone scallop bed, eastern closed zone scallop bed and fished component of the eastern zone scallop bed, all of which are found within the eastern zone of the BSCZSF. This work was conducted as part of the Tasmanian Aquaculture and Fisheries Institute (TAFI) run FRDC 2008/022 "Establishing fine-scale industry based spatial management and harvest strategies for the commercial scallop fishery in South East Australia".
3) Exploratory survey within data poor regions of the eastern zone of the BSCZSF.

The western zone refers to the region near King Island, and will subsequently be referred to as the King Island survey in this report to avoid any confusion with the western closed zone scallop bed. The eastern zone refers to the region to the north of Flinders Island. The eastern zone contains three distinct known regions of scallops,

which will be referred to as the western closed zone scallop bed, eastern closed zone scallop bed and 2009 open zone. The 2009 open zone refers to the area of the eastern zone scallop bed that was open to commercial scallop fishing during the 2009 season.

The overall aim of this report is to describe the findings of these three surveys and provide an estimate of the available scallop resource (biomass estimate) known to occur within part of the eastern zone fishery of the BSCZSF.

3. Materials and Methods

3.1 King Island Survey

Three industry vessels conducted the exploratory survey within the data poor region near King Island over the 9th and 10th September 2009. The vessels involved were the Brid Venture, Brid Voyager and Dell Richey II. The expertise and knowledge of the skippers and crew of these vessels, along with other non-participating fishers and historical catch records, were used to identify key areas of survey interest.

3.2 Eastern Zone Surveys

3.2.1 Targeted survey

The vessel Brid Voyager conducted the targeted survey within the western closed zone scallop bed, eastern closed zone scallop bed and 2009 open zone on 16th and 17th October 2009. 49 sample tows were conducted, with the specific tow locations being provided by TAFI scientists. This work was completed as part of FRDC 2008/022 "Establishing fine-scale industry based spatial management and harvest strategies for the commercial scallop fishery in South East Australia".

3.2.2 Exploratory survey

Six vessels participated in the exploratory survey of data poor regions of the eastern zone of the BSCZSF (i.e. areas outside the known western and eastern closed zone scallop beds). The vessels involved were: Brid Voyager, Dell Richey II, Karumba Gulf, Melas Star, Melinda 1, and Northern Star. The survey was conducted over the 25th October to the 4th November. A broad region of the eastern zone fishery was explored during this survey.

3.3 Data Collection

The expertise and knowledge of the skippers and crew of the participating vessels, along with other non-participating fishers and historical catch records, were used to identify key areas of interest within both the King Island region and eastern zone of the BSCZSF. Specific sample locations, however, were left to the discretion of the participating skippers. For each sample tow conducted, the skipper and crew of the survey vessel recorded the start and finish latitude and longitude, depth and an estimation of the total scallop catch. Total catch was estimated either as the kilograms of scallops caught or the number of individual scallops caught.

Electronic measuring boards were used to measure the shell width of all scallops caught or a randomly selected subsample (50 scallops was suggested) of scallops when the catch was large.

Specific sample tow locations were provided to the skipper of the Brid Voyager during the targeted survey conducted within the western and eastern closed zone scallop beds and 2009 open zone, as previously mentioned. For the majority of sample tows conducted during this survey, all animals were identified and counted. Furthermore, data, which should allow the calculation of dredge efficiency estimates, was also collected during this targeted survey. This data is not presented in this report. It must be mentioned that the time required to sort and count the catch during this research survey prevented further exploration within the known beds of scallops within the eastern zone of the BSCZSF, in particular the western closed zone scallop bed (refer to Figure 8).

3.4 Data Analysis

Scallop abundances were illustrated as the catch per standardised 1000m sample tow length. This calculation did not account for dredge width (i.e. area swept).

Length – frequency plots were used to compare the population structure of scallops caught within different areas of the survey region. Because the larger catches were sub-sampled for size frequency (i.e. not all scallops from a particular sample tow were measured), the ratio of the sub-sample to total catch was used to scale the numbers in each size class to total catch. To characterise the properties of the resulting size distributions the length frequencies were plotted as histograms, with data grouped into 2 mm size classes to reduce noise. The proportion of scallops less than the legal minimum size (90 mm shell diameter) was calculated from the length frequencies to provide an estimate of the potential discard rates within different survey regions.

3.5 Biomass Estimates

A crucial component of the BSCZSF management plan and harvest strategy is the need to calculate biomass within known harvestable scallop beds. Such estimates aid the decision making processes determining which regions of the fishery to open and what TAC to set.

The impacts of fishing study being undertaken by TAFI within the western and eastern closed zone scallop beds and 2009 open zone uses a number of strata (Figure 1). Five scientific sample tows were conducted within each of these strata during October 2009. This data can subsequently be used to calculate biomass estimates for regions of the eastern scallop bed. It must be noted that all scallop catch data from these strata (i.e. legal and sub-legal size scallops combined) were used for the biomass estimate calculations.

The estimated biomass (B) within each of the impacts of fishing strata and associated 95% confidence limits (CL) were estimated as follows:

Estimated biomass (B)(tonnes) $= Av.D \times A / 1000$
Upper 95% CL (tonnes) $= (Av.D + (t_{n-1} \times StErr_N)) \times A / 1000$
Lower 95% CL (tonnes) $= (Av.D - (t_{n-1} \times StErr_N)) \times A / 1000$

Where Av.D = average density of scallops per m^2 swept area; A = total stratum area (m^2); t_{n-1} is from the t-distribution; $StErr_N$ = standard error of the average kg scallops caught per $1m^2$ for a given stratum N, and n is the number of tows within a given stratum.

The biomass estimations, as described above, assume 100% dredge efficiency. However, it is highly unlikely that the dredges used to conduct the sample tows during this survey were fishing at 100% efficiency. Subsequently, the estimate was multiplied by 3.03, assuming 33% dredge efficiency, as used for the 2008 biomass estimates (see Harrington, Semmens & Haddon 2008).

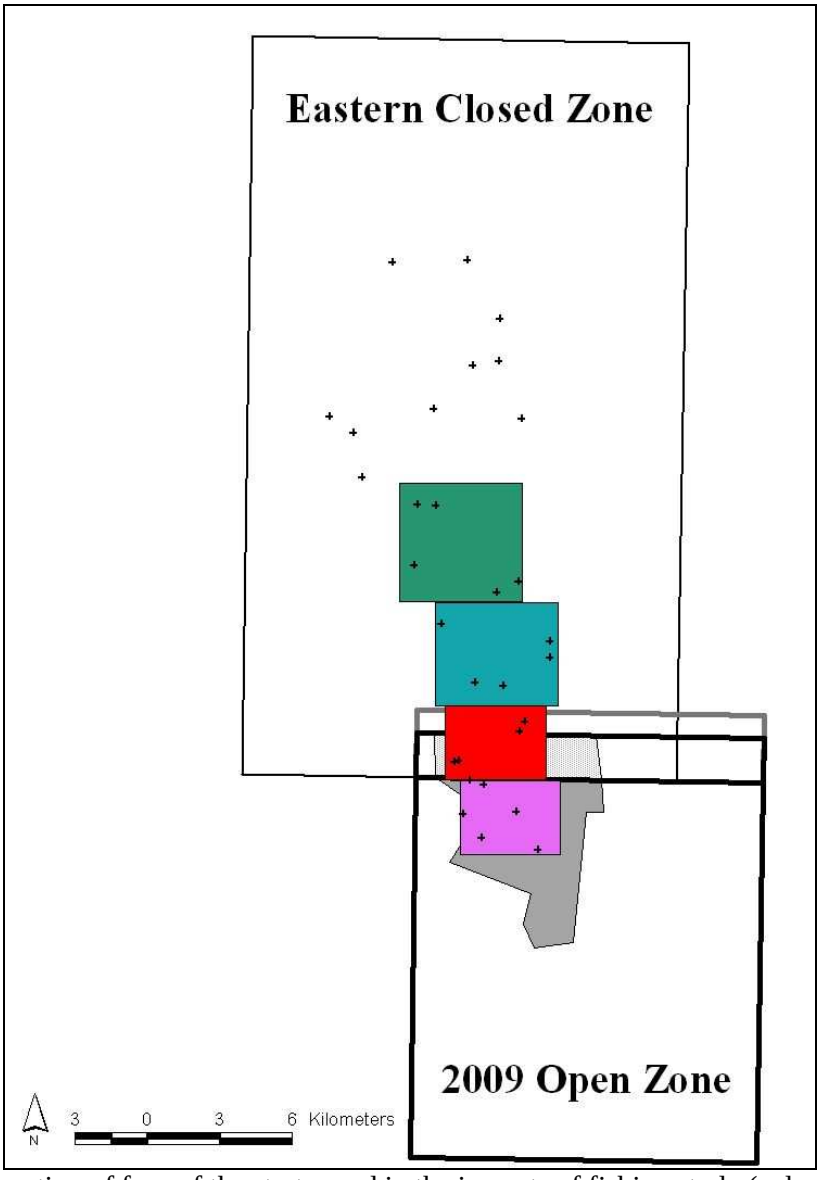


Figure 1: Location of four of the strata used in the impacts of fishing study (coloured boxes) and sample tows conducted within these strata (crosses). The dark grey region within the southern part of the 2009 open zone indicates the area commercially fished (based on VMS data), and the lighter grey region to the north illustrates the area commercially fished within the first extension of the 2009 open zone.

4. Results

1.1 King Island Survey Results

In total, 141 sample dredge tows were conducted during the King Island survey (Figure 2).Only seven individual scallops were caught during these sample tows (Figure 3). Low abundances of what appear to be relatively new empty scallop shell was located within the key areas identified as potential scallop "hotspots". Unsuitable scallop habitat was observed over large areas when travelling between target locations (see Figures 2 and 3).

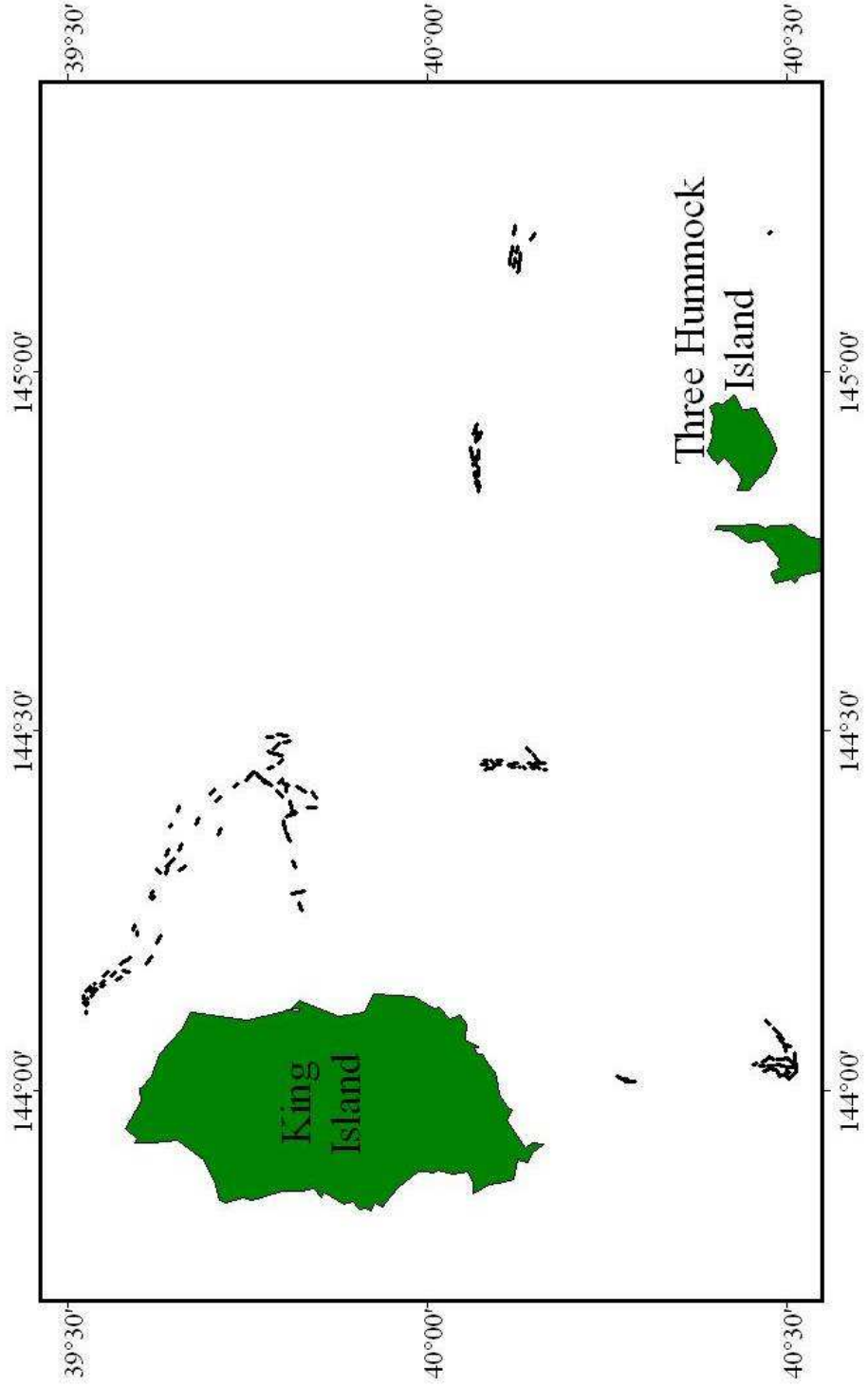


Figure 2: Overview of sample tows conducted during the BSCZSF King Island survey.

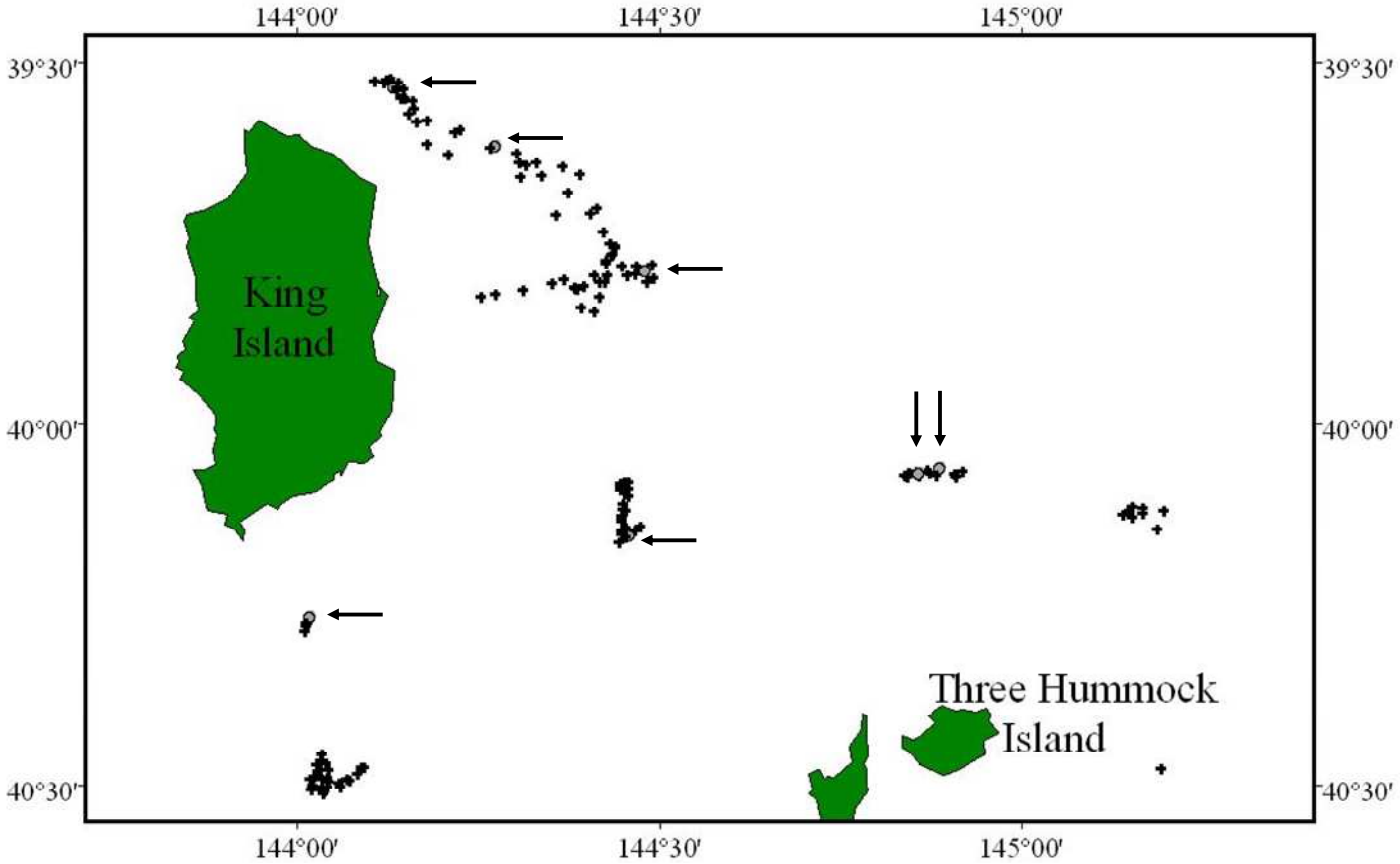


Figure 3: Overview of scallop catches for survey tows conducted during the BSCZSF King Island survey. Arrows identify tows where scallops were caught.

4.2 Eastern Zone Surveys Results

4.2.1 Targeted Survey Overview

In total, 49 sample tows were conducted within the western and eastern closed zone scallop beds and 2009 open zone (see Figure 4). Furthermore, 4, 171 scallops were measured during this survey. High abundances of scallops were identified within some survey regions (see section 4.2.3 for detail).

4.2.2 Exploratory Survey Overview

The six vessels involved with the eastern zone exploratory survey conducted 525 sample tows (see Figure 4) and measured approximately 6, 000 scallops. Three new areas of scallops were identified during the survey; with two areas containing larger scallops and one area containing smaller scallops, which would have settled some time during the 12 to 24 month period prior to the survey (see section 4.2.3 for detail).

4.2.3 Eastern Zone Survey Results

An overview of scallop catches for the eastern zone of the BSCZSF surveys is presented in Figure 5. Of key interest:

- Low abundances of mostly legal sized scallops were found in some sample tows conducted to the north of the Kent group (Figure 6) and south of Lakes Entrance (Figure 7). Most tows contained no scallops.
- A new bed of scallops was found to the north of the western closed zone scallop bed (Figure 8). This approximate 8.5 km x 7.5 km bed contained scallops in the 80 mm to 110 mm size range (Figure 8). The overall discard rate for this region was 29%.
- Scallops in the 80 mm to 114 mm size range were found in good abundances within the western closed zone scallop bed (Figure 8). The overall discard rate for this region was 17.5% (Figure 8). It must be noted, however, that only five sample tows were conducted in this region.
- Very high abundances of scallops were found within the eastern closed zone scallop bed (Figure 9). Majority of these scallops fell within the 84 mm to 114 mm size range, and the population had an overall discard rate of 15% (Figure 9).
- Low abundances of scallops were found within the 2009 open zone (i.e. after the 2009 season completion) (Figure 9). The discard rate within this fished region was 5% (Figure 9).
- A new area of scallops to the west of the 2009 open zone was identified during the survey (Figure 9). Majority of these scallops fell within the 86 mm to 114 mm size range, and there was an overall discard rate of 18% (Figure 9). This bed of scallops is most likely an extension of the 2009 open zone / eastern closed zone scallop bed.
- Low abundances of scallops were found in the other sample tows conducted near the western closed zone scallop bed and eastern closed zone scallop bed (Figures 8 and 9).
- High abundances of scallops were discovered to the north of Babel Island (Figure 10). Scallops within the highest abundance regions were generally small, falling within the 44 mm to 62 mm size class (discard rate of 95%) (Figures 10 and 11). This cohort of scallops would have settled sometime during the 12 to 24 month period prior to survey, and there is a possibility that these recruits originated from the dense aggregation of scallops further north.

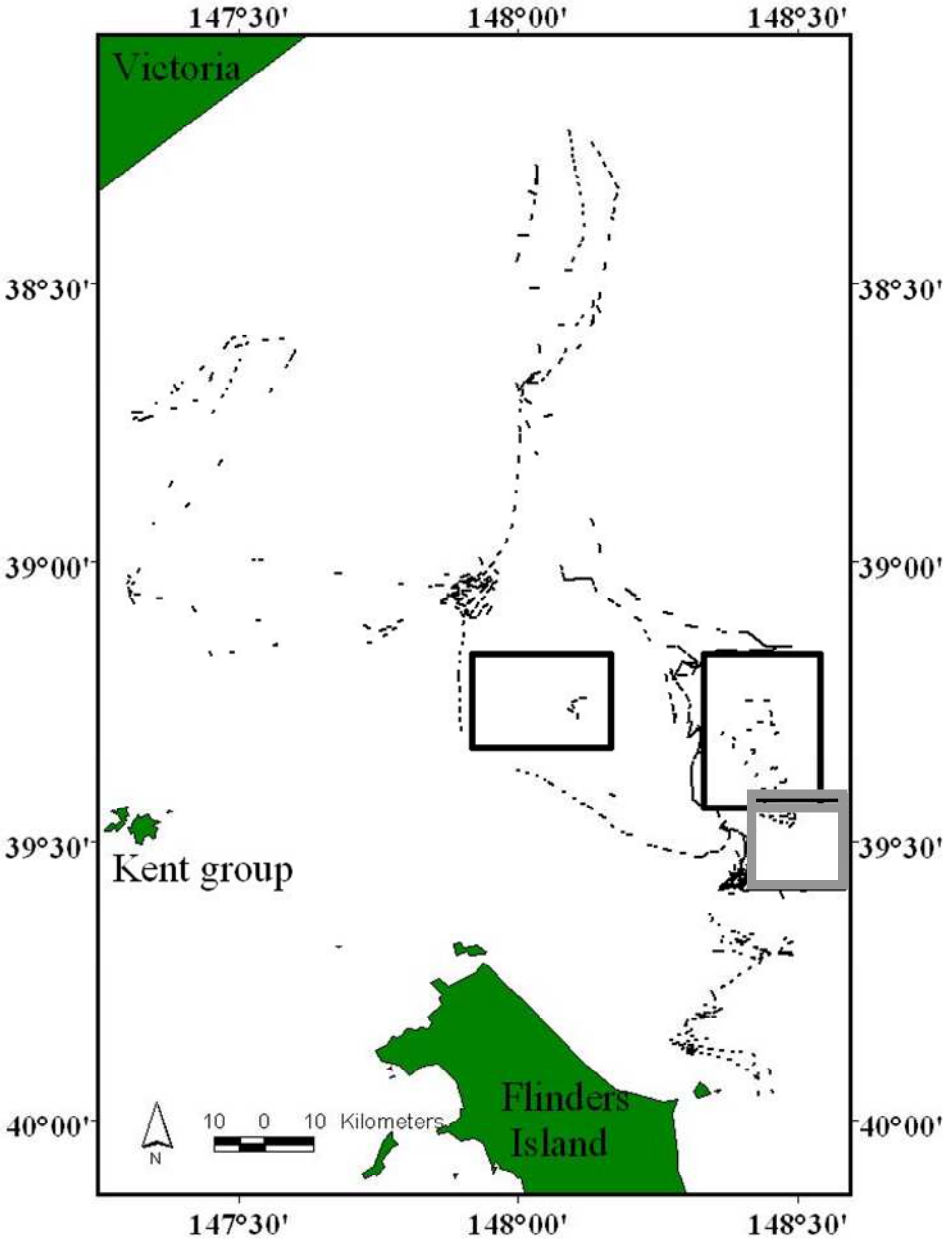


Figure 4: Overview of sample tows conducted during the BSCZSF eastern zone scallop surveys during 2009. The black boxes illustrate the location of the western and eastern closed zones and the grey boxes the 2009 open region and 1nM industry code of practice extension.

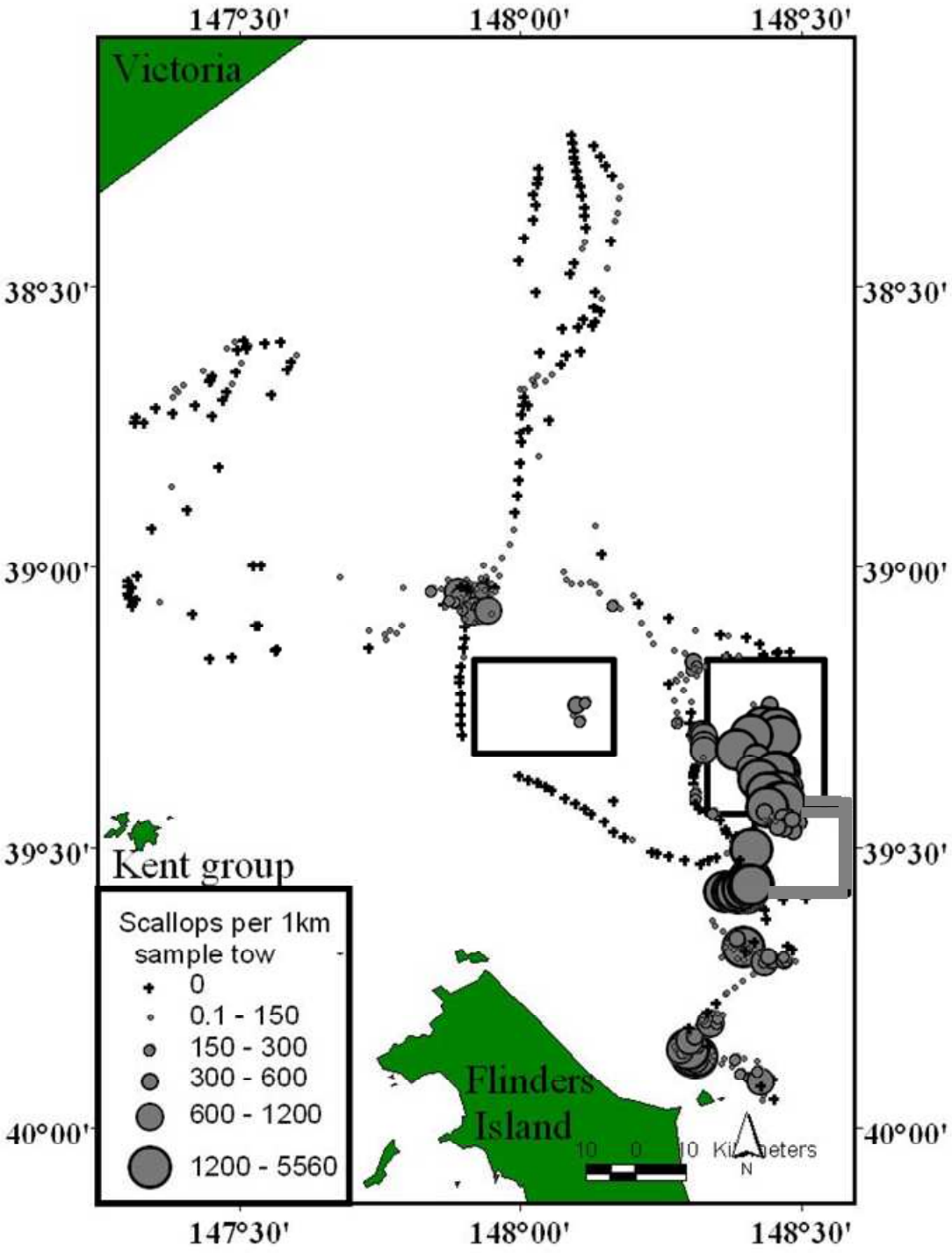


Figure 5: Overview of scallop catches per standardized 1000m sample tow length for all tows conducted during the BSCZSF eastern zone scallop surveys during 2009. For scallops in the 90 – 110 mm size range, approximately 10 scallops is equal to 1kg (i.e. 300 scallops = 30kg; 1200 scallops = 120 kg etc). NOTE: each circle represents scallop catches for an individual sample tow, NOT the area that scallops were found over.

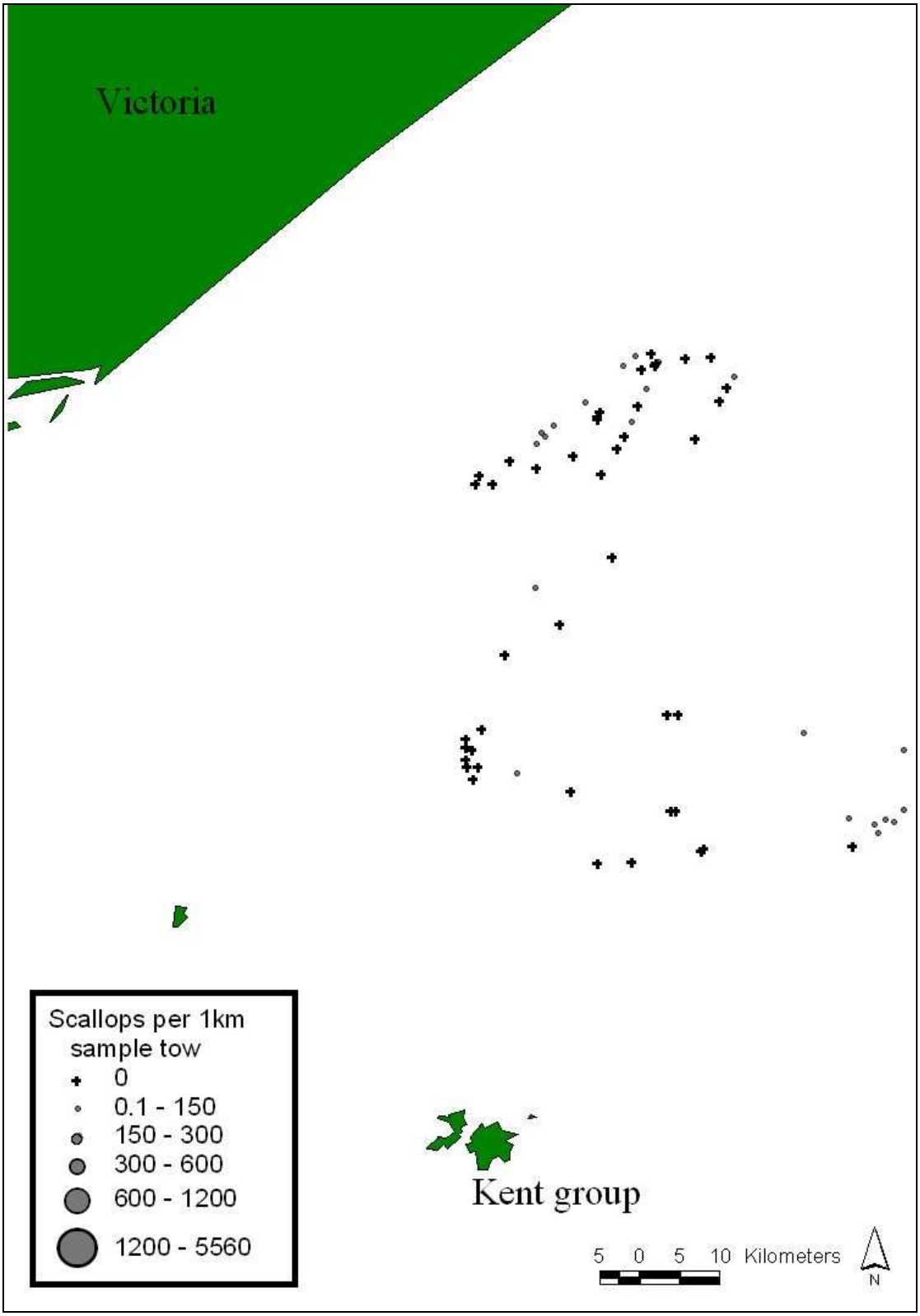


Figure 6: Scallop catches per standardized 1000m sample tow for survey tows conducted north / northeast of the Kent group during the 2009 BSCZSF eastern zone scallop survey.

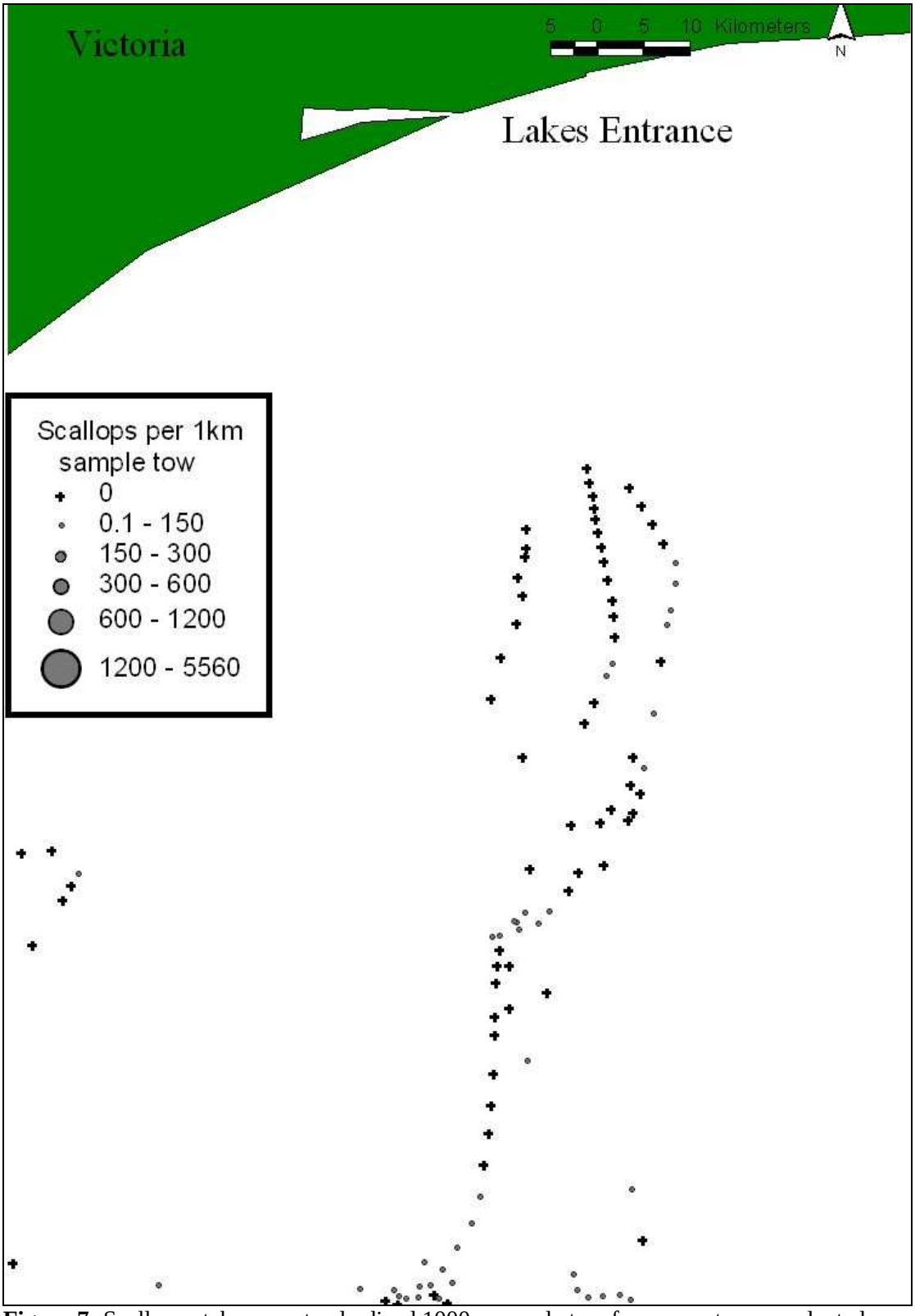


Figure 7: Scallop catches per standardized 1000m sample tow for survey tows conducted directly south of Lakes Entrance during the 2009 BSCZSF eastern zone scallop survey.

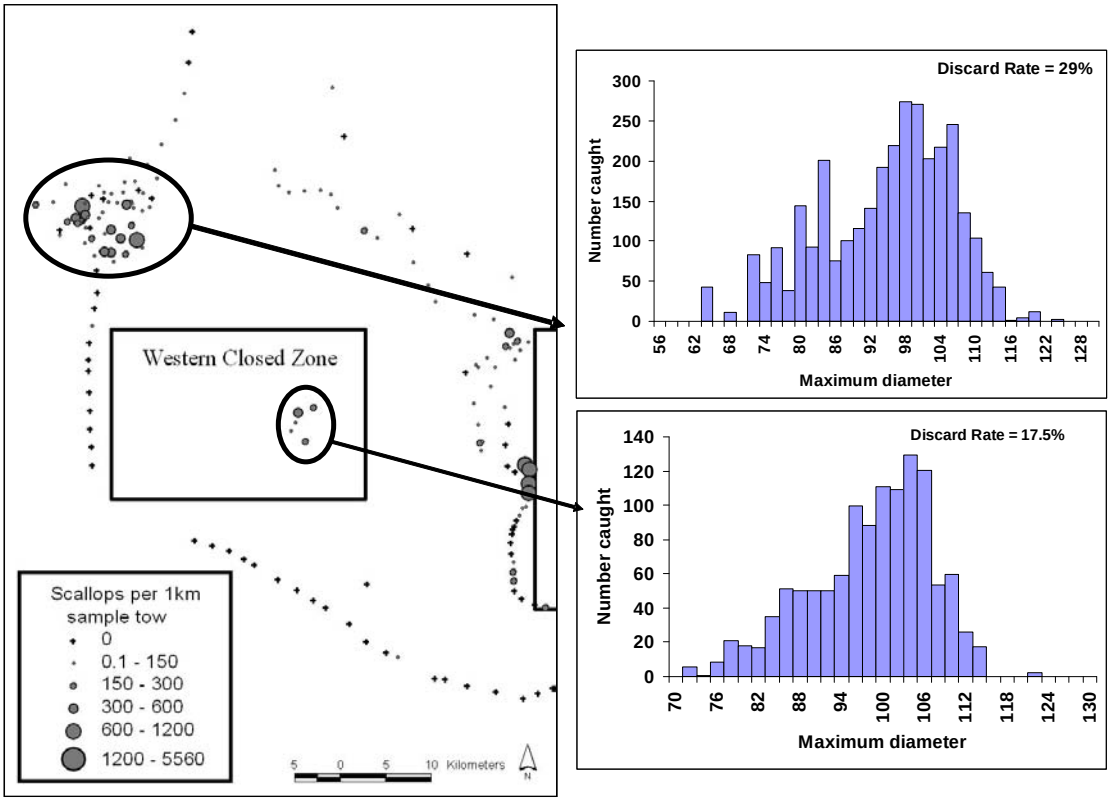


Figure 8: Scallop catches per standardized 1000m sample tow for survey tows conducted within and near the western closed zone scallop bed during the 2009 BSCZSF eastern zone scallop survey. Length - frequency distribution for scallops caught within the new scallop bed (top) located approximately eight km north of the western closed zone and for scallops caught within the western closed zone (bottom) are also shown.

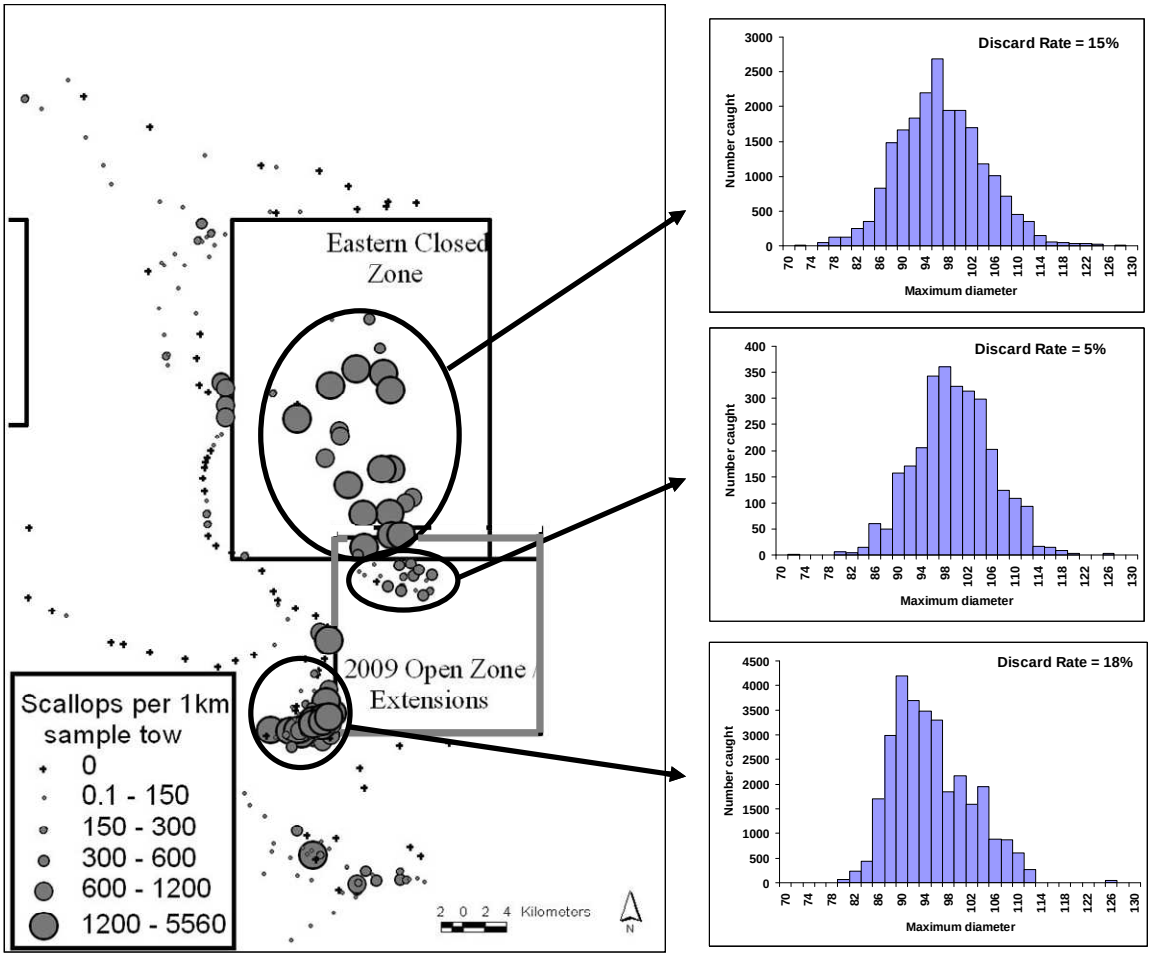


Figure 9: Scallop catches per standardized 1000m sample tow for survey tows conducted within / near the eastern closed zone scallop bed and 2009 open zone during the 2009 BSCZSF eastern zone scallop surveys. The top length frequency distribution represents scallops from the eastern closed region. The middle length frequency distribution represents scallops caught within the fished open zone and the bottom length frequency distribution represents scallops caught from a newly discovered region of scallops to the west of the 2009 open zone.

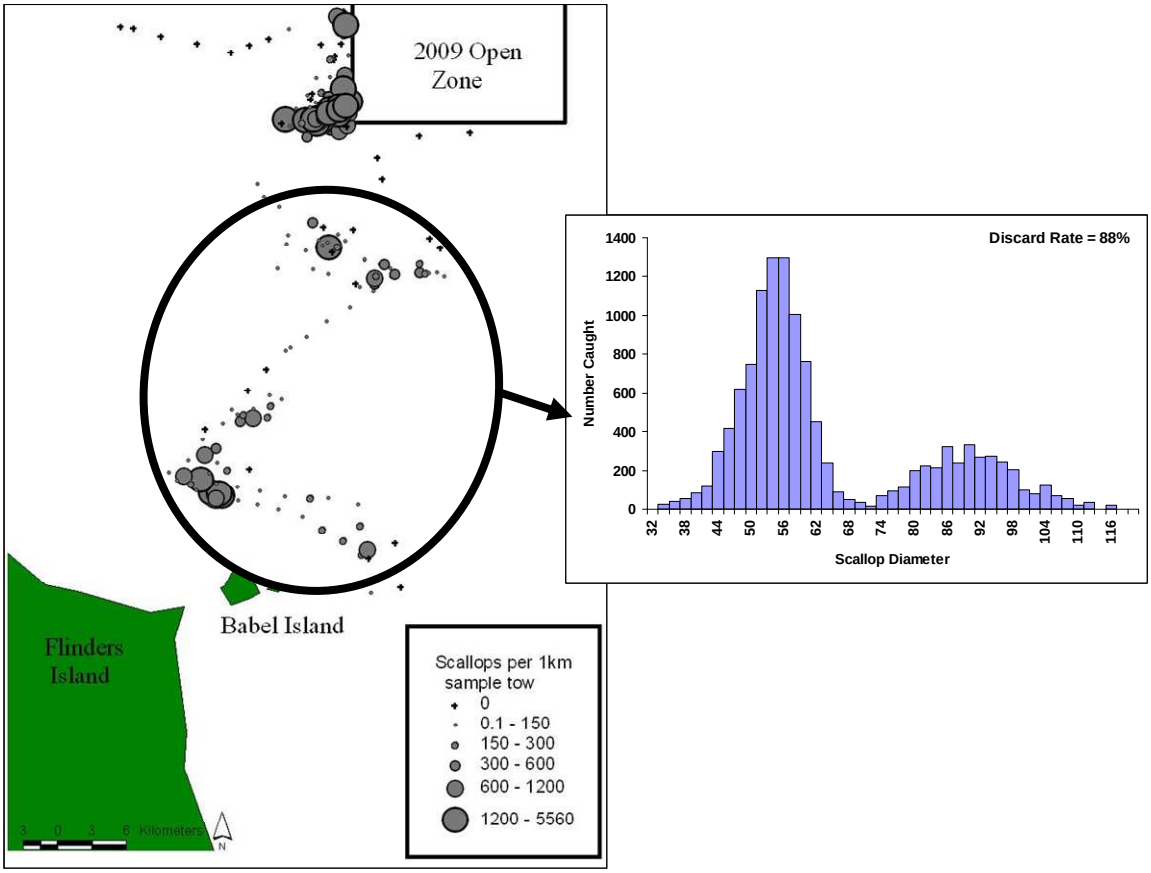


Figure 10: Scallop catches per standardized 1000m sample tow and length – frequency distribution for survey tows conducted to the north of Babel Island during the 2009 BSCZSF eastern zone scallop survey.

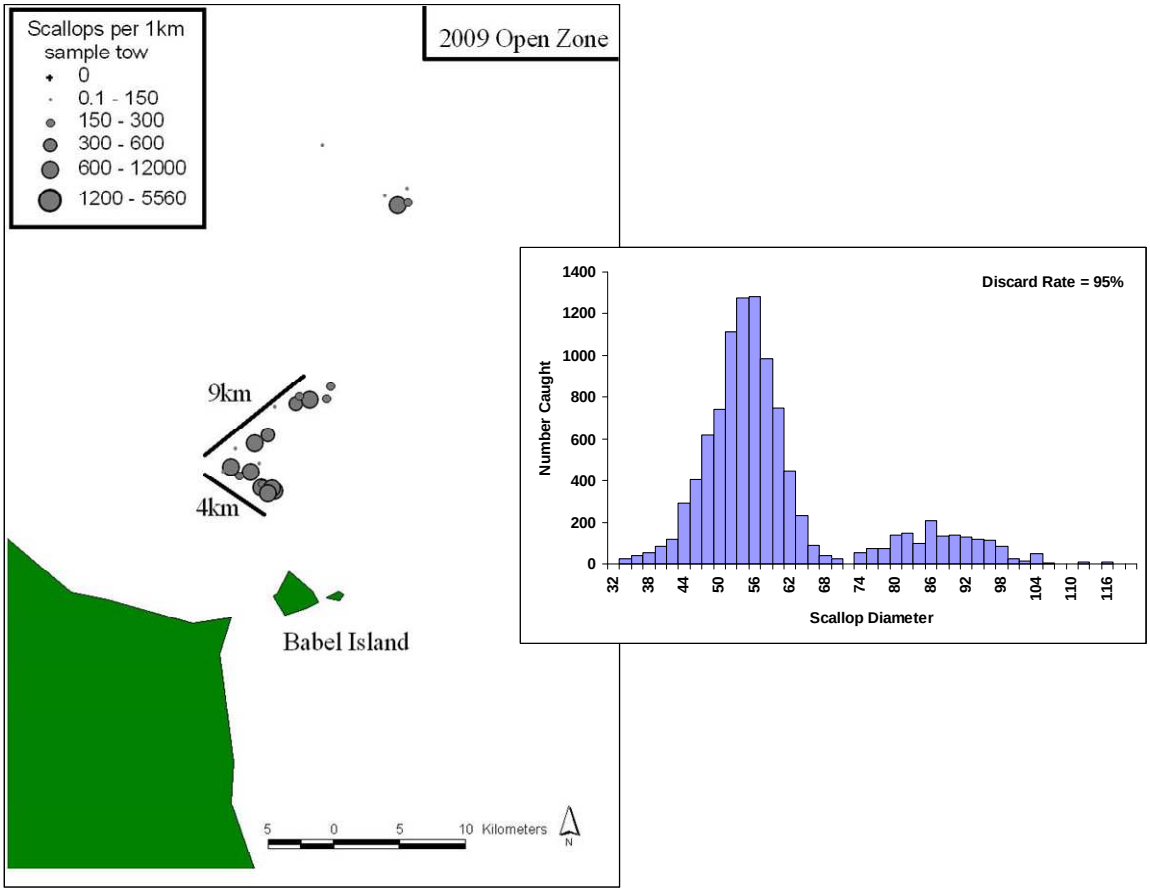


Figure 11: Sample tows containing small / new recruit scallops and the matching length frequency – distribution for tows conducted north of Babel Island during the 2009 BSCZSF eastern zone scallop survey.

4.3 Biomass Estimate for the Eastern Scallop Bed

Results of the calculated biomass estimates at 33% dredge efficiency are presented in Table 1. It must be noted that stratum 2 (red box, Figure 1 & Appendix 2) has been partially fished; however, high abundances of scallops are believed to remain (fisher information). Furthermore, it is highly probable that scallops are located outside the boundaries of the strata used – as per the VMS inferred fished area and strata 2 location (see Figure 1 and Appendix 2).

Table 1: Estimated biomass within each of the strata defined in Figure 11 assuming 33% dredge efficiency.

	Stratum 1 (pink – south)	**Stratum 2 (Red)**	**Stratum 3 (Blue)**	**Stratum 4 (green – north)**
Upper 95%	143	2135	3606	4241
Average	79	1224	2314	2582
Lower 95%	14	314	1022	922

5. Conclusions

- Scallops in the eastern closed zone scallop bed remain abundant and healthy and predominately fall within the 80 mm to 114 mm size range.
- Residual scallops remain within fished regions of the 2009 open zone. These scallops predominately fall within the 84 mm to 114 mm size range.
- Three new areas (beds) of scallops were located within data poor regions of the eastern zone of the BSCZSF.
    - An area to the north of the western closed zone scallop bed contained scallops predominately in the 80 mm to 114 mm size range.
    - An area to the west of the 2009 open zone contained scallops predominately in the 80 mm to 114 mm size range. This area is most likely an extension of the known bed of scallops referred to as the eastern closed zone scallop bed.
    - The final area, to the north of Babel Island contained small, newly recruited scallops in the 44 mm to 62 mm size range. These scallops were found in exceptionally high abundances within some survey tows, and provide evidence of successful recruitment within the eastern zone of the BSCZSF.
- Non – commercial quantities of scallop were located within the King Island region (western zone of the BSCZSF), with only seven individual scallops being caught.

6. Acknowledgements

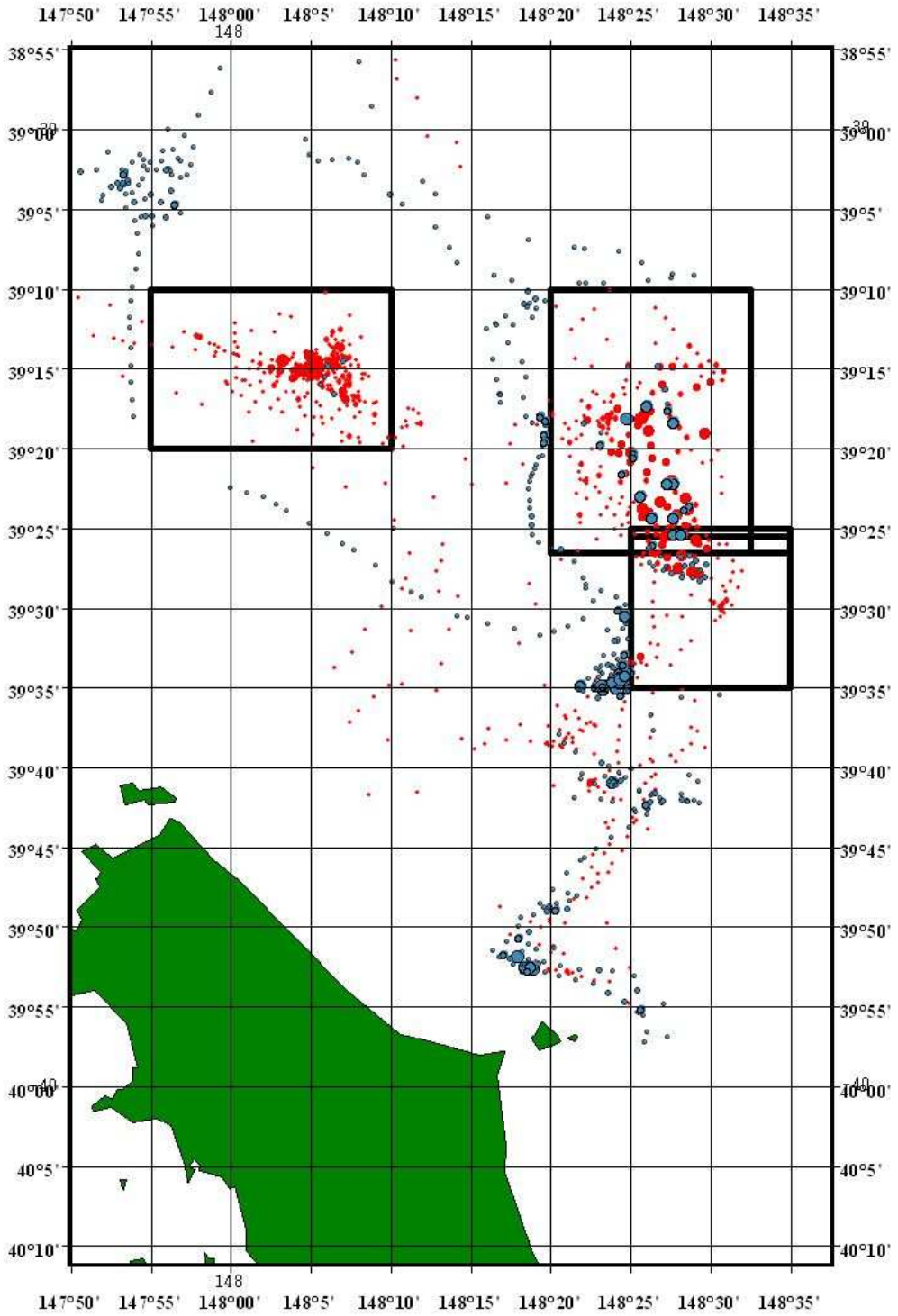
We would like to thank the skippers and crew of all participating vessels for their enthusiasm and support during the organisation of the 2009 surveys. We would also like to thank the fishers who trawled through old log-books and fishing records to provide locations for the King Island survey.

7. References

Harrington, Semmens & Haddon (2008). 2008 Commonwealth Bass Strait Central Zone Scallop Fishery Survey. Survey Final Report. Tasmanian Aquaculture and Fisheries Institute. University of Tasmania.

8. Appendix 1

This figure may aid interpretation and application of the BSCZSF harvest strategy to our knowledge of available stocks. The figure provides an overview of 2008 (Red) and 2009 (Blue with solid black outer circle) survey results for the eastern BSCZSF, with a 5 x 5 minute grid overlay. NOTE: no scale for relative abundance has been provided, however, larger circles represent higher scallop abundances / densities. Also note that 2008 catch results within the 2009 open / fished zone will no longer be a true representation of density / availability.



9. Appendix 2

This figure may further aid interpretation and application of the BSCZSF harvest strategy to our knowledge available stocks. The figure illustrates the strata used to calculate biomass estimates (see page 17), 2008 industry survey results (red circles), 2009 survey results (blue circles) and a 1 minute latitudinal grid.