Marine Environment and Ecology
Benthic Ecology Subprogram

SARDI
SOUTH AUSTRALIAN RESEARCH AND DEVELOPMENT INSTITUTE

Marine Biodiversity of the Northern and Yorke Peninsula NRM Region

SARDI Publication No. F2009/000531-1
SARDI Research Report series No. 415

Keith Rowling, Shirley Sorokin, Leonardo Mantilla and David Currie

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December 2009

Prepared for the Department for Environment and Heritage

Government of South Australia

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EXECUTIVE SUMMARY

1. Marine biodiversity studies were conducted to identify and assess spatial variability in the distribution of key flora and fauna within the Northern and Yorke Peninsula Natural Resource Management (NRM) region. Habitats targeted included soft-bottom fauna, rocky reef and seagrass communities at 24 sites (8 locations and 3 depths). These surveys provide detailed quantitative information on the abundance and composition of species at each site and will form a benchmark for future monitoring programs across the region.

2. The field component of the survey included video assessment of the benthos, water quality sampling and sediment characterisation at all sites. Infauna was sampled by benthic grab at 23 sites. Sled and trawl shots were used to sample the epibiota at 22 and 19 sites respectively. Fish assemblages were sampled by trapping and baited remote underwater video (BRUVS) at all 24 sites.

3. A total of 3272 individuals from 169 species were recorded during the infaunal grab survey, and a total of 390.5 kg of biomass representing 125 species were collected during the sled survey. A further 1920 individuals from 114 species were collected during the beam trawl survey. The trapping survey collected 129 fish and macro-invertebrates representing 23 species, while 3991 fish representing 89 species were recorded during the BRUVS survey.

4. The infauna species composition varied in relation to sediment size and sorting, however, no clear geographical patterns were evident in either overall abundance or species richness. While crustaceans and polychaetes dominated most coarse and fine-grained bedforms, molluscs characterised sites supporting the very finest and poorly-sorted sediments.

5. The sled survey clearly demonstrated that species composition was strongly influenced by the level of seagrass cover at the site. Notably, while biomass varied considerably between shots, sites containing seagrass consistently supported higher biomass. Similar patterns were also observed in the beam trawl survey. Numbers of cryptic fish, for example, were invariably elevated in dense seagrass beds, while un-vegetated sites typically supported low fish densities.

6. Fish community structure differed markedly between sites in the survey area. Both traps and video deployed in or near macroalgal dominated reef habitats supported greater species richness than those set on seagrass or unvegetated habitats. Schooling species dominated abundances at the deeper sites, particularly in respect of the BRUVS technique.

7. A total of 460 taxa were identified using the five sampling techniques employed in this study. Many specimens identified to species level (where distribution data was available) are widespread and found throughout much of southern Australia. Unfortunately we cannot comment on the relative rarity and distributions of a large proportion (46%) of taxa collected, because their identification to species level requires more detailed taxonomic examination.

8. Syngnathids were the only organisms encountered that are currently listed under the EPBC Act as "protected". All seven species collected (i.e. Pugnose Pipefish *Pugnaso curtiorstris*, Mother-of-Pearl Pipefish *Vanacampus margaritifer*, Spotted Pipefish *Stigmatopora argus*, Common Seadragon *Phyllopteryx taeniolatus*, Brushtail Pipefish *Leptoichthys fistularius*, Shorthead Seahorse *Hippocampus breviceps*, and Ringback Pipefish *Stipecampus cristatus*) have ranges extending beyond the Yorke Peninsula region, but the regional significance of their populations is unknown.

9. Like many coastal waters with urbanised catchments, the waters of Spencer and St Vincent Gulfs are subject to growing levels of pollution from a variety of sources. Although pollution effects on the biodiversity of the lower Yorke Peninsula are difficult to assess, results of this study provided a comprehensive basis for gauging any future degradation of the regions marine environment. Regular monitoring of the same sites using at least a subset of the key techniques employed in this study should ensure that important changes to biodiversity are identified quickly.

1. INTRODUCTION

Recent developments in Natural Resource Management (NRM) in South Australia have seen the formation of a central NRM Council and regional NRM Boards to oversee the implementation of the newly created State NRM Plan. The regional NRM Boards' responsibilities involve funding projects related to their region including baseline biodiversity studies, the development of monitoring programs to evaluate changes in the environment, and the delivery of information back to the stakeholders within the region and the rest of the state. One of the key areas identified for successful NRM management is sustaining marine biological health within the various coastal regions of the state.

The scope of this project involves baseline marine biodiversity studies within the lower half of the Northern & Yorke NRM region (Figure 1). The marine component of the Northern and Yorke Peninsula NRM region extends to the state water limit and incorporates a wide variety of open coastal and sheltered habitats spanning a range of depths (intertidal to 50 m). The region supports a variety of habitat types including seagrass beds, reefs and unvegetated soft-sediment areas. Many of these habitats are economically important as they sustain fisheries and tourism and provide a range of other ecosystem services (Bryars 2003; Edyvane 1999b).

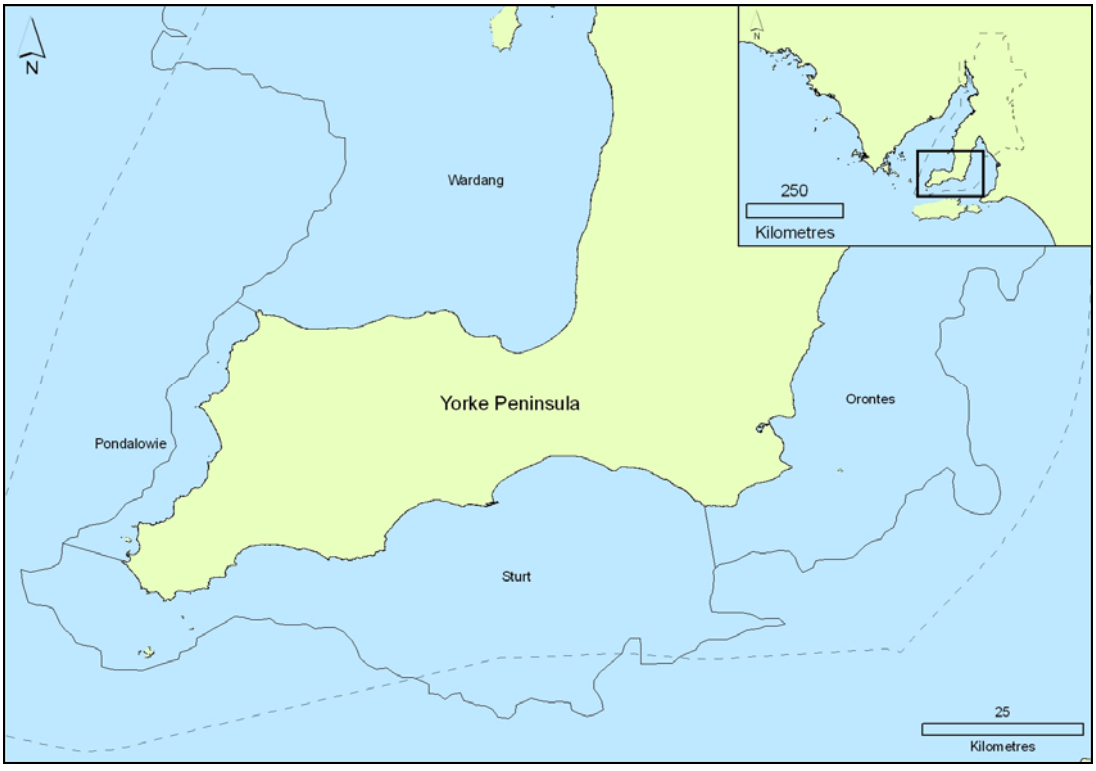

Figure 1. Map of Yorke Peninsula indicating biounits (solid lines) and extent of Northern and Yorke Peninsula NRM region (dotted line).

Previous research has identified a high level of seagrass coverage within the sheltered bays around Yorke Peninsula, with meadows consisting mainly of *Posidonia* and *Amphibolis* species. The more exposed areas of the south west coast are dominated by *Amphibolis* (Edyvane 1999b). Extensive reef systems occur around the south west tip of Yorke Peninsula, and also around the south east of the region. Sheltered reef tends to be dominated by macroalgae including *Cystophora* and *Sargassum*, while more exposed areas are dominated by *Ecklonia* (Edyvane 1999b; Turner *et al.* 2007).

Four biounits have been previously recognised around the lower part of Yorke Peninsula; Wardang, Pondalowie, Sturt and Orontes (Figure 1), with each biounit being defined by coastal features and distribution of habitats. Edyvane (1999b) estimated the area for each broad habitat per biounit (Table 1). Updated habitat mapping for this area will be presented in a companion report prepared by the Department for Environment and Heritage (Miller *et al.* 2009).

Table 1. Areas of key habitats in the survey area (source Edyvane 1999b). Note the sum of the habitat areas in each biounit do not always agree with the total area due to limitations in the resolution of the aerial photography.

Biounit	Sand (ha)	Reef (ha)	Seagrass (ha)	Total (ha)
Wardang	65722	54739	26458	285583
Pondalowie	15077	2862	25	22131
Sturt	3465	5088	25611	183058
Orontes	6081	33745	51713	183762

The study area supports a number of marine species that are of importance to commercial and recreational fisheries including western king prawn (*Penaeus latisulcatus*), King George whiting (*Sillaginodes punctata*), snapper (*Chrysophrys auratus*) and blue swimmer crab (*Portunus pelagicus*). Southern calamary (*Sepioteuthis australis*), southern sea garfish (*Hyporhamphus melanochir*), tommy ruff (Australian herring, *Arripis georgiana*), abalone (*Haliotis* spp.) and southern rock lobster (*Jasus edwardsii*) are also significant fisheries (Bryars 2003; Edyvane 1999b). The Protected Matters database (DEWHA 2009) was used to identify threatened, endangered or protected species that are likely to occur in the region. This database identified several syngnathids (pipefish, seahorses and sea dragons), the great white shark and a number of marine mammal species (including whales and pinnipeds).
Despite the apparent wealth of biologically, economically and environmentally significant marine species in the region, no biodiversity studies have been conducted

in the area other than broad-scale surveys (Edyvane 1999b, Tanner 2005). Large knowledge gaps exist within the marine waters of this area, making meaningful decisions about the effective conservation, monitoring and long-term management of the marine environment difficult (Caton *et al.* 2007).

The present biodiversity study was conducted to address the paucity of information available on the composition and spatial variability of flora and fauna within the Northern and Yorke Peninsula NRM region. Assemblages targeted included fish and invertebrates, soft-bottom fauna, rocky reef and seagrass communities. The aim of the biological surveys was to provide detailed information on the abundance of species within each study site and to develop a framework for future marine monitoring programs.

2. METHODS

2.1 Study Sites

Eight roughly equi-distant transect locations were established around the Northern & Yorke Peninsula NRM region for this survey (Figure 2). These locations were selected to encompass the range of habitat types for the region, and where possible included seagrass, soft sediment and reef. All sampling was depth-stratified and took place at the 10 m, 20 m and 30 m depth contours within these eight locations to integrate any depth related patterns. All survey work was undertaken using the SARDI research vessel *Ngerin*, between the 23rd and 30th November 2008.

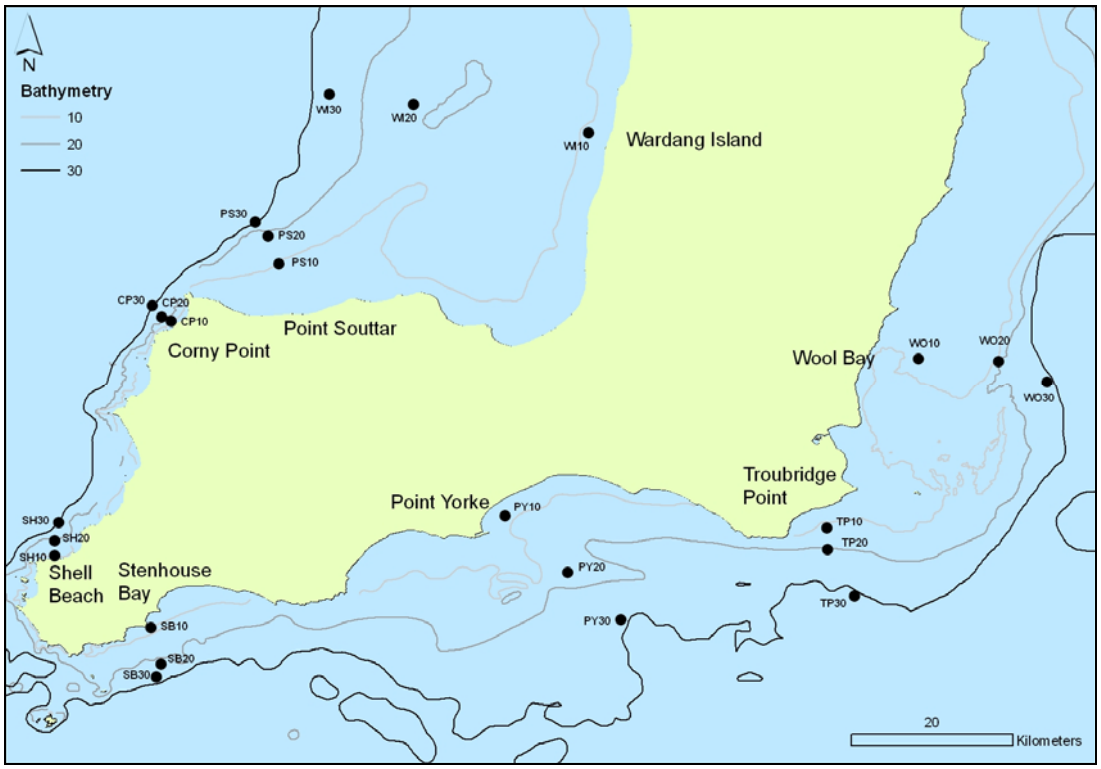

Figure 2. Map of Yorke Peninsula showing survey sites (with accompanying names). Solid black circles signify the depth-stratified survey design with sites at 10 m, 20 m and 30 m depth at each site.

2.2 Infauna

Samples of infauna were collected from 23 of the 24 sites around Yorke Peninsula using a 0.1 m^2 Smith-McIntyre grab. A grab sample could not be collected at one site as the seabed was composed entirely of rocky reef. All grabs collected were sieved through a 1 mm mesh screen and the fauna retained was preserved in 5% formaldehyde solution. Data recorded at each site included date, time, location (latitude and longitude) and depth (Appendix 1). This fauna was later sorted and identified in the laboratory to the lowest taxonomic level before being counted. Voucher specimens were photographed and stored in 75% ethanol for future reference.

2.3 Sediment

A single sediment sub-sample (70 ml) was retained from each grab sample prior to sieving. This fraction was collected from the surface layer by scraping an open vial across the top of each sample. These sediments were snap frozen and stored at -20ºC, before being thawed immediately prior to examination for size-structure and composition. Samples were gently homogenised and a 50 g subsample of each were

taken. The subsample was then dry sieved through 2 mm and 1 mm sieves to obtain the % weight for the coarse fractions and to determine the total proportion (by weight) of material < 1 mm. The size-structure of the finer fraction (< 1 mm) was analysed using laser diffraction on a Mastersizer 2000 Particle Size Analyser.

The percentage of the finer (<1 mm) fraction falling into each of five size classes (<63 µm, 63-125 µm, 125-250 µm, 250-500 µm, 500-1000 µm) was corrected for each sample by multiplying by the proportion (<1 mm) for that sample. Grain size distribution parameters were determined using the software package GRADISTAT (Blott and Pye 2001).

2.4 Water Chemistry

Measures of water temperature and salinity were collected using a Sea-Bird SBE19 SEACAT conductivity-temperature-depth (CTD) profiler at all 24 sample sites. Data recorded at each site included date, time, location and depth (Appendix 1). The instrument was preset to acquire data at 1-second intervals, and was lowered to within 1 m of the seafloor at each site. As water quality data adjacent to the seafloor was considered most biologically relevant to this study, all analyses use data extracted from the deepest part of each vertical profile.

2.5 Habitat Mapping

At each site, an underwater video camera (Morphcam) was lowered to within 1 m of the seabed and the vessel was allowed to drift or slowly motor for 5 minutes. Transects were approximately 100-200 m in length, depending on the prevailing sea conditions. Camera footage was recorded on a Sony digital video recorder and time-stamped with positional data from a Garmin GPS.

Data were extracted from video tapes using a Visual Basic program designed in-house at SARDI. The user viewed the videotape on a TV monitor and was able to select from a list of predetermined habitat categories (Table 2), assigning one of the categories whenever a habitat transition occurred. The Visual Basic program combines each selected habitat category with position information that is simultaneously downloaded from the audio track of the tape during viewing, into a text file that can be imported into a Microsoft Access database for processing. Accurate positional data makes it possible to calculate the length of each section of homogeneous habitat. The percent cover of each habitat was subsequently mapped using the GIS software package ArcGIS (Ver 9.2).

Table 2. Video habitat categories and their assigned habitat group used for describing the benthos of Yorke Peninsula.

Habitat Category	Details	Habitat Group
Amphibolis antartica - Dense	Contiguous seagrass	Seagrass
A. antartica - patchy	Patches isolated from each other	Seagrass
Halophila	Any level of cover	Bare
Macroalgae - dense	Can see little substrate between macroalgae	Macroalgae
Macroalgae - patchy	Patches isolated from each other	Macroalgae
Macroalgae - sparse	Continuous but not dense	Macroalgae
Mixed *Posidonia / Amphibolis* - dense	Can see little substrate between seagrass	Seagrass
Mixed *Posidonia / Amphibolis* - patchy	Patches isolated from each other	Seagrass
Posidonia - dense	Can see little substrate between seagrass	Seagrass
Posidonia - patchy	Patches isolated from each other	Seagrass
Posidonia - sparse	Continuous but not dense	Seagrass
Rock	100% reef	Bare
Rubble	100% Rubble cover	Bare
Sand	100% soft sediment cover	Bare
Unknown	Unidentified - not recordable	Excluded
Zosteraceae - patchy	Patches isolated from each other	Seagrass
Zosteraceae - sparse	Continuous but not dense	Seagrass

2.6 Epibiota

2.6.1 Sled

Samples of epifauna and flora were collected at 22 sites (areas that had >1 m relief were not sampled) using a benthic sled. The CSIRO-SEBS sled is designed to target large sedentary and slow-motile organisms living on or near the seafloor and is 1.0 m wide by 0.6 m high and fitted with a 10 mm mesh bag (Lewis 1999). The large mesh-size employed meant that most small organisms encountered (< 10 mm length)

passed through the mesh and were not collected in this study. The sled was towed across the seafloor at each site for 500 m, with the start and end points of each tow defined using a Garmin GPS. The contents of each sled shot were bagged and frozen aboard the research vessel. Data recorded at each site included date, time, location and depth (Appendix 1).

Sled samples were later sorted and identified to species or putative taxon. A rapid assessment approach was undertaken with specimens smaller than 10 mm not considered. All dead seagrass, broken shells and rocks were discarded. The remaining biological material was weighed and unitary animals were counted. For each species a reference sample was photographed and preserved in 75% ethanol.

2.6.2 Beam Trawl

To target small fish and motile invertebrates on flat soft sediment and seagrass a CSIRO designed beam trawl (4 m width by 0.5 m high) with a 25 mm stretch mesh codend was used. The trawl was towed for 500 m at 19 sites with the start and end points of the tow defined using a Garmin GPS. Five sites were not sampled due to the high relief of the seafloor. Data recorded at each site included date, time, location and depth (Appendix 1). All fish and motile epifauna were bagged and frozen on the research vessel. Trawl samples were later sorted and identified to species or putative taxon. For each species a reference sample was photographed and preserved in 75% ethanol.

2.7 Fish

2.7.1 Trapping

A set of three traps were deployed on the sea floor each evening, and retrieved in the morning at all 24 sites. The set included: 1) a snapper trap (1.2 m high by 1.2 m diameter with a 0.2 m wide slot for fish entry baited with 1.5 kg of crushed pilchards) for targeting large fish and motile invertebrates; 2) an opera trap (0.5 m long by 0.3 m wide by 150 mm high with a 100 mm diameter opening baited with 50 g of pilchards) for targeting small fish and crustaceans; 3) a PVC trap (0.5 m long by 0.1 m diameter with a 50 mm diameter opening baited with 25 g pilchards) for targeting cryptic fish, small molluscs and crustaceans. Upon retrieval the traps were emptied, the species present were weighed and counted and returned alive to the water. The data from all three traps at each site was pooled prior to analysis.

2.7.2 Baited remote underwater video system (BRUVS)

Three BRUVS deployments were undertaken at each of the 24 sites. For each deployment, a pair of digital video cameras (either high definition Canon HV30 or standard definition Sony DCR-HC52E; both fitted with Raynox 0.5x wide angle lens converters) were mounted horizontally on a frame 70 cm above the substrate, with approximately 800g of fresh crushed pilchards in a bait bag ~150 cm from the lens. The cameras were set to record in wide-screen 16:9 format, with focus set at infinity, and lowered over the side of the boat to the seafloor for a minimum of 45 minutes. Data recorded at each site included date, time, location and depth (Appendix 1).

The stereo video equipment was calibrated and imagery analysed using *Cal* software (Ver 2.03) (http://www.seagis.com.au/bundle.html) following the procedures outlined in Harvey *et al.* (2002) and Harvey and Shortis (1998). All video footage was captured using Adobe Premiere Pro 2 in an AVI (Audio Video Interleaved) format. The AVI file was imported into *EventMeasure* (Ver 2.03) (http://www.seagis.com.au/event.html) and was used to determine the relative abundance of the fish seen on the video tape. The maximum number of each species seen in a single frame during each deployment (*MaxN*) was recorded. A reference collection of photographs and video clips were also captured using *EventMeasure*.

2.8 Data Analysis

Site-related differences in community structure were examined using Bray-Curtis dissimilarity measures (Bray and Curtis 1957). This dissimilarity measure was chosen because it is not affected by joint absences, and has consistently performed well in preserving 'ecological distance' in a variety of simulations on different types of data (Faith *et al.* 1987; Field *et al.* 1982). Single square-root transformations were applied to the data before calculating the Bray-Curtis dissimilarity measures. These transformations were made to prevent abundant species from influencing the Bray-Curtis dissimilarity measures excessively (Clarke 1993; Clarke and Green 1988). Spatial patterns in dissimilarity were examined using a combination of hierarchical agglomerative clustering (with group average linking) and non-metric multi-dimensional scaling (MDS). The SIMPER routine of PRIMER was subsequently used to identify those species contributing most to observed differences, and the BEST:BioEnv routine was used to determine the best match between biological and environmental data (Clarke and Gorley 2001).

3. RESULTS

3.1 Physical Characteristics

3.1.1 Water Quality

Sea-bed salinity levels ranged from a high of >36.8 psu at Wardang Island and Point Souttar to a low of <36.5 psu at Troubridge Point and Wool Bay (Figure 3). This is consistent with previous studies, as salinity tends to be higher on the western than the eastern side of Yorke Peninsula, with waters to the south of Yorke Peninsula remaining constant (36 psu) throughout the year (Bye and Kampf 2008). Within locations there was little variation between depths.

Temperature levels broadly reflected patterns for salinity, with warmer water (>18°C) observed at the north western sites (Wardang Island, Point Souttar and Corny Point) and cooler water (<18°C) observed in the south eastern and southern sites (Wool Bay, Troubridge Point and Point Yorke). Within transects, temperature tended to decrease with depth (0.3 °C to 0.5 °C) (Figure 3). Shallower areas including bays tend to have the highest temperatures within the region, and the clockwise circulation of current within the gulfs traps water within the north western survey areas (Bye and Kampf 2008; Edyvane 1999b).

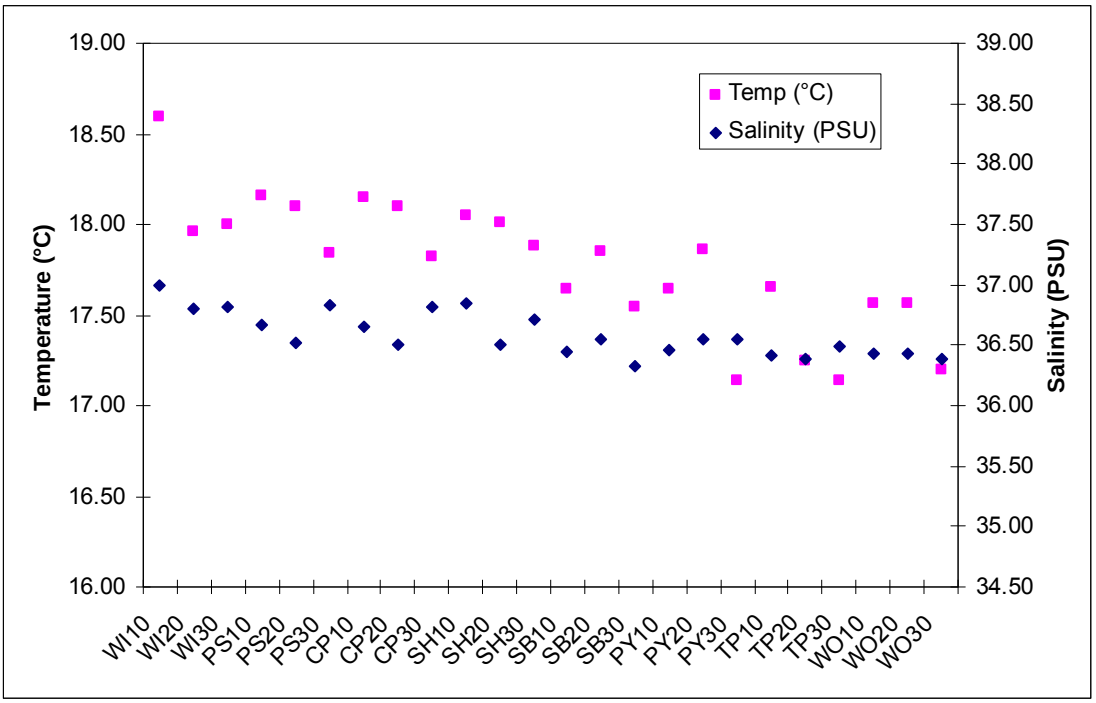

Figure 3. Seabed salinity and temperature measurements extracted from CTD casts around Yorke Peninsula.

3.1.2 Sediment Characteristics

Sediments around Yorke Peninsula were variable in structure and ranged from very fine sand (63-125 µm) at the deepest site off Wool Bay (WO30) to very coarse sand (>1000 µm) at Corny Point and Point Souttar (Figure 4). Shell Beach, Stenhouse Bay and Point Yorke had medium (250-500 µm) to fine (125-250 µm) sand at all depths, while Wardang Island was coarse (500-1000 µm) inshore and medium to fine further out. Troubridge Point had coarse sand at 20 m with medium sand at the other depths.

Sediment sorting at Wool Bay ranged from very poorly sorted at WO30 to poorly sorted at WO10 and WO20. The shallow sites at Point Yorke (PY10) and Wardang Island (WI10) were also poorly sorted, along with the deep site at Point Souttar (PS30). Stenhouse Bay and Troubridge Point were moderately sorted at all depths, along with the deeper sites at Point Yorke, shallow sites at Point Souttar, as well as most other sites. The only exceptions were the two deeper sites at Corny Point and one site at Shell Beach (SH20) which were moderately well sorted.,

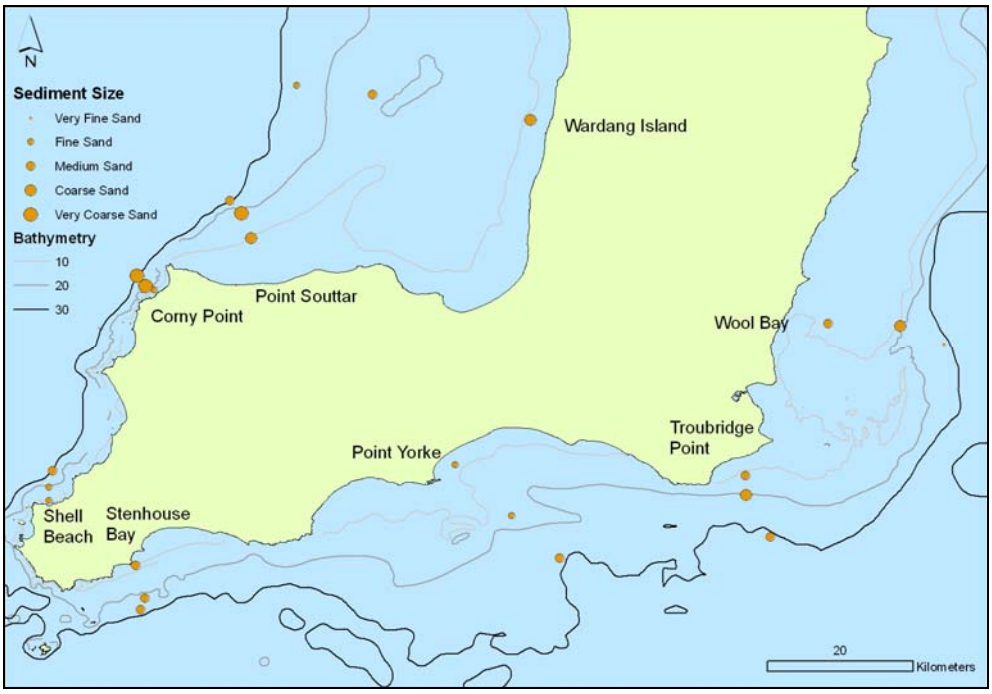

Figure 4. Map of Yorke Peninsula showing classification of mean grain size of sediment taken from Smith-McIntyre grab samples.

3.1.3 Habitat Classification

Observations taken from the video habitat mapping are summarised in Figure 5. Analysis of the video drops indicated that bare substrate (mainly sand, but also

rubble and rock) was encountered at the 30 m depth contour at all sites, with a small amount of seagrass at Wardang Island and Point Yorke. The 30 m site at Shell Beach was completely bare, but depth soundings (and also trap and BRUVS data) later revealed a large reef within 50 m of the video transect. Contiguous seagrass beds (*Posidonia* and *Amphibolis*) were observed at 10 m at Troubridge Point and Point Souttar, with ~50 % cover at Point Yorke. Seagrass was also present in low densities at Wardang Island and Stenhouse Bay (~20 %). The shallow site at Stenhouse Bay had high levels of macroalgal cover (~80 %), and 100% macroalgal cover was observed at 10 m off Corny Point. Macroalgae was also present in low densities off Wardang Island and Wool Bay, while Shell Beach had 100% bare substrate.

The intermediate depth (20 m) was 100% bare at Point Souttar, Shell Beach and Troubridge Point, while Stenhouse Bay was bare except for ~5% seagrass. High seagrass cover was observed at Point Yorke (~70%) and Wardang Island (~60%) while a similar cover of macroalgae (~60%) was observed at Corny Point. In contrast, macroalgae was rarely encountered at Wool Bay (~20 %) and the majority of the seabed at this location was bare.

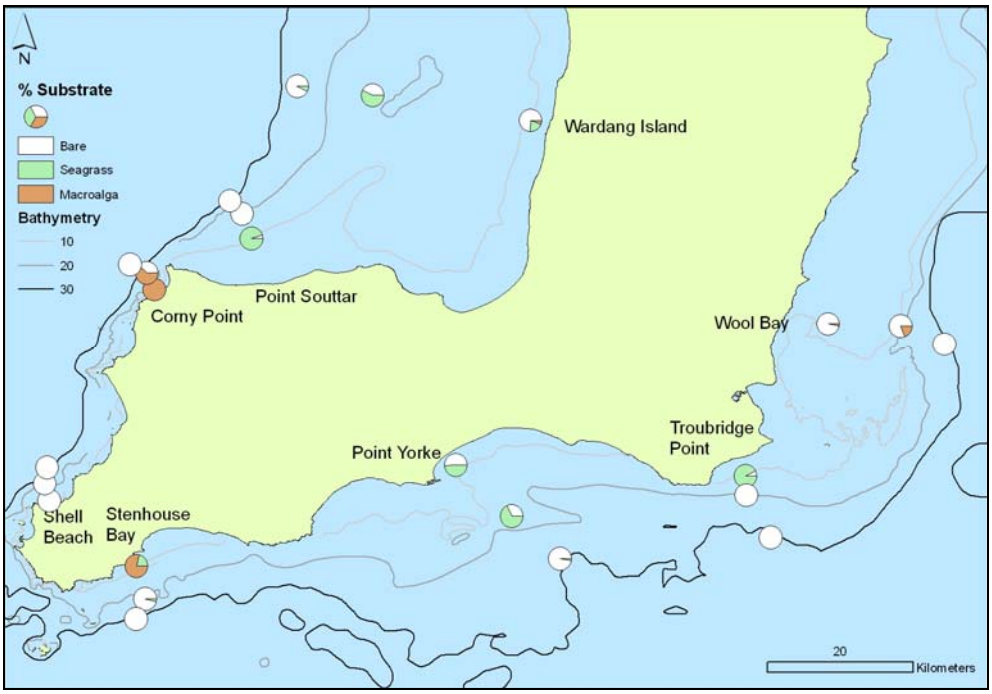

Figure 5. Map of Yorke Peninsula showing the percent cover of key substrate types (bare, seagrass, macroalgae) determined from 24 video drops.

3.2 Infauna

In total, 3272 individuals from 169 species representing 12 phyla were collected from the 23 grab samples (Figure 6). The number of individuals at each site ranged from a high of 306 in 20 m at Wool Bay (WO20) and 30 m at Point Souttar (PS30) to a low of 26 in 20 m at Shell Beach (SH20). Other sites with abundant infauna included the shallow site at Wool Bay (WO10) with 257 individuals while the deep site at Stenhouse Bay (SB30) had 208. Crustaceans and annelids together accounted for more than 83% of the individuals collected. The most abundant crustaceans belonged to the families Phoxocephalidae (295 individuals), Urohaustoriidae (110 individuals) and Nebaliidae (108 individuals). The most abundant polychaetes were from the families Syllidae (142 individuals) and Spionidae (129 individuals).

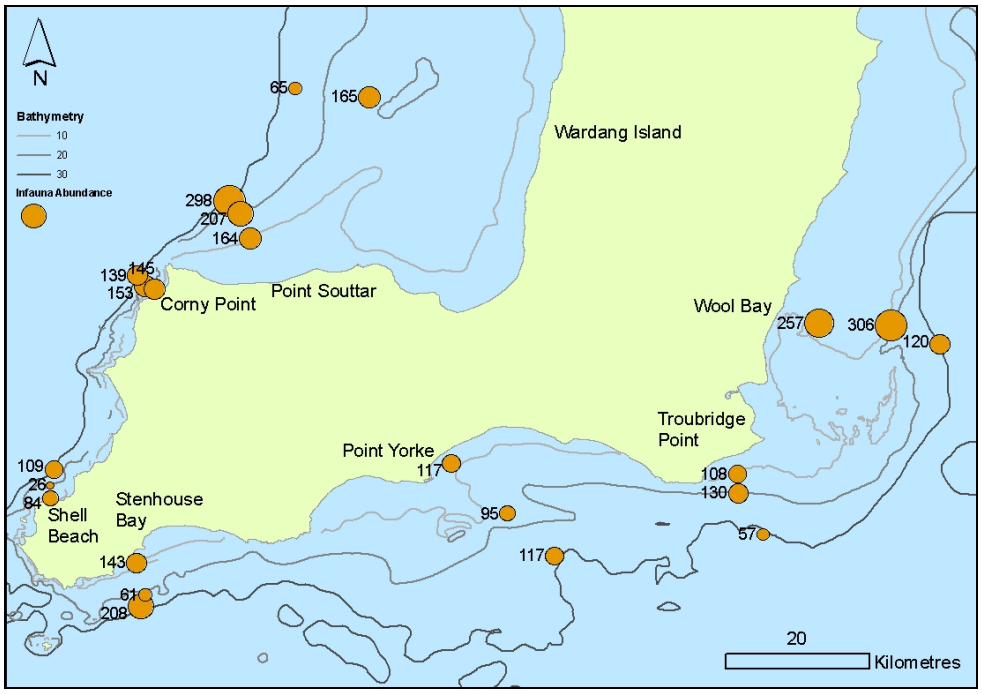

Figure 6. Bubble plot showing the total abundance of infauna found in 23 grab samples (0.1 m^2) around Yorke Peninsula. Numerals next to each bubble represent total numbers of individuals.

Patterns in infaunal species richness broadly followed patterns in abundance (Figure 7). In addition to supporting the highest infaunal densities the shallow sites at Wool Bay (WO10 and WO20) and the deep site at Point Souttar (PS30) also had the highest number of species. The lowest number of species (11) occurred at sites with the lowest abundance. As well as dominating abundance, annelids and crustaceans were also the most widely distributed taxa (occurring at 23 and 22 sites, respectively). A further two phyla (Mollusca and Echinodermata) were found at 16

and 11 sites respectively. Some of the most widespread infaunal orders/families included the crustaceans Phoxocephalidae (19 sites), Cumacea (17 sites), Dexaminidae (15 sites) and Cylindroleberididae (13 sites), and the polychaetes Spionidae (14 sites) and Syllidae (13 sites).

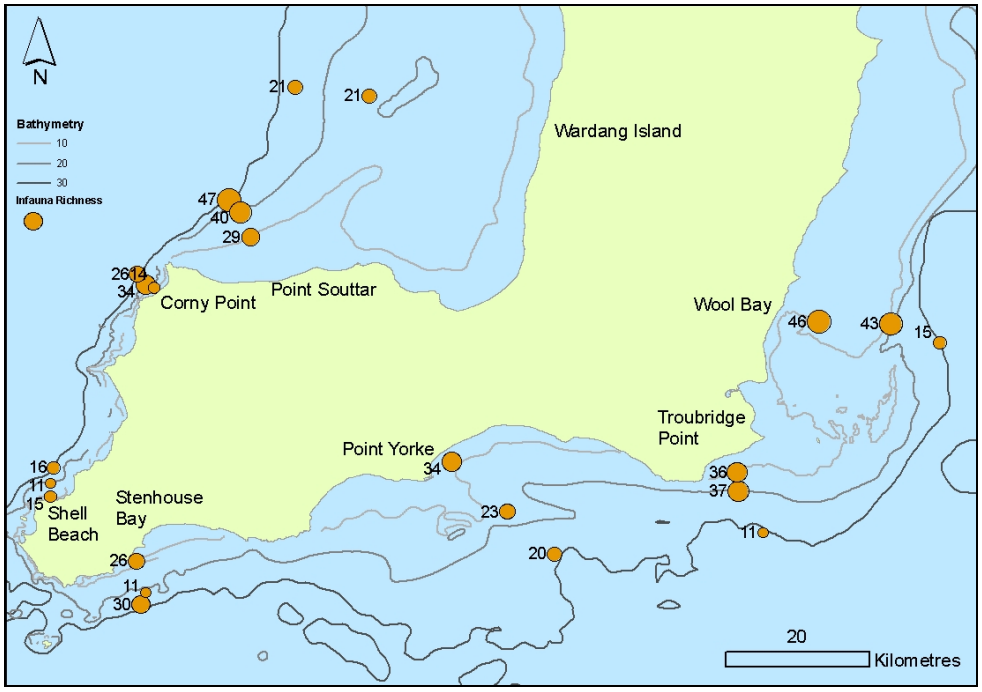

Figure 7. Bubble plot showing the total number of infauna species found in 23 grab samples (0.1 m^2) around Yorke Peninsula. Numerals next to each bubble represent total species number**.**

Patterns in infaunal species composition were investigated using cluster analysis (Figure 8) and non-metric multidimensional scaling (MDS) (Figure 9). Four discrete groupings were separated at the 20% Bray-Curtis dissimilarity level in the cluster analysis. The groups recognised correspond to different sediment types, these being; (i) coarse sediment that is poorly sorted, (ii) medium sediment with moderate sorting (iii) fine sediment with moderate sorting and (iv) very fine sediment with poor sorting.

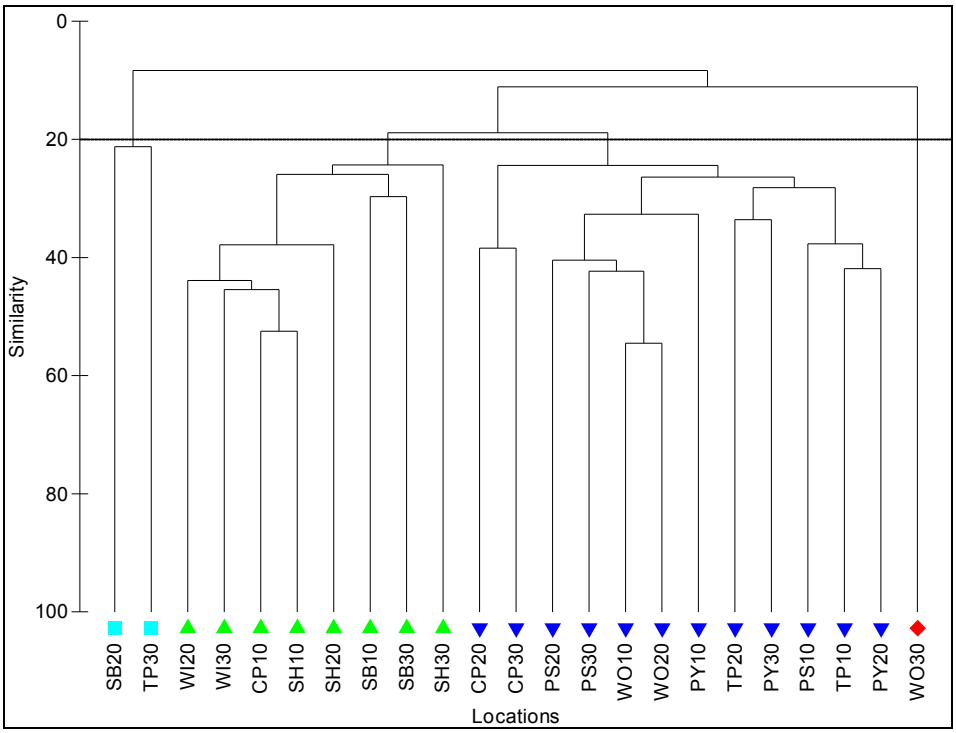

Figure 8. Cluster analysis of community structure in 23 grab samples taken off Yorke Peninsula. Four assemblage types (linked to sediment characteristics) are identified at a Bray-Curtis dissimilarity level of 20 percent; medium sediment size with moderate sorting (blue squares), finer sediment with moderate sorting (green triangles), coarse sediment that is poorly sorted (blue triangles) and very fine sediment with poor sorting (red diamond).

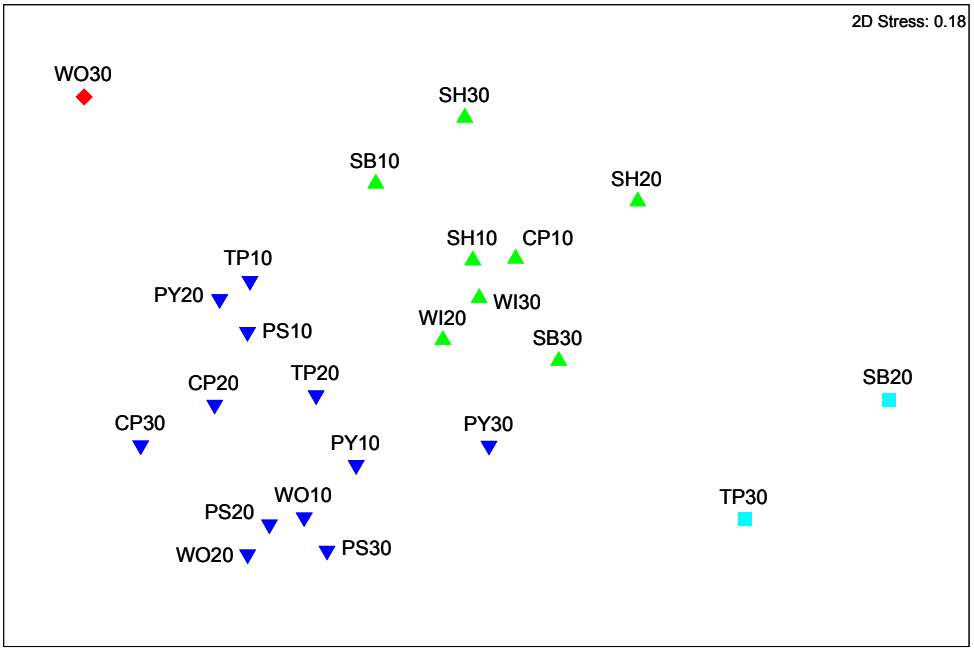

Figure 9. Non-metric MDS plot of community structure in 23 grab samples taken off Yorke Peninsula. Four assemblage types (linked to sediment characteristics) are identified via cluster analysis at a Bray-Curtis dissimilarity level of 20 percent; medium sediment size with moderate sorting (blue squares), finer sediment with moderate sorting (green triangles), coarse sediment that is poorly sorted (blue triangles) and very fine sediment with poor sorting (red diamond).

SIMPER analysis was undertaken to determine which species contributed most to similarities within and differences between the four site groupings. Abundances of the 12 species contributing ≥ 5% to within-group similarity or between-group dissimilarity for at least one of the four groupings are given in Table 3. Results from the SIMPER analysis indicate that the larger groups (i) and (iii) are both characterised by high numbers of the crustacean family Phoxocephalidae. Group (iii) is also characterised by the polychaete family Spionidae and shares many other common species with group (i). The group with two sites (group ii) is characterised by the mollusc Trochidae and the crustacean Gammarid sp1, while the final group (group iv) consists of one site (WO30) with high numbers of the mollusc Ischnochitonidae sp1 and the polychaete worm Terebellidae sp1.

Table 3. Mean abundance (per 0.1 m^2) of infauna collected from 23 grab samples around Yorke Peninsula. Species listed were identified via SIMPER analysis as contributing ≥ 5% to the similarity within and/or dissimilarity between groupings. Species indicative of each sediment characteristic (contributing ≥ 10% to the total similarity within an assemblage type) are highlighted in bold (n = number of sites in group).

Phylum	Species/Family	Sediment Characteristics (size/sorting)			
		(i) n=12 Coarse/Poor	(ii) n=2 Medium/Moderate	(iii) n=8 Fine/Moderate	(iv) n=1 Very fine/Poor
Crustacea	Phoxocephalidae sp1	**13.17**		**17.12**	
Annelida	Syllidae	11.17		1	
Annelida	Spionidae	3.75	0.5	**10.38**	
Crustacea	Urohaustoriidae	0.4		13.13	
Crustacea	Dexaminidae	6.42		2.75	
Crustacea	Apseudidae	3.67	14.5	1	
Mollusca	Trochidae	1.5	**11.5**	4	
Crustacea	Cumacea sp1	2.08		4.38	7
Crustacea	Gammarid sp1	0.17	**3.5**	6.38	
Crustacea	Platyischnopidae	0.92	0.5	5.13	
Annelida	Terebellidae sp1	1.08		0.25	38
Mollusca	Ischnochitonidae sp1	0.5			43

The PRIMER routine BEST:BioEnv was used to assess the correspondence and significance of the measured environmental data (Section 3.1) to the four sediment type groupings. The best fit was with a combination of mean sediment size and sediment sorting (Spearman Rank Correlation ρ=0.21).

3.3 Epibiota

3.3.1 Sled

A total of 390.5 kg of living benthos was collected from 22 sites during the sled surveys (Figure 10). The highest biomass recorded was 101.5 kg from the 10 m site at Wool Bay (WB10). Most of this biomass could be attributed to a single coral *Plesiastrea versipora* weighing 43 kg, and some dense patches of red alga (*Botryocladia obovate*, >27 kg) and sponge (Spirophirida, >21 kg). Over 100 kg was also collected in 10 m at Troubridge Point (TP10), with >99% of this consisting of filamentous red alga *Warrenia comosa* (>75 kg) and seagrass *Posidonia angustifolia* (~25 kg). The 10 m site at Point Souttar (PS10) had ~53 kg of biomass, with >50% of this consisting of seagrass *Amphibolis antartica*. The mid depth sites at Troubridge Point (TP20) and Wool Bay (WB20) had ~45 kg and >34 kg biomass respectively. These catches also included large volumes of rhodolith *Sporolithon durum* (>27 kg), great spider crab *Leptomithrax gaimardii* (~24.5 kg) and rock crab *Nectocarcinus integrifrons* (>23 kg). The three depths at Shell Beach (SH10, SH20 and SH30) had the lowest biomass with <0.15 kg of epibenthos at each site.

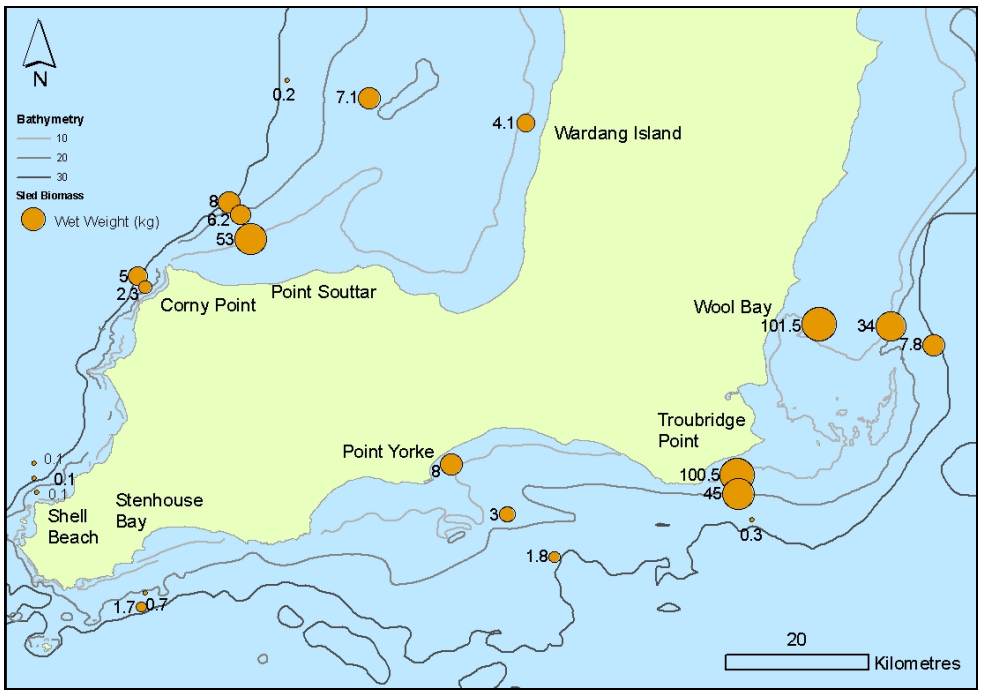

Figure 10. Bubble plot showing the total biomass of live epibenthos collected at 22 sled shots (500 m length) around Yorke Peninsula. Numerals next to each bubble represent wet weight (kg) of biomass..

A total of 125 species were identified from the 22 sites surveyed using the sled (Figure 11). The highest number of species recorded at a site was 30 inshore at

Wardang Island (WI10), followed by 24 species inshore at Point Souttar (PS10). Although the number of species remained relatively consistent between most sites (between 8 and 13), species richness decreased with depth at Wardang Island, Point Souttar and Point Yorke. The three depths at Wool Bay (WO10, WO20 and WO30) had similar species richness with 15, 14 and 14 species respectively. The number of species collected was lowest in the five south west sites at Shell Beach (SH10, SH20 and SH30) and Stenhouse Bay (SB20 and SB30). The most widespread species collected included the rock crab *Nectocarcinus integrifrons*, the seagrasses *Posidonia angustifolia* and *Amphibolis antartica* and the rough leatherjacket *Scobinichthys granulatus,* which were all found at over 25% of sites.

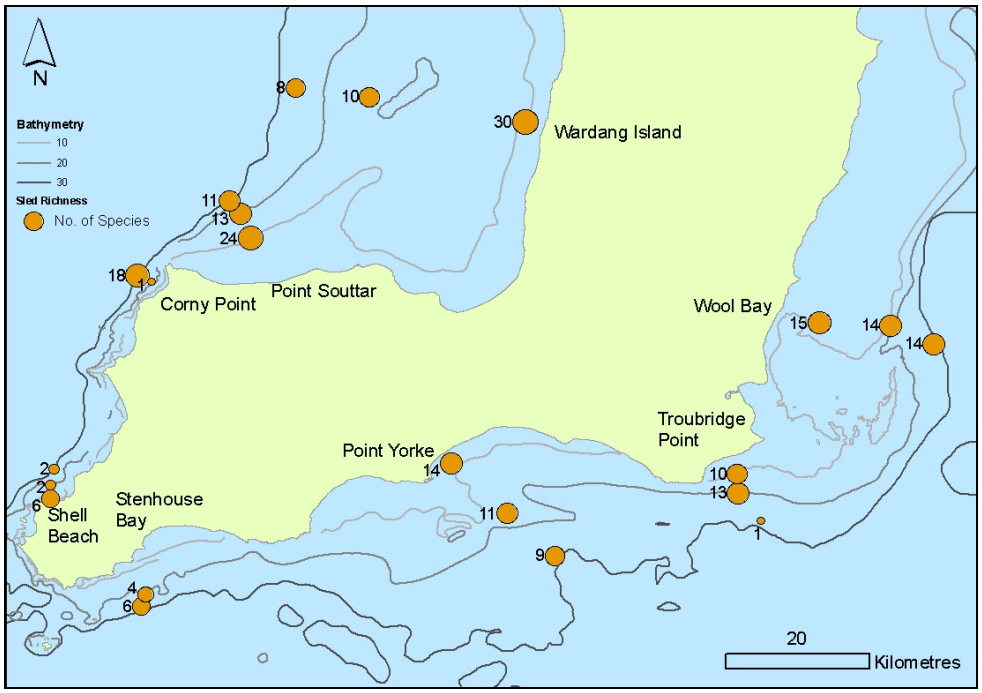

Figure 11. Bubble plot showing the total number of epibenthos species found in 22 sled shots (500 m length) around Yorke Peninsula. Numerals next to each bubble represent total species number**.**

Patterns in species composition were compared using cluster analysis (Figure 12) and MDS analysis (Figure 13). The cluster analysis showed a high level of inter-site variability with no strong groupings identified. In the MDS, when community structure was plotted using percent cover of seagrass as a factor, the group of sites containing >50% seagrass clearly group together in the centre of the ordination. The sites with less seagrass cover (<50%) and sites without seagrass intergrade more through the MDS and do not form cohesive groupings. Notably, the lowest seagrass sites tend to group slightly on the right of the ordination.

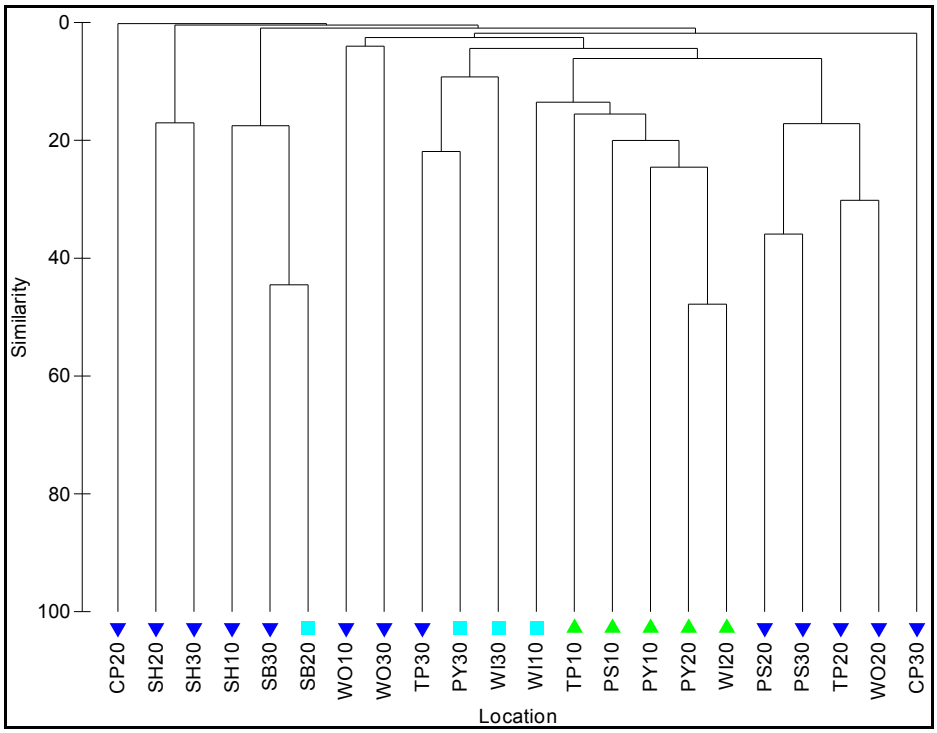

Figure 12. Cluster analysis of community structure from 22 sled shots off Yorke Peninsula. The symbols identify three habitat types; high seagrass sites (green triangles), low seagrass sites (blue squares) and sites where seagrass is absent (blue triangles).

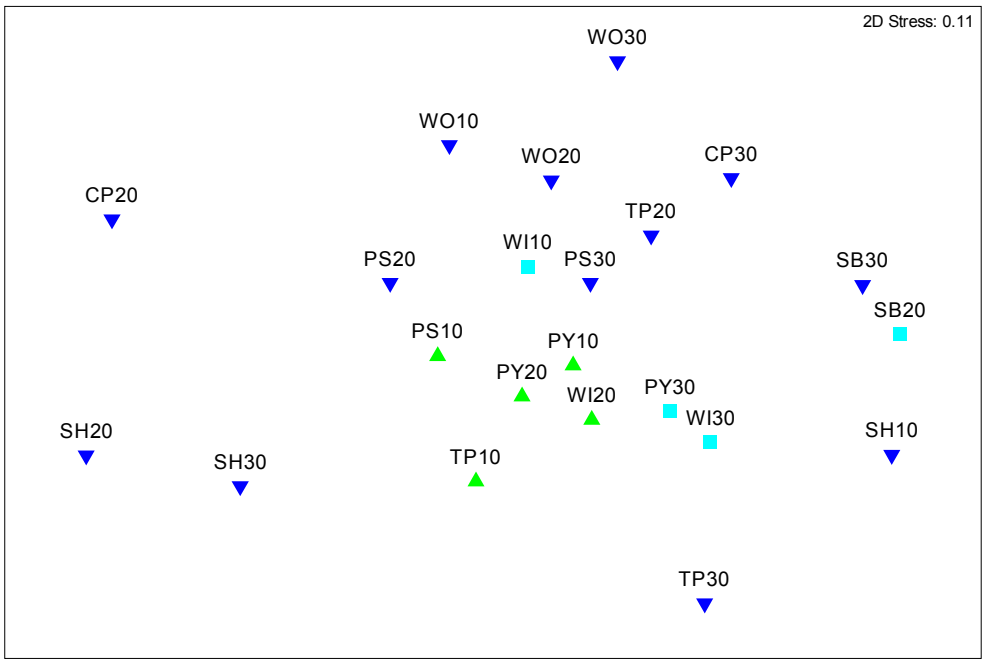

Figure 13. Non-metric MDS plot of community structure from 22 sled shots off Yorke Peninsula. Three habitat types are identified; high seagrass sites (green triangles), low seagrass sites (blue squares) and sites where seagrass is absent (blue triangles).

Abundances of the 10 species contributing ≥ 5% to within group similarity or between group dissimilarity for the three assemblage types are given in Table 4. Both heavy

and sparse seagrass assemblages are influenced by the relative densities of the two seagrasses species (*Amphibolis antartica* and *Posidonia angustifolia*). The rock crab *Nectocarcinus integrifrons* had a lower biomass in the two seagrass groups, but occurred with a much higher biomass in the bare sites. The bare sites were also characterised by high biomass of the rhodolith *Sporolithon durum* and great spider crab *Leptomithrax gaimardii*. In addition to supporting both common seagrass species, the sparse seagrass sites also supported the flat brown alga *Zonaria spiralis*.

Table 4. Mean biomass (kg per 500 m^2) of epibiota species collected from 22 sled shots taken around Yorke Peninsula. Species listed were identified from SIMPER analysis as contributing ≥ 5% to the similarity within and/or dissimilarity between groupings. Species indicative of each assemblage type (contributing ≥ 10% to the total similarity within an assemblage type) are highlighted in bold (n = number of sites in group).

Phylum	Species	Seagrass		
		High (n=5)	Low (n=4)	Absent (n=13)
Rhodophyta	*Warrenia comosa*	15.4	0.02	
Magnoliophyta	*Amphibolis antartica*	**7.18**	**0.02**	
Magnoliophyta	*Posidonia angustifolia*	**6.42**	**0.04**	
Rhodophyta	*Sporolithon durum*	0.06		**2.06**
Crustacea	*Leptomithrax gaimardii*			**1.89**
Crustacea	*Nectocarcinus integrifrons*	**0.28**	0.13	1.64
Porifera	*Chondropsid sp.*		0.15	0.48
Phaeophyta	*Zonaria spiralis*		**0.35**	0.02
Chordata	*Scobinichthys granulatus*	0.04		0.09

The relationship between the epibenthic community structure and the environmental characteristics of the sites were analysed using the BEST:BioEnv function in PRIMER. The results of this analysis indicated that a combination of depth, % cover of macroalgae, seagrass and bare substrate best match the patterns of the sled assemblage (Spearman Rank Correlation ρ=0.193).

3.3.2 Beam Trawl

A total of 1920 fish and motile invertebrate individuals were recorded from the 19 sites surveyed (Figure 14). The highest number of individuals recorded from a site was at Troubridge Point (TP20, 321 individuals), followed by Shell Beach (SH10, 275 individuals), Point Souttar (PS10, 203 individuals) and Stenhouse Bay (SB20, 193 individuals). The most abundant species collected was the great spider crab *Leptomithrax gaimardii* with 238 individuals. This number was influenced by a large number of individuals at one site (TP20, 226 individuals; Figure 15), and may be

explained by this species commonly forming large aggregations (Edgar 1997). Other common species included the orange-barred puffer fish (*Polyspina piosae*, 217 individuals), the longray rock whiting (*Siphonognathus radiatus,* 151 individuals), and the sand crab (*Ovalipes australiensis*, 132 individuals).

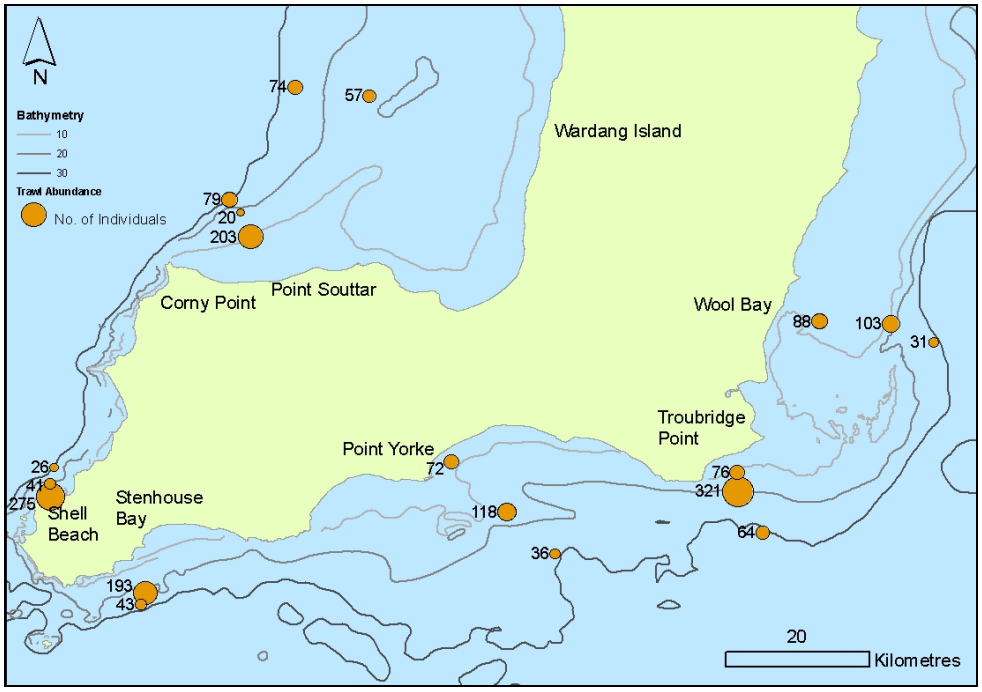

Figure 14. Bubble plot showing the total abundance of fish and motile invertebrates found at 19 beam trawl shots (500 m length) around Yorke Peninsula. Numerals next to each bubble represent the total numbers of individuals.

Figure 15. Contents of codend from beam trawl shot at TP20 showing large numbers of great spider crab *Leptomithrax gaimardii*.

A total of 114 species were recorded from the 19 sites surveyed (Figure 16). The Point Souttar sites supported the highest species richness, with 31 species at PS10 and 27 species at PS30. However PS20 had only seven species, possibly due to the high biomass of rhodolith *Sporolithon durum* found at the site (see Section 3.3.1).

Species richness was consistent across most sites and depths at Point Yorke, Wardang Island and Wool Bay, with the number of species ranging from 14 to 25. The lowest species richness occurred at the deeper sites at Shell Beach (SH20 and SH30) and the inshore site at Troubridge Point (TP10). The most widespread species included the red mullet *Upeneichthys vlamingii*, the silverbelly *Parequula melbournensis,* the southern gurnard perch *Maxillicosta meridianus* and the rough leatherjacket *Scobinichthys granulatus*. All of these species occurred at more than 50% of the sites.

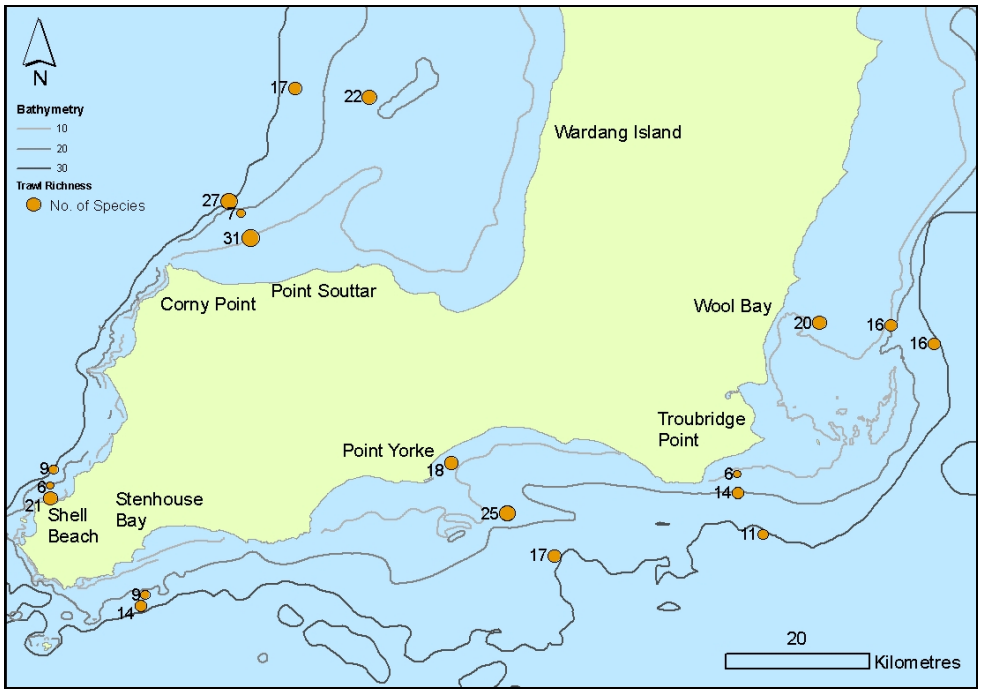

Figure 16. Bubble plot showing the total number of fish and motile invertebrate species found at 19 beam trawl shots (500 m length) around Yorke Peninsula. Numerals next to each bubble represent total species number**.**

After cluster (Figure 17) and MDS analysis (Figure 18), three major assemblage types were recognised at a Bray-Curtis dissimilarity level of 16 percent: (i) an exposed south west bare assemblage, (ii) a seagrass dominated assemblage, and (iii) all other bare assemblages.

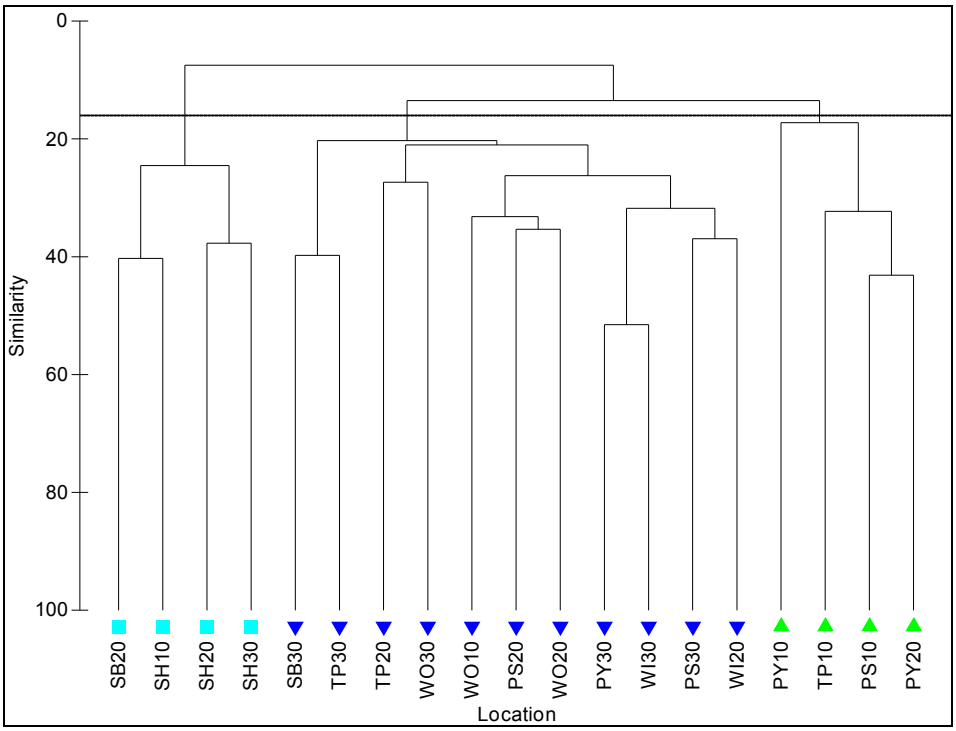

Figure 17. Cluster analysis of community structure from 19 beam trawl shots off Yorke Peninsula. Three assemblage types are identified at a Bray-Curtis dissimilarity level of 16 percent; exposed south west bare sites (blue squares), seagrass sites (green triangles), and all other bare sites (blue triangles).

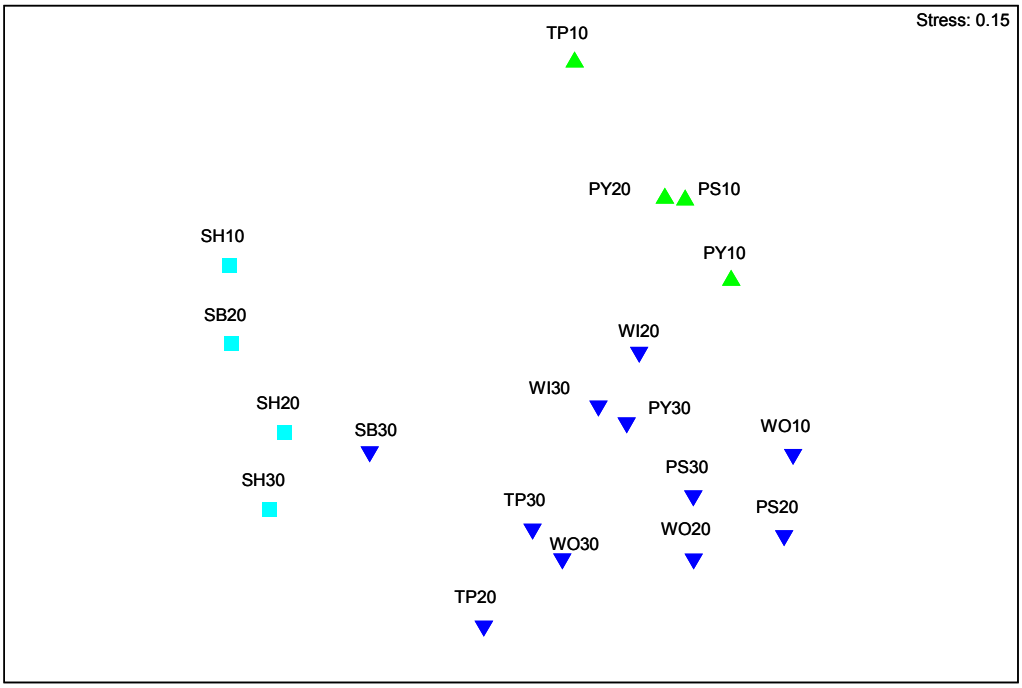

Figure 18. Non-metric MDS plot of community structure from 19 beam trawl shots off Yorke Peninsula. Three assemblage types are identified at a Bray-Curtis dissimilarity level of 16 percent; exposed south west bare sites (blue squares), seagrass sites (green triangles), and all other bare sites (blue triangles).

Eighteen species contributed ≥ 5% to within group similarity or between group dissimilarity for the three assemblage types (Table 5). Community differences were partially driven by species that occurred in high numbers in only one assemblage, particularly in the case of the exposed south west bare sites, which had high numbers of pufferfish *Polyspina piosae* and the broad duckbill *Enigmapercis reducta.* The south west bare sites also supported high numbers of the sand crab *Ovalipes australiensis* and sand flathead *Platycephalus bassensis.*

The Bare group had very high numbers of the great spider crab *Leptomithrax gaimardii* and high numbers of the southern gurnard perch *Maxillicosta meridianus* and rock crab *Nectocarcinus integrifrons.* Other significant contributors to the bare group were the silverbelly *Parequula melbournensis,* the red mullet *Upeneichthys vlamingii*, and the bridled leatherjacket *Acanthaluteres spilomelanurus*. The seagrass dominated habitat supported high numbers of longray rock whiting *Siphonognathus radiatus,* red mullet *Upeneichthys vlamingii*, the bridled leatherjacket *Acanthaluteres spilomelanurus* and Castelnaus wrasse *Dotalabrus aurantiacus.*

Table 5. Mean abundance (n per 0.2 ha) of epibiota species collected in a beam trawl shot (500 m length) in three habitat/region types around Yorke Peninsula. Species listed were identified from SIMPER analysis as contributing ≥ 5% to the similarity within and/or dissimilarity between regional groupings. Species indicative of each assemblage type (contributing ≥ 10% to the total similarity within an assemblage type) are highlighted in bold (n = number of sites in group).

Phylum	Species	Assemblage Types		
		South west bare (n=4)	Bare (n=11)	Seagrass (n=4)
Crustacea	*Leptomithrax gaimardii*		26.44	
Chordata	*Polyspina piosae*	**42.6**	0.33	0.2
Chordata	*Siphonognathus radiatus*	0.2	0.89	**28.4**
Crustacea	*Ovalipes australiensis*	**18.8**	4.22	
Chordata	*Upeneichthys vlamingii*		**3**	**5**
Chordata	*Acanthaluteres spilomelanurus*	0.6	2.22	**5.4**
Chordata	*Parequula melbournensis*		**3.67**	3.2
Chordata	*Maxillicosta meridianus*	0.2	**4.89**	0.6
Chordata	*Platycephalus bassensis*	**4.2**	2.78	
Chordata	*Scobinichthys granulatus*	0.2	3	3.6
Crustacea	*Nectocarcinus integrifrons*		3.44	0.4
Chordata	*Enigmapercis reducta*	**5.8**		
Mollusca	*Thalotia conica*			5
Chordata	*Dotalabrus aurantiacus*			**4.6**
Chordata	*Leptoichthys fistularius*			4.2
Chordata	*Crapatulus munroi*	1.4		
Chordata	*Siphonognathus argyrophanes*			1

Analysis of the relationship between fish and motile invertebrate community structure and the physical characteristics of the sites indicated that a combination of depth, % cover of seagrass and % cover of bare substrate best match the patterns of the beam trawl assemblage (Spearman Rank Correlation ρ=0.308).

3.4 Fish

3.4.1 Traps

A total of 129 fish and motile invertebrates were recorded from traps at the 24 sites surveyed (Figure 19). The sites with the highest abundance were at Wool Bay (WB20 and WB30, 16 individuals each), followed by the deep sites at Shell Beach (SB30, 12 individuals) and Point Souttar (PS30, 10 individuals). The only shallow site with a relatively high abundance was Corny Point (CP10, 10 individuals) while three other shallow sites (WI10, WO10, SB10) had no fish recorded. Corny Point and Shell Beach had consistently higher numbers at all depths than the other sites.

The most abundant and widespread species collected was Degens leatherjacket *Thamnaconus degeni* (24 individuals at 6 sites). Two species of crab, the sand crab *Ovalipes australiensis* (18 individuals at 4 sites) and the rock crab *Nectocarcinus integrifrons* (17 individuals at 3 sites) were also relatively abundant. Two commercially important species, snapper *Chrysophrys auratus* (Corny Point (CP30), 4 individuals and Shell Beach (SH30), 7 individuals) and southern rock lobster *Jasus edwardsii* (Corny Point (CP10), 3 individuals), were captured in the traps.

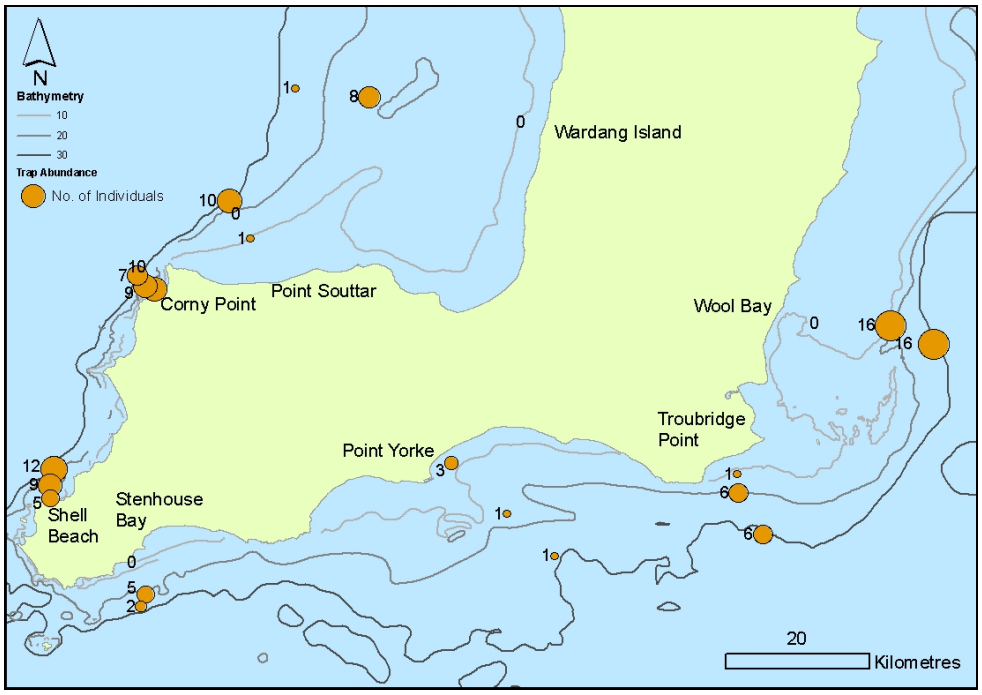

Figure 19. Bubble plot showing the total abundance of fish and motile invertebrates found in 24 sets of traps deployed around Yorke Peninsula. Numerals next to each bubble represent total numbers of individuals.

A total of 23 species were recorded from the 24 sites surveyed by trap (Figure 20). As well as having a high number of individuals and commercially important species, the deeper site at Shell Beach (SH30, 5 species) and two depths at Corny Point (CP10 and CP30, 4 species each) also had relatively high species richness. Traps set at the mid range depths at Corny Point, Wool Bay and Troubridge Point also collected 4 species.

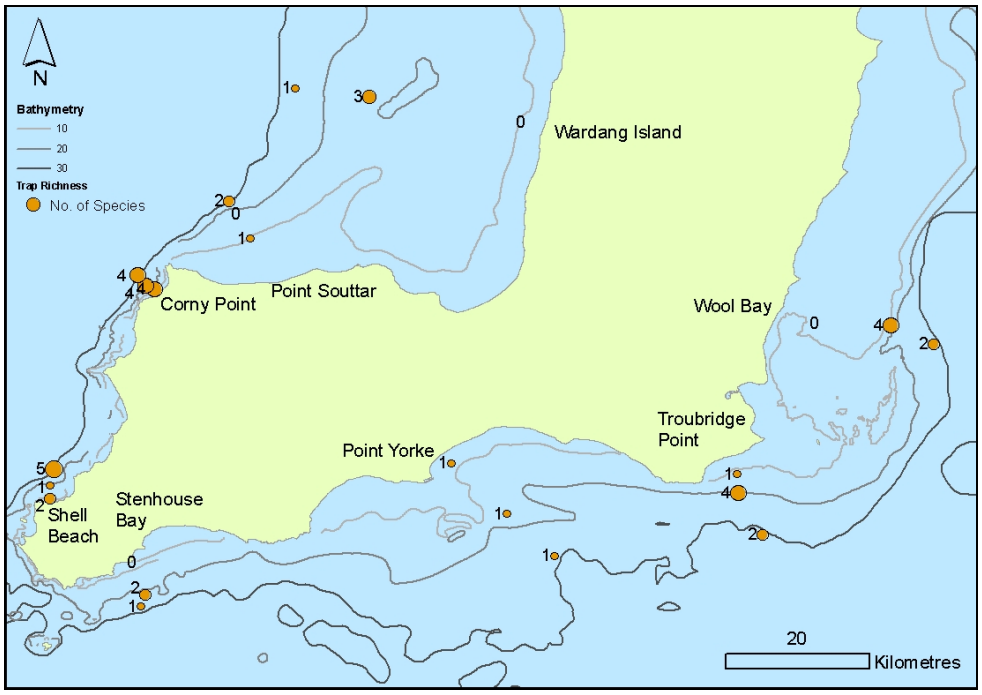

Figure 20. Bubble plot showing the total number of fish and motile invertebrate species found in 24 sets of traps deployed around Yorke Peninsula. Numerals next to each bubble represent total species number**.**

Cluster analysis (Figure 21) showed a high level of inter-site variability with no strong groupings identified. Non-metric MDS analysis (Figure 22) showed grouping of sites with similar habitats. Three groups are recognised: (i) traps set adjacent to reef covered with macroalgae; (ii) traps set on dense seagrass (with three sites aggregating on the left hand side of the plot with one (PY10) removed, and (iii) traps set on bare substrate (in the centre and bottom of the plot).

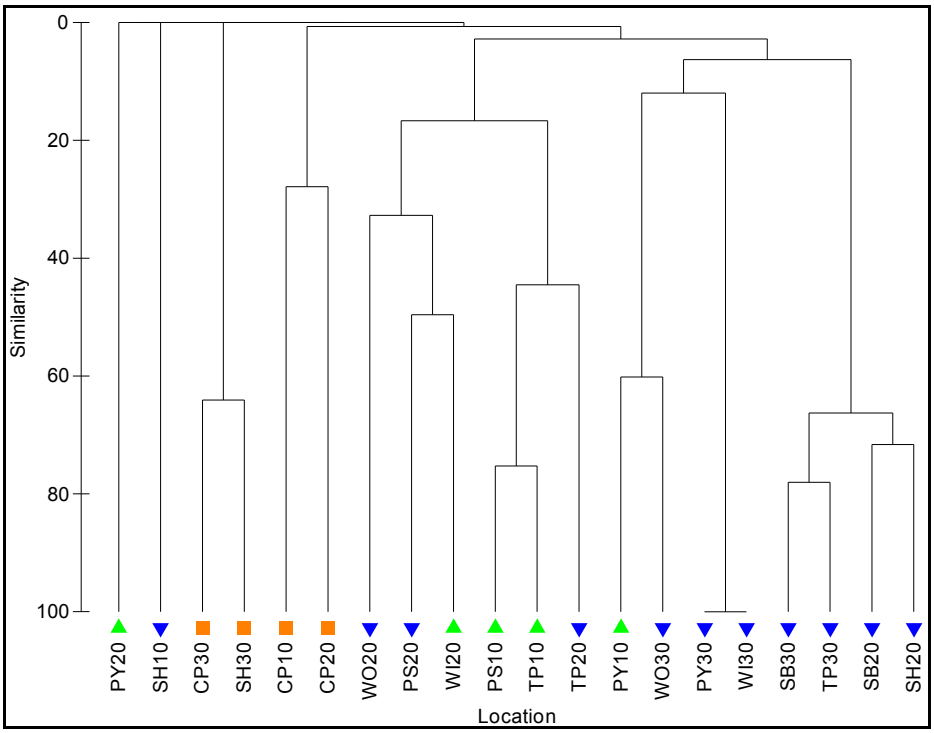

Figure 21. Cluster analysis of community structure from 20 trap sets deployed off Yorke Peninsula. Empty traps were excluded from the analysis. The habitat type at each site is identified; Macroalgae (orange squares), seagrass (green triangles), and bare sites (blue triangles).

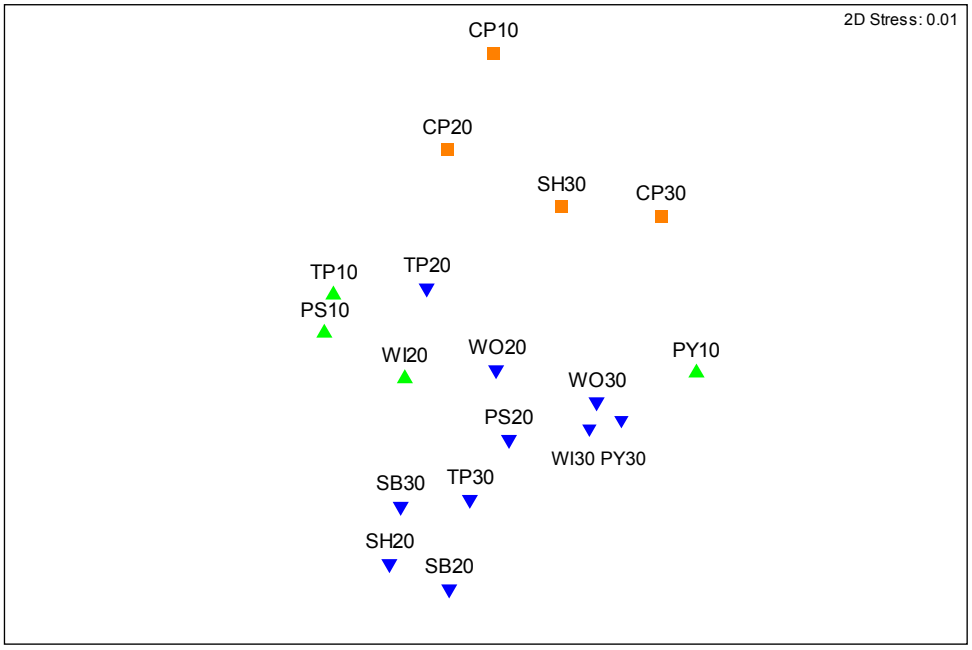

Figure 22. Non-metric MDS plot of community structure from 18 trap sets deployed off Yorke Peninsula. Empty traps were excluded from the analysis and the sites PY20 and SH10 (no species in common with other sites) were excluded from this figure. Three habitat types are identified; Macroalgae sites (orange squares), seagrass sites (green triangles), and bare sites (blue triangles).

Abundances of the 14 species contributing ≥ 5% to within group similarity or between group dissimilarity for the three assemblage types are given in Table 6. The data indicate that community differences among the macroalgae, seagrass and bare groups are primarily the result of species unique to each group. Notably Degens leatherjacket *Thamnaconus degeni* and sand crab *Ovalipes australiensis* only occur in bare habitats, while snapper *Chrysophrys auratus* were only trapped in the macroalga habitat. The macroalga group also supported many other unique species. The seagrass assemblage had higher numbers of the southern fiddler ray *Trygonorrhina dumerilii* and the Port Jackson shark *Heterodontus portusjacksoni* but no unique species.

Table 6. Mean abundance of fish and motile invertebrate species collected from 24 trap sets placed adjacent to or on in three habitat types around Yorke Peninsula. Species listed were identified from SIMPER analysis as contributing ≥ 5% to the similarity within and/or dissimilarity between groupings. Species indicative of each assemblage type (contributing ≥ 10% to the total similarity within an assemblage type) are highlighted in bold (n = number of sites in group).

Phylum	Species	Habitat Types		
		Macroalgae (n=4)	Seagrass (n=5)	Bare (n=15)
Chordata	*Thamnaconus degeni*			**1.71**
Crustacea	*Ovalipes australiensis*			**1.29**
Crustacea	*Nectocarcinus integrifrons*		1	0.79
Chordata	*Chrysophrys auratus*	**2.75**		
Crustacea	*Plagusia chabrus*	1.5		
Chordata	*Neosebastes bougainvillii*	1		0.07
Crustacea	*Leptomithrax gaimardii*			0.36
Chordata	*Trygonorrhina dumerilii*		**0.5**	0.07
Chordata	*Heterodontus portusjacksoni*		0.5	0.07
Chordata	*Meuschenia hippocrepis*	0.75		
Chordata	*Notolabrus tetricus*	**0.75**		
Crustacea	*Jasus edwardsii*	0.75		
Chordata	*Pseudophycis barbata*	**0.5**		
Chordata	*Meuschenia freycineti*	**0.5**		

The BEST:BioEnv function in PRIMER indicated that a combination of depth, % cover of seagrass, macroalgae and bare substrate best matched the patterns in trap species assemblages (Spearman Rank Correlation ρ=0.317).

3.4.2 BRUVS

A total of 3991 individuals from 89 fish species were identified from the 24 sites surveyed by BRUVS (Figure 23). The highest numbers of individuals recorded occurred at the 30 m depth sites at Point Souttar (PS30; 974 individuals), Troubridge

Point (TP30, 418 individuals), Wardang Island (WI30, 346 individuals), Wool Bay (WB30, 332 individuals) and Point Yorke (PY30; 211 individuals). Degens leatherjacket *Thamnaconus degeni* was the most common species observed (1540 individuals, accounting for 38% of all fish observed). Other common species included the silverbelly *Parequula melbournensis* (492 individuals), the trevally *Pseudocaranx* sp. (347 individuals), and the southern school whiting *Sillago bassensis* (330 individuals).

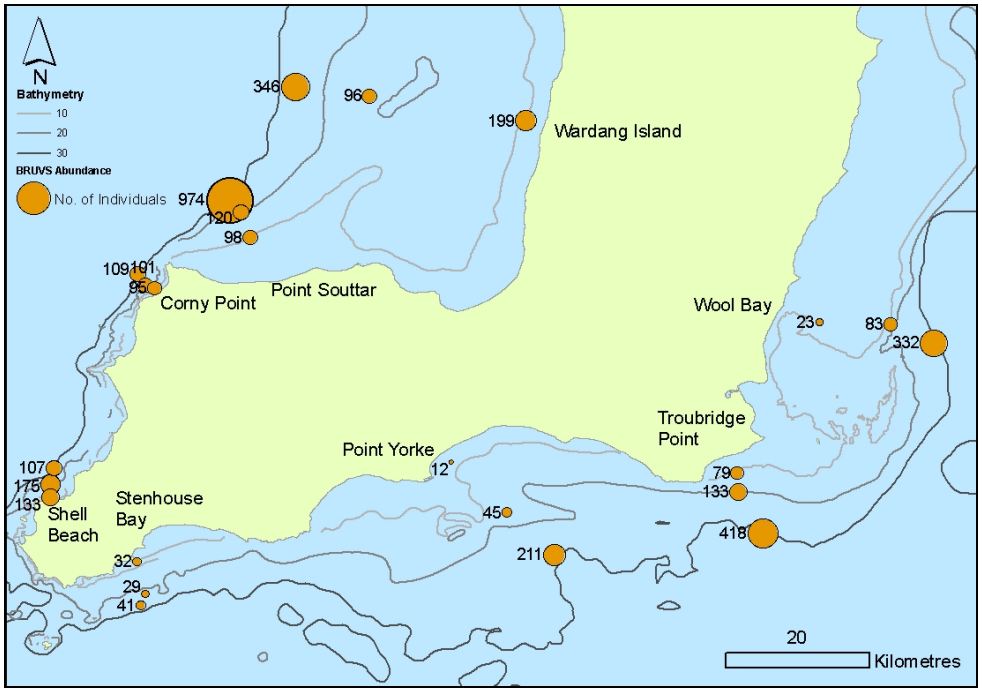

Figure 23. Bubble plot showing the total abundance of fish and motile invertebrates found in 24 sets of three BRUVS deployed around Yorke Peninsula. Numerals next to each bubble represent total numbers of individuals.

A total of 89 species were recorded from the 24 sites surveyed (Figure 24). Corny Point had three of the sites with the highest species richness (CP10, CP20 and CP30 having 25, 31 and 23 species, respectively). The deeper site at Shell Beach (SB30) had 27 species. The shallow sites at Wool Bay and Point Yorke (WO10, 5 species; PY10, 6 species) and the 20 m sites at Stenhouse Bay and Shell Beach SB20 and SH20, 6 species each) had the lowest species richness. The most widespread species included the silverbelly *Parequula melbournensis* (present at 17 sites), the red mullet *Upeneichthys vlamingii* (14 sites), and the Port Jackson shark *Heterodontus portusjacksoni* (12 sites).

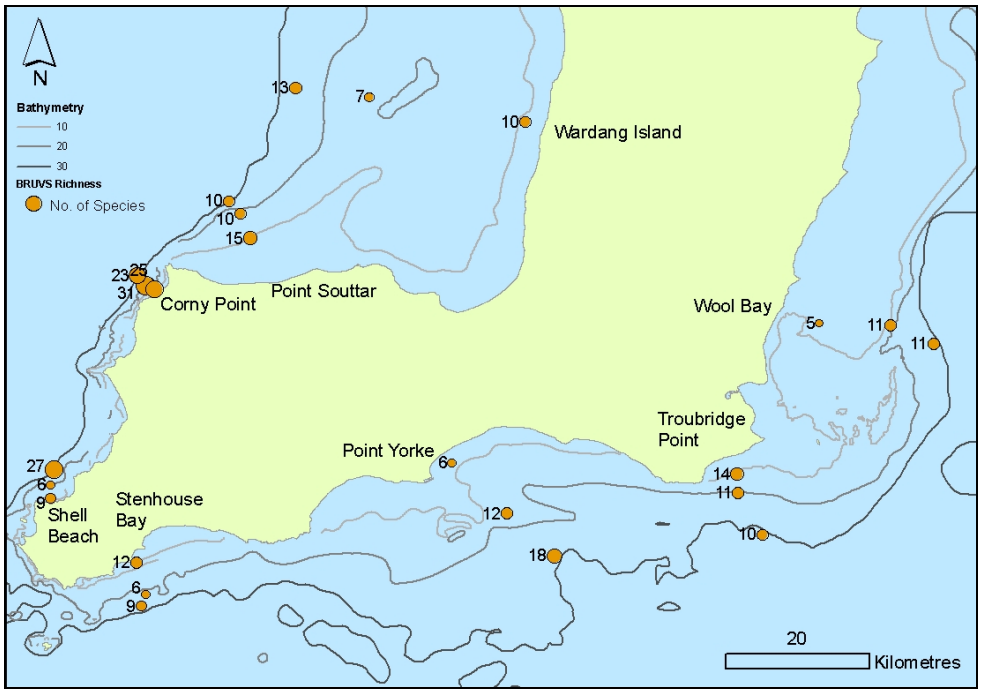

Figure 24. Bubble plot showing the total number of fish species found in 24 sets of three BRUVS deployed around Yorke Peninsula. Numerals next to each bubble represent total species number**.**

Cluster (Figure 25) and MDS analysis (Figure 26) showed that, at a Bray-Curtis dissimilarity level of 21 percent, four major assemblage types were evident: (i) BRUVS deployed adjacent to reef covered with macroalgae, (ii) the south west bare sites, (iii) all other shallow (10 m) sites and (iv) all other deeper (20 m and 30 m) sites.

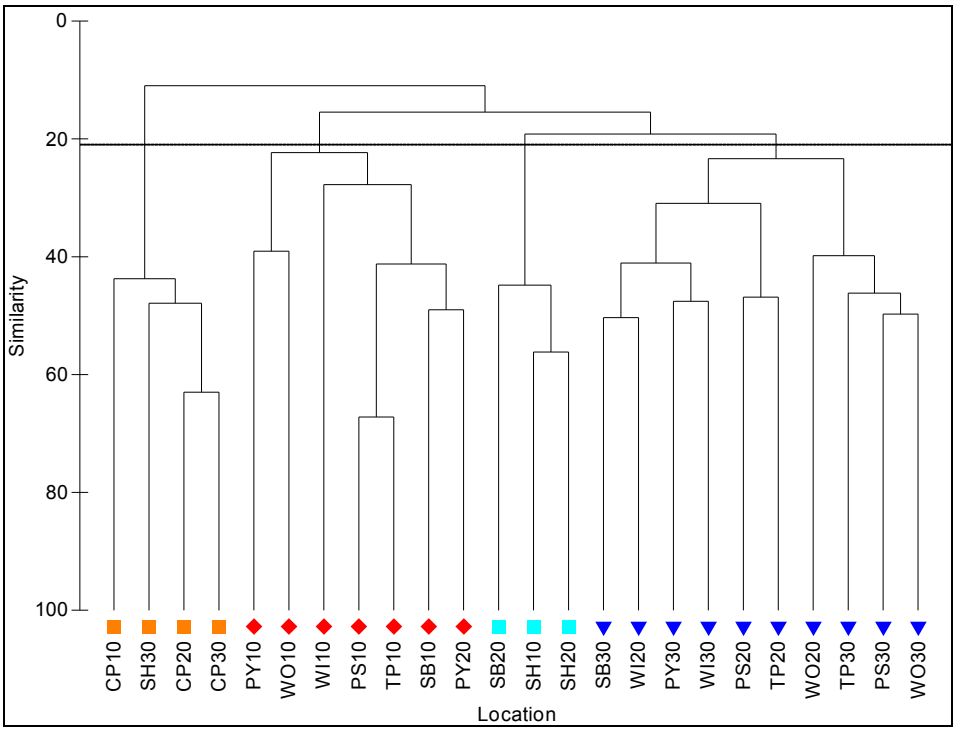

Figure 25. Cluster analysis of fish community structure at 24 sets of three BRUVS deployed off Yorke Peninsula. Four assemblage types are identified at a Bray-Curtis dissimilarity level of 21 percent; exposed south west bare sites (blue squares), macroalgae sites (orange squares), other shallow sites (red diamonds) and all other deeper sites (blue triangles).

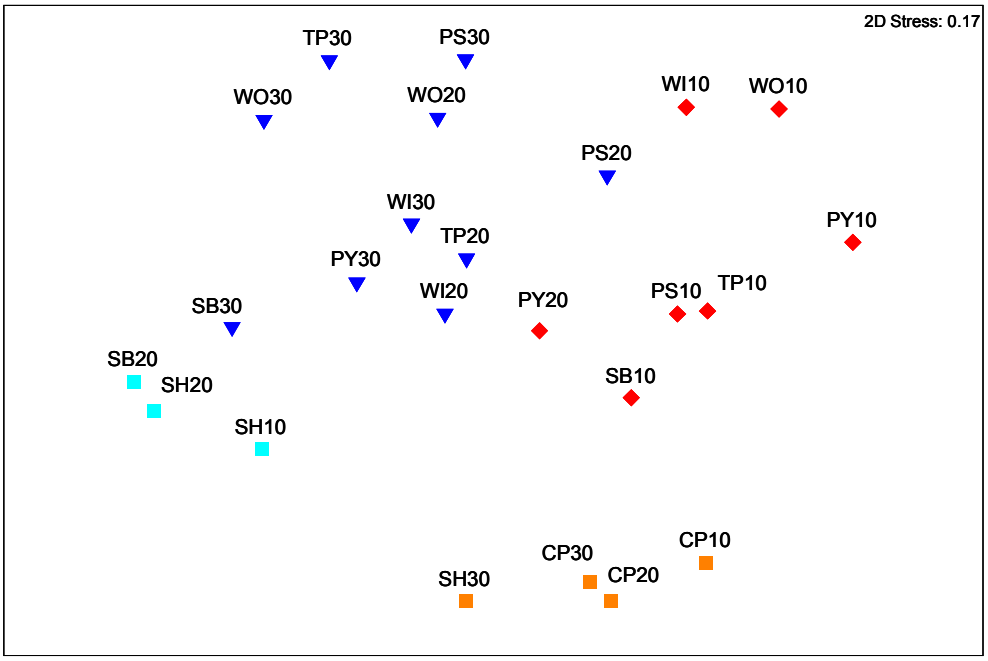

Figure 26. Non-metric MDS plot of fish community structure at 24 sets of three BRUVS deployed off Yorke Peninsula. Four assemblage types are identified at a Bray-Curtis dissimilarity level of 21 percent; exposed south west bare sites (blue squares), macroalgae sites (orange squares), other shallow sites (red diamonds) and all other deeper sites (blue triangles).

Abundances of the 24 species contributing ≥ 5% to within group similarity or between group dissimilarity for the three assemblage types were identified using SIMPER analysis (Table 7). The deep assemblage is characterised by high numbers of the small species including Degens leatherjacket *Thamnaconus degeni*, silverbelly *Parequula melbournensis* and trevally *Pseudocaranx* sp. The silverbelly is also an important contributor to the shallow assemblage together with the Australian herring *Arripis georgianus.* The larger bottom dwelling Port Jackson shark *Heterodontus portusjacksoni* and southern fiddler ray *Trygonorrhina dumerilii* also are important contributors to the shallow assemblages.

Three species that are commonly found in sandy assemblages, the southern school whiting *Sillago bassensis,* the pufferfish *Polyspina piosae* and the southern sand flathead *Platycephalus bassensis* characterise the south west bare substrate. The macroalgae assemblage includes four sites with the highest species richness (Figure 23), however few are abundant and no one species dominates the assemblage type. This group also includes three fish species (i.e. old wife *Enoplosus armatus*, blue throated wrasse *Notolabrus tetricus* and horseshoe leatherjacket *Meuschenia hippocrepis*) that are not found in any other assemblage.

Table 7. Mean abundance of fish species observed in 24 sets of three BRUVS placed adjacent to or on in four habitat/depth types around Yorke Peninsula. Species listed were identified from SIMPER analysis as contributing ≥ 5% to the similarity within and/or dissimilarity between groupings. Species indicative of each assemblage type (contributing ≥ 10% to the total similarity within an assemblage type) are highlighted in bold (n = number of sites in group).

Phylum	Species	Assemblage Type			
		Macroalgae (n=4)	South west bare (n=3)	Shallow (n=7)	Deep (n=10)
Chordata	*Thamnaconus degeni*				**154**
Chordata	*Parequula melbournensis*	3.25		**9.33**	**42.3**
Chordata	*Pseudocaranx* sp.	2.75	6.25		**31.1**
Chordata	*Sillago bassensis*	0.25	**65.25**		6.8
Chordata	Monacanthidae sp.			27.83	11.8
Chordata	*Arripis georgianus*			**11.67**	
Chordata	*Polyspina piosae*	0.75	**8.75**	0.34	1.9
Chordata	*Platycephalus bassensis*	1.25	**3.25**		3.4
Chordata	*Upeneichthys vlamingii*	4.75	0.25	1.83	1.8
Chordata	*Scobinichthys granulatus*			4.33	1.7
Chordata	*Acanthaluteres vittiger*	0.25		1.83	**2.4**
Chordata	*Nelusetta ayraudi*		5.5		1.3
Chordata	*Notolabrus parilus*	3.25		3.5	
Chordata	*Chrysophrys auratus*	8		0.17	
Chordata	*Sillaginodes punctata*	2.25	0.5	1.83	1
Chordata	*Trygonorrhina dumerilii*			**2.17**	1.9
Chordata	*Notolabrus tetricus*	7.75			
Chordata	*Meuschenia hippocrepis*	7.75			
Chordata	*Heterodontus portusjacksoni*	0.5		**1.83**	0.7
Chordata	*Platycephalus* sp.		2		0.8
Chordata	*Austrolabrus maculatus*	2.5		0.33	
Chordata	*Pictilabrus laticlavius*	2.5		0.17	
Chordata	*Enoplosus armatus*	2.5			
Chordata	*Tilodon sexfasciatus*	2.25			

The BEST:BioEnv function in PRIMER indicated that a combination of depth, sediment sorting size, % cover of seagrass, macroalgae and bare substrate best match the patterns in BRUVS species assemblages (Spearman Rank Correlation ρ=0.321).

4. DISCUSSION

4.1 Infauna

Infaunal community structure was observed to vary in relation to mean sediment grain size and sediment sorting. As most infauna live between sand grains in the top few centimetres of the seafloor, sediment structure has an important influence on their distribution, abundance and community composition. Strong correlations between sediment grain size and biotic composition have been previously demonstrated in estuarine and shallow coastal environments (Snelgrove 1999). Grain size varied markedly across the study area, but did not show any clear geographical or depth-related patterns. A range of other environmental factors considered in this study (including salinity, temperature, % cover of seagrass, sand and bare substrate) had no apparent direct influence on infaunal community structure around Yorke Peninsula.

In this study 169 infaunal species were found in a combined sampling area of 2.3 m^2. This appears to be higher than comparable studies in deeper waters off western South Australia (240 per 7.2 m^2, Currie *et al.* 2007), but is broadly comparable with shallow studies off the eastern Victorian coast (803 species per 10.3 m^2, Coleman *et al.* 1997). It is, however, noteworthy that the Victorian study employed a finer sieve size (0.5 mm) than that used in the present study (1 mm), and would therefore have sampled a much wider range of organisms.

It is difficult to assess the conservation status of marine infaunal species because only a small proportion of the global fauna has been described, and very little is known about their distributions. Less than sixteen percent (27/169) of the taxa collected during this survey could be confidently identified to the level of species, so, a large proportion of the Yorke Peninsula infauna may be undescribed. Presently, no infaunal species are listed under the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) as threatened, endangered or rare.

Most infaunal taxa that could be reliably identified to species (and for which there were distributional data available) were found to be widespread in southern Australian waters. Indeed, the majority of these species had ranges that extended at least from the southwest of Western Australia to Victoria (DEWR 2009).

4.2 Epibiota

Results from sled and beam trawl sampling highlight habitat (particularly the presence/absence of seagrass for both techniques) and regional (beam trawl only) environmental gradients. Both sled and beam trawl tows were standardised to 500 m in length, however the sampling efficiency of sleds and trawls are greatly influenced by the topography and composition of the seafloor (Currie and Parry 1999). It is unclear to what extent sampling efficiencies for the two techniques have influenced the results.

Biomass of sled samples varied markedly between sites, however, consistently higher biomasses were recorded in areas where seagrass was present in medium to high abundance. Sites with seagrass also had higher species diversity than those without, possibly reflecting the reliance of many species of fish and decapods on seagrass meadows for all or part of their life cycles (Bryars 2003; Edyvane 1999b; Walker and McComb 1992). The seagrass species identified in the study are consistent with those listed in previous broad-scale studies of the area (Bryars 2003; Edyvane 1999b).

The overall number of species identified using the sled (125) is low compared to a study carried out in deeper shelf-waters in western South Australia (720 species) (Currie *et al.* 2008). This relatively lower species richness in this study is likely due to the reduced sampling effort, shorter tow length (tows were 5 mins at 3.5 knots, ca 550-600 m) and narrower geographical coverage. No one species was collected at all the sled sample sites in the current survey; however the rock crab (*Nectocarcinus integrifrons*) and rough leatherjacket (*Scobinichthys granulatus*) were the most widespread. Commercially important species were rare in the sled samples, although the sand crab (*Ovalipes australiensis*) was caught in moderate numbers, and is targeted by some marine scale fishers.

Although the beam trawl could not be deployed at as many sites as the sled due to rough terrain, it was still deployed at 19 of the 24 sites surveyed. The advantage of the beam trawl over the sled is the ability to sample seagrass beds without removing the canopy and the increase in sampling area. Beam trawling (and trawling in general) targets smaller, sedentary, demersal species (Cappo *et al.* 2004). The total number of species collected (114) during this study is comparable to numbers collected in the tropics (90 species 19 shots Cappo *et al.* 2004) and Port Phillip Bay

(63 species 30 shots Cohen *et al.* 2000) although the equipment and methodology varies from this study.

Beam trawling highlighted differences between vegetated and un-vegetated habitats. As with the sled samples, seagrass dominated sites supported a higher number of species than the bare sites, particularly a higher number of cryptic species such as syngnathids, *Siphonognathus* species and leatherjackets. The south west bare group was characterised by a lower number of species but had a higher overall abundance than many of the sites, mainly due to the schooling pufferfish *Polyspina piosae*. This area is influenced more by oceanic swell than elsewhere in the region, and collected a different species assemblage to those found in other bare sites. The most widespread species collected in the trawls were either absent, or found in very low numbers, in the south west bare site (a result that may indicate a general preference in fish for sheltered areas). Commercially targeted species including sand crab (*Ovalipes australiensis*), blue swimmer crab (*Portunus pelagicus*) and western king prawn (*Penaeus latisulcatus*) were typically more common in the trawl than sled samples, probably refecting the differential efficiencies of the two sampling gear types.

No epibenthic species collected in the sled and trawl shots are listed under the EPBC Act as threatened, endangered or rare. However, seven Syngnathidae species were collected, the Pugnose Pipefish (*Pugnaso curtiorstris*), Mother-of-Pearl Pipefish (*Vanacampus margaritifer*), Spotted Pipefish (*Stigmatopora argus*), Common Seadragon (*Phyllopteryx taeniolatus*), Brushtail Pipefish (*Leptoichthys fistularius*), Shorthead Seahorse (*Hippocampus breviceps*), and Ringback Pipefish (*Stipecampus cristatus*), and are listed as protected under the EPBC Act. The majority of species that could be reliably identified were found to be widespread in southern Australian waters (CAAB 2009; DEWR 2009; Last and Stevens 2009) and have been observed in previous broad-scale biodiversity studies of the region (Bryars 2003; Edyvane 1999b).

4.3 Fish

Both the traps and the BRUVS target large mobile species by attraction using a bait plume. Although fish bait was used to attract predators and scavengers, a wide variety of fish were sampled, including herbivores and planktivores (Appendix 4). This agrees with other baited surveys, where fish are attracted to bait or commotion (Cappo *et al.* 2004; Malcolm *et al.* 2007). The baited trapping and underwater video

sampling around Yorke Peninsula indicated that fish assemblages vary according to adjacent habitat types (Traps and BRUVS), depth (BRUVS only) and region (BRUVS only).

Despite an order of magnitude difference between abundances sampled using the two different techniques (Trap, 129 individuals; BRUVS, 3991 individuals) the four sites adjacent to macroalgae-covered reef systems (Corny Point, all depths; Shell Beach 30 m) had similar fish assemblages that differed from all other sites. These differences were due to higher species richness and the presence of some species unique to this habitat. These included snapper (*Chrysophrys auratus*), blue-throated wrasse (*Notolabrus tetricus*) and horseshoe leatherjacket (*Meuschenia hippocrepis*), all of which are common in other subtidal reef environments in South Australia.

The effectiveness of traps is determined by the likelihood of three successive events. Notably, that a species will encounter, enter and remain in the trap (Hayes *et al.* 2005). In the bare areas the schooling Degens leatherjacket (*Thamnaconus degeni*) was found in some traps but in much lower numbers than seen in the adjacent BRUVS videos. This result may be due to the large mesh size in the snapper trap and small openings of the other traps. The commercially targeted sand crab *Ovalipes australiensis* was relatively common on the bare areas where its commercial catch rates are also recorded as high.

In contrast to the traps, schooling species including Degens leatherjacket (*Thamnaconus degeni*), the silverbelly (*Parequula melbournensis*) and the trevally (*Pseudocaranx* sp.) were identified in high numbers in the deeper BRUVS deployments. These species are some of the most common in bycatch from the Spencer Gulf prawn fishery and consistently occur in high numbers in deeper waters off Yorke Peninsula (SARDI, unpublished data). The school whiting (*Sillago bassensis*) and the Australian herring (*Arripis georgianus*) were also important in defining assemblages. Abundant schooling species are frequently recognised as important contributors to fish assemblages in BRUVS research (Cappo *et al.* 2004; Malcolm *et al.* 2007).

The use of *MaxN* to give a measure of abundance represents a potential bias that may have affected the results. Estimates of *MaxN* are considered conservative, particularly in areas where fish occur in high-densities, due to the ability to only count fish in the field of view and the tendency for fish to stay around the bait while entering and exiting the view (Cappo *et al.* 2004). In this study some of these deficiencies

were partially overcome by using stereo-video camera systems, which allow for fish to be precisely measured for use in calculation of the *MaxN* value (Harvey *et al.* 2002). In this study, 89 species were identified from the video taken at the 24 sites (72 drops). This is comparable to the numbers observed in Queensland (76 species, 95 drops Cappo *et al.* 2004) and in New South Wales (101 species, 96 drops Malcolm *et al* 2007).

Limited image quality through poor visibility or obscuring of the video cameras by biota at the site caused some variability in measurement and observations. The use of standard definition cameras made differentiation of similar species quite difficult, and some fish could not be identified higher than family level. Many *Monacanthidae* species for example are morphologically similar with similar colour patterns and could not be clearly differentiated. These families were included in the analysis, but may have resulted in some species being underestimated.

All species identified in the traps and BRUVS around Yorke Peninsula are common and occur widely throughout southern Australian waters (CAAB 2009; Edgar 1997; Gomon *et al.* 2008). It is also notable that many of the species identified in this study have also been observed in previous broad-scale biodiversity studies of the region (Bryars 2003; Edyvane 1999b, Shepherd and Baker 2008).

4.4 Summary and Recommendations

Using all sampling techniques, a total of 460 individual taxa were identified during this study. Many of the marine species that inhabit the temperate waters of southern Australia are characterised by short larval periods and localised dispersal. For these reasons, it has been suggested that there is a high tendency for local and regional rarity and endemism in temperate waters, with species distributions characterised by small isolated localised populations (Edyvane 1999a). We found little evidence to support this hypothesis in our survey of marine species off the Yorke Peninsula. Most taxa that could be reliably identified to species (and for which there were distributional data available) were found to be widespread in southern Australian waters. Unfortunately we cannot comment on the relative rarity and distributions of a large proportion (46%) of the taxa collected, because their identification to species level requires more time and taxonomic expertise. Voucher material for each taxon collected during this study has been lodged with the South Australian Museum and State Herbarium of South Australia for comparison in future bio-regionalisation assessments.

The general lack of comparative benthic data available in South Australia limits our ability to evaluate the regional biodiversity of the Northern and Yorke NRM region. Results from this study do, however, provide a quantitative basis to assess this question in the future as data for other regions become available. Like many areas with urbanised catchments, the Northern and Yorke Peninsula NRM Region receives pollution from a wide range of sources including urban developments, commercial and recreational fishing and rural agriculture. While some impacts, such as the introduction of exotic marine organisms are probably contributing to irreversible changes to the ecology of the region, the cumulative effects from these impacts on regional biodiversity is unclear.

This study provides a quantitative assessment of marine biodiversity in the lower Yorke Peninsula. In combination with regular ongoing monitoring this study provides a context for assessing changes in community structure, assessing the impact of threatening processes and evaluating the effectiveness of conservation measures such as the establishment of marine reserves. Regular monitoring of the same site using at least a subset of the key techniques employed in this study should ensure that important changes to biodiversity are identified quickly.

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Appendix 1. Location, date and depth of all sampling undertaken during the biodiversity survey at Yorke Peninsula in 2008. Note that the WGS84 datum is employed for all position fixes.

Site	Date	Method	Depth	Start		Finish	
				Latitude	Longitude	Latitude	Longitude
CP10	28/11/2008	BRUV1	10	-34.92764	136.99215		
CP10	28/11/2008	BRUV2	10	-34.92602	136.99393		
CP10	28/11/2008	BRUV3	10	-34.92441	136.99575		
CP10	28/11/2008	CTD	10	-34.92588	136.99404		
CP10	27/11/2008	Grab	10	-34.92582	136.99246		
CP10	28/11/2008	Trap	10	-34.9273	136.99524		
CP10	28/11/2008	Video	10	-34.9257	136.99451	-34.92506	136.99625
CP20	28/11/2008	BRUV1	20	-34.92432	136.9833		
CP20	28/11/2008	BRUV2	20	-34.92219	136.98433		
CP20	28/11/2008	BRUV3	20	-34.9199	136.98547		
CP20	28/11/2008	CTD	20	-34.92059	136.98616		
CP20	27/11/2008	Grab	20	-34.92174	136.99547		
CP20	28/11/2008	Sled	20	-34.91371	136.99617	-34.91664	136.99199
CP20	28/11/2008	Trap	20	-34.92174	136.99547	-34.91991	136.96509
CP20	28/11/2008	Video	20	-34.92099	136.98615	-34.92138	136.98549
CP30	28/11/2008	BRUV1	30	-34.91408	136.96996		
CP30	28/11/2008	BRUV2	30	-34.9159	136.96859		
CP30	28/11/2008	BRUV3	30	-34.91747	136.96665		
CP30	28/11/2008	CTD	30	-34.91877	136.96566		
CP30	27/11/2008	Grab	30	-34.91488	136.96797		
CP30	28/11/2008	Sled	30	-34.91661	136.96455	-34.91254	136.96638
CP30	28/11/2008	Trap	30	-34.91457	136.96862		
CP30	28/11/2008	Video	30	-34.91955	136.96498		
PS10	26/11/2008	BRUV1	10	-34.86703	137.11124		
PS10	26/11/2008	BRUV2	10	-34.86549	137.1132		
PS10	26/11/2008	BRUV3	10	-34.86396	137.1152		
PS10	26/11/2008	CTD	10	-34.86207	137.11561		
PS10	25/11/2008	Grab	10	-34.8647	137.11322		
PS10	26/11/2008	Sled	10	-34.86336	137.11391	-34.86611	137.1099
PS10	26/11/2008	Trap	10	-34.86571	137.11289		
PS10	26/11/2008	Trawl	10	-34.86754	137.1133	-34.86534	137.11799
PS10	26/11/2008	Video	10	-34.86259	137.11569	-34.86211	137.11572
PS20	26/11/2008	BRUV1	20	-34.83422	137.0964		
PS20	26/11/2008	BRUV2	20	-34.83341	137.09886		
PS20	26/11/2008	BRUV3	20	-34.83242	137.1014		
PS20	26/11/2008	CTD	20	-34.83127	137.10264		
PS20	25/11/2008	Grab	20	-34.83249	137.09929		
PS20	26/11/2008	Sled	20	-34.83351	137.1021	-34.83525	137.09705
PS20	26/11/2008	Trap	20	-34.83269	137.09981		
PS20	26/11/2008	Trawl	20	-34.8342	137.09913	-34.83332	137.10165
PS20	26/11/2008	Video	20	-34.83145	137.10329	-34.83121	137.10456
PS30	26/11/2008	BRUV1	30	-34.81902	137.0859		
PS30	26/11/2008	BRUV2	30	-34.81747	137.08811		
PS30	26/11/2008	BRUV3	30	-34.81601	137.09022		
PS30	26/11/2008	CTD	30	-34.81572	137.09018		

Site	Date	Method	Depth	Start		Finish	
				Latitude	Longitude	Latitude	Longitude
PS30	25/11/2008	Grab	30	-34.81618	137.09156		
PS30	26/11/2008	Sled	30	-34.81659	137.08703	-34.81977	137.08314
PS30	26/11/2008	Trap	30	-34.81642	137.09079		
PS30	26/11/2008	Trawl	30	-34.81936	137.08826	-34.81625	137.0922
PS30	26/11/2008	Video	30	-34.81512	137.08902	-34.8149	137.08874
PY10	25/11/2008	BRUV1	10	-35.13949	137.37367		
PY10	25/11/2008	BRUV2	10	-35.1407	137.37129		
PY10	25/11/2008	BRUV3	10	-35.14233	137.36768		
PY10	25/11/2008	CTD	10	-35.14233	137.36768		
PY10	25/11/2008	Grab	10	-35.14359	137.36432		
PY10	25/11/2008	Sled	10	-35.14226	137.37105	-35.13968	137.37547
PY10	25/11/2008	Trap	10	-35.1438	137.36401		
PY10	25/11/2008	Trawl	10	-35.13943	137.37654	-35.14163	137.37181
PY10	25/11/2008	Video	10	-35.14252	137.36736	-35.1426	137.36681
PY20	25/11/2008	BRUV1	20	-35.20573	137.44173		
PY20	25/11/2008	BRUV2	20	-35.20533	137.43901		
PY20	25/11/2008	BRUV3	20	-35.20594	137.43627		
PY20	25/11/2008	CTD	20	-35.20708	137.43614		
PY20	25/11/2008	Grab	20	-35.20542	137.43729		
PY20	25/11/2008	Sled	20	-35.20711	137.43971	-35.20711	137.4452
PY20	25/11/2008	Trap	20	-35.20533	137.43689		
PY20	25/11/2008	Trawl	20	-35.20723	137.44496	-35.2073	137.43953
PY20	25/11/2008	Video	20	-35.20608	137.43651	-35.2053	137.43628
PY30	30/11/2008	BRUV1	30	-35.26136	137.49074		
PY30	30/11/2008	BRUV2	30	-35.26117	137.49348		
PY30	30/11/2008	BRUV3	30	-35.26088	137.4962		
PY30	25/11/2008	CTD	30	-35.26158	137.49213		
PY30	25/11/2008	Grab	30	-35.26082	137.49604		
PY30	25/11/2008	Sled	30	-35.26196	137.49434	-35.26221	137.4998
PY30	25/11/2008	Trap	30	-35.26082	137.49604		
PY30	25/11/2008	Trawl	30	-35.26195	137.49951	-35.26207	137.49393
PY30	25/11/2008	Video	30			-35.26255	137.49118
SB10	29/11/2008	BRUV1	10	-35.27047	136.96639		
SB10	29/11/2008	BRUV2	10	-35.27021	136.96903		
SB10	29/11/2008	BRUV3	10	-35.26944	136.97153		
SB10	29/11/2008	CTD	10	-35.26885	136.97281		
SB10	28/11/2008	Grab	10	-35.2698	136.96019		
SB10	30/11/2008	Trap	10	-35.27016	136.96231		
SB10	29/11/2008	Video	10	-35.26838	136.97299	-35.26794	136.97332
SB20	30/11/2008	BRUV1	20	-35.30954	136.9789		
SB20	30/11/2008	BRUV2	20	-35.30851	136.98141		
SB20	30/11/2008	BRUV3	20	-35.30756	136.98387		
SB20	30/11/2008	CTD	20	-35.30668	136.98474		
SB20	29/11/2008	Grab	20	-35.30834	136.98187		
SB20	29/11/2008	Sled	20	-35.30983	136.9826	-35.31172	136.97768
SB20	30/11/2008	Trap	20	-35.30839	136.98283		
SB20	29/11/2008	Trawl	20	-35.31153	136.97831	-35.30967	136.98321
SB20	29/11/2008	Video	20	-35.30722	136.98425	-35.30944	136.98418
SB30	29/11/2008	BRUV1	30	-35.32687	136.98422		
SB30	29/11/2008	BRUV2	30	-35.32619	136.98677		
SB30	29/11/2008	BRUV3	30	-35.32492	136.98876		
SB30	29/11/2008	CTD	30	-35.32766	136.98174		
SB30	28/11/2008	Grab	30	-35.32761	136.98099		

Site	Date	Method	Depth	Start		Finish	
				Latitude	Longitude	Latitude	Longitude
SB30	29/11/2008	Sled	30	-35.32416	136.98876	-35.32637	136.98408
SB30	30/11/2008	Trap	30	-35.32704	136.98379		
SB30	29/11/2008	Trawl	30	-35.32126	136.99594	-35.3231	136.99099
SB30	29/11/2008	Video	30	-35.32729	136.98216	-35.3271	136.983
SH10	29/11/2008	BRUV1	10	-35.18927	136.85995		
SH10	29/11/2008	BRUV2	10	-35.1888	136.86284		
SH10	29/11/2008	BRUV3	10	-35.18819	136.86544		
SH10	29/11/2008	CTD	10	-35.18738	136.8664		
SH10	28/11/2008	Grab	10	-35.1894	136.86251		
SH10	29/11/2008	Sled	10	-35.18739	136.86613	-35.18815	136.86078
SH10	29/11/2008	Trap	10	-35.18971	136.86353		
SH10	29/11/2008	Trawl	10	-35.18758	136.86073	-35.186	136.86586
SH10	29/11/2008	Video	10	-35.18754	136.86581	-35.18735	136.86492
SH20	29/11/2008	BRUV1	20	-35.17372	136.86055		
SH20	29/11/2008	BRUV2	20	-35.17285	136.86288		
SH20	29/11/2008	BRUV3	20	-35.17201	136.86528		
SH20	29/11/2008	CTD	20	-35.17095	136.86616		
SH20	28/11/2008	Grab	20	-35.17297	136.86344		
SH20	29/11/2008	Sled	20	-35.17138	136.86439	-35.17346	136.85953
SH20	29/11/2008	Trap	20	-35.17248	136.86328		
SH20	29/11/2008	Trawl	20	-35.17411	136.85813	-35.17184	136.86284
SH20	29/11/2008	Video	20	-35.1712	136.86591	-35.17115	136.86514
SH30	29/11/2008	BRUV1	30	-35.15603	136.86753		
SH30	29/11/2008	BRUV2	30	-35.15425	136.86914		
SH30	29/11/2008	BRUV3	30	-35.1527	136.87148		
SH30	29/11/2008	CTD	30	-35.15109	136.87259		
SH30	28/11/2008	Grab	30	-35.15534	136.86701		
SH30	29/11/2008	Sled	30	-35.15196	136.86899	-35.15617	136.86417
SH30	29/11/2008	Trap	30	-35.15676	136.86759		
SH30	29/11/2008	Trawl	30	-35.1553	136.86467	-35.15244	136.8688
SH30	29/11/2008	Video	30	-35.15085	136.8704	-35.15123	136.86904
TP10	24/11/2008	BRUV1	10	-35.15374	137.73148		
TP10	24/11/2008	BRUV2	10	-35.15427	137.7286		
TP10	24/11/2008	BRUV3	10	-35.15484	137.72582		
TP10	24/11/2008	CTD	10	-35.1555	137.72534		
TP10	24/11/2008	Grab	10	-35.1555	137.72534		
TP10	24/11/2008	Sled	10	-35.15573	137.72847	-35.1555	137.73388
TP10	24/11/2008	Trap	10	-35.15552	137.72367		
TP10	24/11/2008	Trawl	10	-35.15282	137.73025	-35.15202	137.73279
TP10	24/11/2008	Video	10	-35.15573	137.72628	-35.15549	137.7263
TP20	24/11/2008	BRUV1	20	-35.1801	137.73404		
TP20	24/11/2008	BRUV2	20	-35.17995	137.73113		
TP20	24/11/2008	BRUV3	20	-35.17977	137.72866		
TP20	24/11/2008	CTD	20	-35.18001	137.72731		
TP20	24/11/2008	Grab	20	-35.18001	137.72731		
TP20	24/11/2008	Sled	20	-35.18139	137.73401	-35.18097	137.72865
TP20	24/11/2008	Trap	20	-35.18041	137.72907		
TP20	24/11/2008	Trawl	20	-35.18122	137.73236	-35.18109	137.73782
TP20	24/11/2008	Video	20	-35.18044	137.72735	-35.18095	137.72724
TP30	24/11/2008	BRUV1	30	-35.23533	137.76009		
TP30	24/11/2008	BRUV2	30	-35.23447	137.75751		
TP30	24/11/2008	BRUV3	30	-35.23368	137.75492		
TP30	24/11/2008	CTD	30	-35.23354	137.7596		

Site	Date	Method	Depth	Start		Finish	
				Latitude	Longitude	Latitude	Longitude
TP30	24/11/2008	Grab	30	-35.23354	137.7596		
TP30	24/11/2008	Sled	30	-35.23556	137.75538	-35.23696	137.7577
TP30	24/11/2008	Trap	30	-35.23085	137.76175		
TP30	24/11/2008	Trawl	30	-35.23656	137.75642	-35.23412	137.75175
TP30	24/11/2008	Video	30	-35.23471	137.7569	-35.23507	137.75639
WI10	27/11/2008	BRUV1	10	-34.72123	137.45941		
WI10	27/11/2008	BRUV2	10	-34.71904	137.46023		
WI10	27/11/2008	BRUV3	10	-34.71691	137.4608		
WI10	27/11/2008	CTD	10	-34.71594	137.46122		
WI10	26/11/2008	Grab	10	-34.72019	137.45803		
WI10	27/11/2008	Sled	10	-34.71745	137.45944	-34.72215	137.4556
WI10	27/11/2008	Trap	10	-34.72019	137.45803		
WI10	27/11/2008	Video	10	-34.71604	137.46055	-34.71586	137.46072
WI20	27/11/2008	BRUV1	20	-34.68729	137.25856		
WI20	27/11/2008	BRUV2	20	-34.68579	137.26047		
WI20	27/11/2008	BRUV3	20	-34.68457	137.26249		
WI20	27/11/2008	CTD	20	-34.68395	137.26323		
WI20	26/11/2008	Grab	20	-34.68565	137.26217		
WI20	27/11/2008	Sled	20	-34.68449	137.2604	-34.68757	137.25646
WI20	27/11/2008	Trap	20	-34.68565	137.26217		
WI20	27/11/2008	Trawl	20	-34.68776	137.25629	-34.68465	137.26054
WI20	27/11/2008	Video	20	-34.68407	137.26232	-34.68411	137.26188
WI30	27/11/2008	BRUV1	30	-34.6768	137.16766		
WI30	27/11/2008	BRUV2	30	-34.67502	137.16882		
WI30	27/11/2008	BRUV3	30	-34.67305	137.16995		
WI30	27/11/2008	CTD	30	-34.67098	137.17134		
WI30	26/11/2008	Grab	30	-34.67438	137.1688		
WI30	27/11/2008	Sled	30	-34.67355	137.1714	-34.67782	137.1697
WI30	27/11/2008	Trap	30	-34.67438	137.1688		
WI30	27/11/2008	Trawl	30	-34.67703	137.16941	-34.67305	137.17194
WI30	27/11/2008	Video	30	-34.67175	137.1717	-34.67212	137.17204
WO10	23/11/2008	BRUV1	10	-34.96404	137.83025		
WO10	23/11/2008	BRUV2	10	-34.96192	137.82981		
WO10	23/11/2008	BRUV3	10	-34.95974	137.82965		
WO10	23/11/2008	CTD	10	-34.96534	137.82981		
WO10	23/11/2008	Grab	10	-34.96534	137.82981		
WO10	23/11/2008	Sled	10	-34.96411	137.8295	-34.95978	137.82849
WO10	23/11/2008	Trap	10	-34.96437	137.82911		
WO10	23/11/2008	Trawl	10	-34.96366	137.83187	-34.95934	137.83091
WO10	23/11/2008	Video	10	-34.96615	137.82909		
WO20	23/11/2008	BRUV1	20	-34.97785	137.91765		
WO20	23/11/2008	BRUV2	20	-34.97561	137.91762		
WO20	23/11/2008	BRUV3	20	-34.97342	137.91805		
WO20	23/11/2008	CTD	20	-34.97087	137.91948		
WO20	23/11/2008	Grab	20	-34.97087	137.91948		
WO20	23/11/2008	Sled	20	-34.97393	137.91896	-34.97836	137.91852
WO20	23/11/2008	Trap	20	-34.9801	137.91656		
WO20	23/11/2008	Trawl	20	-34.97546	137.91834	-34.97098	137.91898
WO20	23/11/2008	Video	20			-34.9701	137.91776
WO30	23/11/2008	BRUV1	30	-34.99435	137.97247		
WO30	23/11/2008	BRUV2	30	-34.99207	137.97202		
WO30	23/11/2008	BRUV3	30	-34.98953	137.97168		
WO30	23/11/2008	CTD	30	-34.99492	137.9723		

Site	Date	Method	Depth	Start		Finish	
				Latitude	Longitude	Latitude	Longitude
WO30	23/11/2008	Grab	30	-34.99517	137.97179		
WO30	23/11/2008	Sled	30	-34.99736	137.97139	-34.9927	137.97057
WO30	23/11/2008	Trap	30	-34.99538	137.97286		
WO30	23/11/2008	Trawl	30	-34.99132	137.96885	-34.99569	137.96996
WO30	23/11/2008	Video	30	-34.99411	137.97279	-34.99335	137.97252

Appendix 2. Taxonomic classification and abundances of 169 infaunal species collected from Smith-McIntyre grabs at 23 sites located around Yorke Peninsula during 2008. A reference collection is maintained at SARDI Aquatic Sciences.

Phylum/Family	Species	Corny Point (CP)			Point Souttar (PS)			Point Yorke (PY)			Stenhouse Bay (SB)			Shell Beach (SH)			Troubridge Point (TP)			Wardang Island (WI)		Wool Bay (WO)		
		10 m	20 m	30 m	10 m	20 m	30 m	10 m	20 m	30 m	10 m	20 m	30 m	10 m	20 m	30 m	10 m	20 m	30 m	20 m	30 m	10 m	20 m	30 m
Brachiopoda																								
Terebratellidae	*Magellania flavescens*					7	4																	
Bryozoa																								
Phidoloporidae	*Iodictyum phoeniceum*																		1					
Crustacea																								
Gammaridea	Gammaridea	6	1					1				4	20	1	3				3	18	3			
Flabellifera	Flabellifera										1													
Urohaustoriidae	Urohaustoriidae	16								5	9		37	18	12	2				5	6			
Phoxocephalidae	Phoxocephalidae	44	4	6	17	5	16	25	17	20			17	21	1	14	15	4		33	7	12	17	1
Gammaridea	Gammaridea sp2															12								
Valvifera	Valvifera-1															3		3						
Apseudidae	Apseudidae				1	6	10		1	6						3		6	29	5		11	3	7
Gammaridea	Gammaridea sp3						12																	
Platyischnopidae	Platyischnopidae	17	1		7						2	1	14			3		3		3	2			
Corophiidae	Monocorophium											1												
Cumacea	Cumacea	7	3	6			2		8	1	9		2	11	1		2	1		4	1	1	1	
Phoxocephalidae	Phoxocephalidae sp2										7													
Aoridae	Aoridae				1		10	4		10	10		2					11		26	2	1		1
Dexaminidae	Dexaminidae		2	3		4	16	2	3	3	2		11				4	3		7	2	6	31	
Ampithoidae	Ampithoinae				1	5		8		1	3		1				12					2		
Cumacea	Cumacea sp4							1																
Melitidae	Ceradocus		1	16	1				3		2									2		5	3	3
Tanaidae	*Tanais tenucornis*		1								1			1		1	1			2	2			
Lysianassidae	Lysianassidae				6	11		3			14		1			1	2	1		3		4	13	

Phylum/Family	Species	Corny Point (CP)			Point Souttar (PS)			Point Yorke (PY)			Stenhouse Bay (SB)			Shell Beach (SH)			Troubridge Point (TP)			Wardang Island (WI)		Wool Bay (WO)		
		10 m	20 m	30 m	10 m	20 m	30 m	10 m	20 m	30 m	10 m	20 m	30 m	10 m	20 m	30 m	10 m	20 m	30 m	20 m	30 m	10 m	20 m	30 m
Pontogeneiidae	Pontogeneiidae				11				14	5	1						14	5						
Cylindroleberididae	Cylindroleberididae	1	1		6	4	1	1		1	3			2			2	5		1	4			
Malacostraca	Crab megalopa sp2												3											
Serolidae	Serolina	1			1				1						1									
Mysidacea	Mysidacea								1				2	3	2				2					
Stenothoidae	Stenothoidae												11							3				
Oedicerotidae	Oedicerotidae			7			3											1				3	2	3
Cirolanidae	Cirolana		1	1	2	2												8					2	
Ostracoda	Ostracoda				2								1											
Flabellifera	Flabellifera sp2												2											
Caprellidae	Paraprota						1						1				1	1					1	
Malacostraca	Crab megalopa												1											
Diogenidae	Diogenidae												1											
Alpheidae	Alpheidae													1			1				1	1		
Anthuridea	Anthuridea													3										
Leptocheliidae	*Leptochelia ignotus*													1										
Ischyroceridae	*Cerapus tubularis*	2																				5		
Portunidae	*Ovalipes australiensis*	1																						
Corophiidae	Corophiidae						10	2										12		32			7	
Sphraerpmatidae	Cymodoce				3	7				1			2					6				8	2	
Cypridinidae	Cypridinodes			1		2			8													2	1	
Bodotriidae	Leptocuma		2																					
Anthuridae	Cyathura		1				2										1						1	
Cirolanidae	Cirolanidae																1	1						
Majidae	Majidae							3															1	
Caprellidae	Caprella					1	1	1																
Leucothoidae	Leucothoidae			6														1					4	
Philomedidae	Philomedidae						7	1		3							3	1						

Phylum/Family	Species	Corny Point (CP)			Point Souttar (PS)			Point Yorke (PY)			Stenhouse Bay (SB)			Shell Beach (SH)			Troubridge Point (TP)			Wardang Island (WI)		Wool Bay (WO)		
		10 m	20 m	30 m	10 m	20 m	30 m	10 m	20 m	30 m	10 m	20 m	30 m	10 m	20 m	30 m	10 m	20 m	30 m	20 m	30 m	10 m	20 m	30 m
Cypridinidae	Cypridinidae						3																	
Cumacea	Cumacea sp2																	1						
Cumacea	Cumacea sp3	1																						
Pontocyprididae	Pontocyprididae																1	1						
Bodotriidae	*Glyphocuma bakeri*						13	1		4														
Nebaliidae	Nebalia			8		30	15															8	47	
Podoceridae	Podoceridae					3	3																	
Janiridae	Janiridae					11	1		1								1						4	
Melitidae	Melitidae				7		25										1					7	16	
Ischyroceridae	Ischyroceridae			6			2																	
Asellota	Asellota					10	3																11	
Melitidae	Ceradocus sp2				3	4											1					2		
Ampeliscidae	Ampeliscidae				1	4			5								1					7	6	
Callipallenidae	*Pycnothea flynni*				1				1								8							
Eusiridae	Eusiridae																1							
Galatheidae	Galatheidae																					1		
Chordata																								
Branchiostomatidae	*Epigonichthys australis*		1				2		1									1						
Echinodermata																								
Holothuroidea	Holothuroidea															1								
Ophiuroidea	Ophiuroidea										11		7			59		1						
Echinometridae	Echinometridae	4					7			15							1				1	3	2	3
Sarcodina																								
Foraminifera	Foraminifera										35	18	10			1								
Mollusca																								
Epitoniidae	Rissoina fasciata						3					5												
Condylocardiidae	Condylocardiidae											7												
Cerithiidae	*Aclophoropsis festiva*											12	5									9	16	

Phylum/Family	Species	Corny Point (CP)			Point Souttar (PS)			Point Yorke (PY)			Stenhouse Bay (SB)			Shell Beach (SH)			Troubridge Point (TP)			Wardang Island (WI)		Wool Bay (WO)		
		10 m	20 m	30 m	10 m	20 m	30 m	10 m	20 m	30 m	10 m	20 m	30 m	10 m	20 m	30 m	10 m	20 m	30 m	20 m	30 m	10 m	20 m	30 m
Trochidae	Trochidae									18		8	32						15					
Eulimidae	Eulimidae											1	6											
Olividae	Amalda edithae	1																	1					
Nuculanidae	Nuculanidae							5													2	3		3
Cardiidae	*Nemocardium thetidis*						7																	
Cerithiidae	*Cacozeliana granaria*						1	1													2	1		1
Limopsidae	Limopsis							1														1	1	1
Corbulidae	*Corbula iredalei*		1																1					
Calyptraeidae	Calyptraea		1																					
Veneridae	*Notocallista kingi*									1														
Cardiidae	Acrosterigma																						2	
Columbellidae	Columbellidae		1		12																			
Limidae	Limidae																	1					2	
Veneridae	*Dosinia victoriae*																	1						
Veneridae	Placamen									1														
Tellinidae	Tellinidae					3	3			9							1	1				7	12	1
Philinidae	Philinidae									3													1	
Amphibolidae	Salinator		16																					
Veneridae	Tawera					3	5	8					1					1				6	11	
Ischnochitonidae	Ischnochitonidae sp1		2															4						
Ischnochitonidae	Ischnochitonidae sp2		2																					
Chitonidae	Chitonidae					8	5	1															1	
Ischnochitonidae	*Stenochiton longicymba*																7							
Naticidae	Naticidae								4													1		1
Carditidae	Carditidae						1																	
Mytilidae	Musculus				3																			
Pectinidae	Pectinidae																						1	
Nemata																								

Phylum/Family	Species	Corny Point (CP)			Point Souttar (PS)			Point Yorke (PY)			Stenhouse Bay (SB)			Shell Beach (SH)			Troubridge Point (TP)			Wardang Island (WI)		Wool Bay (WO)		
		10 m	20 m	30 m	10 m	20 m	30 m	10 m	20 m	30 m	10 m	20 m	30 m	10 m	20 m	30 m	10 m	20 m	30 m	20 m	30 m	10 m	20 m	30 m
Nemata	Nematoda		5	10		1																		
Annelida																								
Paralacydoniidae	Paralacydoniidae-1															2								
Sigalionidae	Sigalionidae			4	1			1						1		1								
Nepthyidae	*Nephtys gravieri*							20	3													11	11	
Onuphidae	Onuphidae										1	1									2			
Hesionidae	Hesionidae										1	3												
Syllidae	Syllinae			3	9						17						1							
Magelonidae	Magelona										1													
Opheliidae	Opheliidae					3					3		1				4		1					
Lumbrineridae	Lumbrineridae		2		4	9	1	1			1			1					2			3	27	1
Eunicidae	Nematonereis										1													
Terebellidae	Terebellidae		1	3		3	2				1						2				1	2		
Spionidae	Malacoceros										1													
Orbiniidae	Orbiniidae						3				1					1				1			2	
Spionidae	Prionospio	40	7	1		12	8	7						17	1	2		7	1	9	14	3		
Spionidae	Scolelepis			1											1						1			
Nepthyidae	*Nephtys longipes*													1	2					6				
Oweniidae	Oweniidae									7			1					1						
Sphaerodoridae	Sphaerodoridae												1											
Polygordiidae	Polygordiidae												10						1					
Nepthyidae	Nephtyidae												1											
Orbiniidae	Phylo					2		1																
Ampharetidae	*Amphicteis dalmatica*																				1			
Capitellidae	Mediomastus						12	1													9	43	5	43
Polynoidae	Polynoidae																1					3	2	
Nepthyidae	Aglaophamus		1																	1				
Dorvilleidae	Schistomeringos		6																					

Phylum/Family	Species	Corny Point (CP)			Point Souttar (PS)			Point Yorke (PY)			Stenhouse Bay (SB)			Shell Beach (SH)			Troubridge Point (TP)			Wardang Island (WI)		Wool Bay (WO)		
		10 m	20 m	30 m	10 m	20 m	30 m	10 m	20 m	30 m	10 m	20 m	30 m	10 m	20 m	30 m	10 m	20 m	30 m	20 m	30 m	10 m	20 m	30 m
Phyllodocidae	*Hesionura australiensis*																					3		3
Serpulidae	Serpulidae					1	13													1				
Dorvilleidae	Dorvilleidae		4	4	4			3	6														5	38
Nereididae	Platynereis			1				1																
Flabelligeridae	Flabelligeridae		5	4		5	10	2										1				35	10	
Aonidae	Aonidaes		3																					
Pectinariidae	Pectinariidae		1																					
Poecilochaetidae	Poecilochaetidae		1																					
Chrysopetalidae	Chrysopetalidae		4		1	3			1								1							
Syllidae	Syllidae		55	13	26	2	10		2				4	2	1		4	21		1		1		1
Sigalionidae	Sigalionidae sp2																	4						
Capitellidae	Capitella			7																		3		
Oenonidae	Oenonidae						5										1	2						
Paraonidae	Paraonidae					5												1						
Terebellidae	Terebellidae sp2																	2						
Terebellidae	Terebellidae sp3																	1						
Spionidae	*Microspio occipitalis*			2			4															2	1	
Scalibregmatidae	Scalibregmatidae							2																
Maldanidae	Maldanidae							1									1					5		
Goniadidae	Goniadidae	4	2			6	10													2	1	3		3
Ampharetidae	Ampharetidae							1																
Spionidae	Pseudopolydora						6	1														1		1
Nereididae	Nereididae				30	5		1	4	3	5						2					4		
Phyllodocidae	Phyllodoce		6	4	1		1	1	1													1	1	1
Nepthyidae	Micronephthys																							1
Spionidae	*Prionospio auklandica*																							1
Neph	Nephtys inornata						13																	
Flabelligeridae	Flabelligeridae sp2						5																	

Phylum/Family	Species	Corny Point (CP)			Point Souttar (PS)			Point Yorke (PY)			Stenhouse Bay (SB)			Shell Beach (SH)			Troubridge Point (TP)			Wardang Island (WI)		Wool Bay (WO)		
		10 m	20 m	30 m	10 m	20 m	30 m	10 m	20 m	30 m	10 m	20 m	30 m	10 m	20 m	30 m	10 m	20 m	30 m	20 m	30 m	10 m	20 m	30 m
Capitellidae	Notomastus			18		1	1															3		
Polynoidae	*Lepidonotus melanogrammus*					1																		
Eunicidae	Marphysa					4																		
Euphrosinidae	Euphrosinidae					5											1							
Glyceridae	Glyceridae			3	1	7																	2	
Amphinomidae	Amphinomidae					1																		
Sabellidae	Sabellidae		8	1	1			4										5					7	
Trichobranchidae	Trichobranchidae								1								3					2	4	
Cirratulidae	Cirratulidae								3							3	4							
Acoetidae	Acoetidae																1							
Pectinariidae	*Pectinaria antipoda*																					1		
Eunicidae	Eunicidae								6													11	7	
Platyhelminthes																								
Platyhelminthes	Platyhelminthes					1																		
Sipuncula																								
Sipuncula	Sipuncula														1						1			

Appendix 3. Taxonomic classification and biomass (kg) of 125 epibiota species collected from 22 sled shots around Yorke Peninsula during 2008.

Phylum/Family	Scientific Name	Corny Point (CP)		Point Souttar (PS)			Point Yorke (PY)			Stenhouse Bay (SB)		Shell Beach (SH)			Troubridge Point (TP)			Wardang Island (WI)			Wool Bay (WO)		
		20 m	30 m	10 m	20 m	30 m	10 m	20 m	30 m	20 m	30 m	10 m	20 m	30 m	10 m	20 m	30 m	10 m	20 m	30 m	10 m	20 m	30 m
Brachiopoda																							
Terebratellidae	*Magellania flavescens*		0.93																				
Cancellothyrididae	*Cancellothyris hedleyi*		0.27																				
Bryozoa																							
Phidoloporidae	*Triphyllozoon moniliferum*		0.68																				
Bugulidae	Bryozoan 1		0.19																				
Vesiculariidae	Amathia		0.15																				
Bugulidae	*Bulgula dentata*		0.50																				
Phidoloporidae	*Iodictyum phoeniceum*		0.57															0.20					
Catenicellidae	*Orthoscuticella ventricosa*		0.14					0.28															
Chlorophyta																							
Caulerpaceae	*Caulerpa remotifolia*						0.42																
Chordata																							
Mullidae	*Upeneichthys vlamingii*			0.13																			
Monacanthidae	*Thamnaconus degeni*																					0.42	

Phylum/Family	Scientific Name	Corny Point (CP)		Point Souttar (PS)			Point Yorke (PY)			Stenhouse Bay (SB)		Shell Beach (SH)			Troubridge Point (TP)			Wardang Island (WI)			Wool Bay (WO)		
		20 m	30 m	10 m	20 m	30 m	10 m	20 m	30 m	20 m	30 m	10 m	20 m	30 m	10 m	20 m	30 m	10 m	20 m	30 m	10 m	20 m	30 m
Ostraciidae	*Aracana ornata*																	0.86	0.42				
Labridae	*Pictilabrus laticlavius*														0.35								
Syngnathidae	*Phyllopteryx taeniolatus*																	0.68					
Paralichthyidae	*Pseudorhombus jenynsii*																			0.32			
Neosebastidae	*Maxillicosta meridianus*		0.76		0.25											0.60						0.30	
Triglidae	*Lepidotrigla papilio*		0.50																				0.24
Tetraodontidae	*Polyspina piosae*									0.29	0.53	0.92							0.18				
Monacanthidae	*Brachaluteres jacksonianus*				0.19																		
Monacanthidae	*Acanthaluteres spilomelanurus*							0.32											0.28				
Odacidae	*Siphonognathus beddomei*														0.28								
Diodontidae	*Diodon nicthemerus*			0.14														0.16	0.55				
Monacanthidae	*Scobinichthys granulatus*					0.32		0.22	0.36							0.78					0.49	0.22	
Platycephalidae	*Platycephalus bassensis*								0.70														
Odacidae	*Siphonognathus radiatus*			0.59											0.59			0.75					
Syngnathidae	*Hippocampus sp.*														0.18								

Phylum/Family	Scientific Name	Corny Point (CP)		Point Souttar (PS)			Point Yorke (PY)			Stenhouse Bay (SB)		Shell Beach (SH)			Troubridge Point (TP)			Wardang Island (WI)			Wool Bay (WO)		
		20 m	30 m	10 m	20 m	30 m	10 m	20 m	30 m	20 m	30 m	10 m	20 m	30 m	10 m	20 m	30 m	10 m	20 m	30 m	10 m	20 m	30 m
Callionymidae	*Repomucenus calcaratus*										0.13												0.15
Syngnathidae	*Hippocampus breviceps*																	0.50					
Odacidae	*Heteroscarus acroptilus*			0.80																			
Tetrarogidae	*Gymnapistes marmoratus*																						0.27
Apogonidae	*Vincentia conspersa*																						0.46
Cnidaria																							
Pteroeididae	*Sarcoptilus grandis*					0.18			0.13								0.25						
Faviidae	*Plesiastrea versipora*																				43.00		
Crustacea																							
Portunidae	*Nectocarcinus integrifrons*			0.62	0.95	0.18	0.28	0.31							0.24			0.46	0.52			9.19	
Portunidae	*Ovalipes australiensis*									0.39		0.74				0.12							
Majidae	*Leptomithrax gaimardii*															3.14						2.48	0.24
Diogenidae	*Paguristes frontalis*							0.18								0.30							0.55
Majidae	*Naxia spinosa*						0.20											0.23			0.17	0.32	
Goneplacidae	*Litocheira bispinosa*						0.61														0.11		

Phylum/Family	Scientific Name	Corny Point (CP)		Point Souttar (PS)			Point Yorke (PY)			Stenhouse Bay (SB)		Shell Beach (SH)			Troubridge Point (TP)			Wardang Island (WI)			Wool Bay (WO)		
		20 m	30 m	10 m	20 m	30 m	10 m	20 m	30 m	20 m	30 m	10 m	20 m	30 m	10 m	20 m	30 m	10 m	20 m	30 m	10 m	20 m	30 m
Pilumnidae	*Pilumnus tomentosus*																						0.17
Majidae	*Naxia aurita*																					0.97	
Diogenidae	*Paguristes brevirostris*				0.27								0.30	0.55									
Scyllaridae	*Ibacus peronii*							0.16						0.61									
Portunidae	*Portunus pelagicus*																				0.48	0.28	
Decapoda	*Alpheus sp.*																				0.22		
Xanthidae	*Actaea calculosa*																						
Echinodermata																							
Luidiidae	*Luidia australiae*		0.12																				
Temnopleuridae	*Amblypneustes formosus*						0.21																
Temnppleuridae	*Amblypneustes pallidus*			0.58											0.22			0.50					
Comasteridae	*Comatuella brachiolata*														0.18								
Diadematidae	*Centrostephanus tenuispinus*	1.15		0.23																			
Temnopleuridae	Echinoid. sp.5			0.15																			
Oreasteridae	*Nectria ocellata*			0.80																			
Holothuriidae	*Holothuria hartmeyeri*					0.17																0.43	
Astropectinidae	*Astropecten vappa*		0.36																				
Goniasteridae	*Tosia australis*																				0.60		

Phylum/Family	Scientific Name	Corny Point (CP)		Point Souttar (PS)			Point Yorke (PY)			Stenhouse Bay (SB)		Shell Beach (SH)			Troubridge Point (TP)			Wardang Island (WI)			Wool Bay (WO)		
		20 m	30 m	10 m	20 m	30 m	10 m	20 m	30 m	20 m	30 m	10 m	20 m	30 m	10 m	20 m	30 m	10 m	20 m	30 m	10 m	20 m	30 m
Magnoliophyta																							
Cymodoceaceae	*Amphibolis antartica*		0.30	0.99			0.28	0.46	0.14									0.22	5.88	0.25			
Posidoniaceae	*Posidonia angustifolia*			0.16			0.35	1.84	0.40						0.52			0.99	0.97	0.14			
Zosteraceae	Zostera / Heterozostera						0.23		0.15		0.89									0.15			
Hydrocharitacae	*Halophila australis*						0.11	0.50											0.69	0.62			
Mollusca																							
Phasianellidae	*Phasianella australis*			0.32			0.57								0.24								
Pectinidae	*Mimachlamys asperrima*						0.31													1.00			
Buccinidae	*Fusinus australis*			0.68			0.30									0.59						0.38	
Pinnidae	*Atrina tasmanica*			0.17																			
Sepiidae	*Sepia novaehollandiae*																				0.82		
Ostreidae	*Ostrea angasi*																	0.18					
Veneridae	*Sunetta vaginalis*											0.23											
Mactridae	*Mactra sp.*											0.83											
Glycymerididae	*Glycymeris striatularis*											0.37								0.70			
Buccinidae	*Pleuroploca australasiae*															0.19		0.14				0.14	
Pectinidae	*Equichlamys bifrons*															0.94		0.86				0.26	

Phylum/Family	Scientific Name	Corny Point (CP)		Point Souttar (PS)			Point Yorke (PY)			Stenhouse Bay (SB)		Shell Beach (SH)			Troubridge Point (TP)			Wardang Island (WI)			Wool Bay (WO)		
		20 m	30 m	10 m	20 m	30 m	10 m	20 m	30 m	20 m	30 m	10 m	20 m	30 m	10 m	20 m	30 m	10 m	20 m	30 m	10 m	20 m	30 m
Malleidae	*Malleus meridianus*		0.17			0.18												0.14					
Muricidae	*Pterynotus triformis*			0.20																			
Haliotidae	*Haliotis cyclobates*			0.11																			
Crassatellidae	*Eucrassatella donacina*					0.22																	
Octopodidae	*Octopus pallidus*				0.54											0.48							
Carditidae	*Cardita incrassata*				0.13																		
Glycymerididae	*Glycymeris* sp 1				0.56											0.22							
Conidae	*Conus anemone*				0.80																		
Buccinidae	*Fusinus novaehollandiae*																			0.20			
Mytilidae	*Trichomya hirsuta*																					1.76	
Sepiadariidae	*Sepioloidea lineolata*																				0.25		
Phaeophyta																							
Cystoseiraceae	*Scaberia agardhii*			0.12														0.14	0.70				
Dictyotaceae	*Zonaria spiralis*								1.45							0.36							
Cystoseiraceae	*Cystophora botryocystis*			0.84														0.92					
Sargassaceae	Sargassum sp. 1																	0.35					
Sargassaceae	Sargassum sp. 2			0.27																	0.29		
Cystoseiraceae	*Cystophora monilifera*												0.72										

Phylum/Family	Scientific Name	Corny Point (CP)		Point Souttar (PS)			Point Yorke (PY)			Stenhouse Bay (SB)		Shell Beach (SH)			Troubridge Point (TP)			Wardang Island (WI)			Wool Bay (WO)		
		20 m	30 m	10 m	20 m	30 m	10 m	20 m	30 m	20 m	30 m	10 m	20 m	30 m	10 m	20 m	30 m	10 m	20 m	30 m	10 m	20 m	30 m
Alariaceae	*Ecklonia radiata*									0.19	1.95												
Seirococcaceae	*Scytothalia dorycarpa*									0.12	0.58												
Cystoseiraceae	*Carpoglossum confluens*										0.44												
Porifera																							
Chondropsidae	Chondropsis sp.3		0.55																				
Haplosclerida	Haplosclerid sp.3																						0.27
Chondropsidae	Chondropsid sp.1																	0.62			0.25	0.23	5.33
Thorectidae	Thorectandra sp.																	0.39					
Verongida	Verongid sp.																	0.45					
Spirophorida	Spirophorida sp.			0.14																	1.51		
Haplosclerida	Haplosclerid sp.4					0.80																	
Demospongiae	Demosponge sp.19					0.22																	
Haplosclerida	Haplosclerid sp.2				0.12																		
Spongiidae	Spongiid sp.		3.47																				
Demospongiae	Demosponge sp.10																						0.31
Demospongiae	Demosponge sp.9																						0.28
Rhodophyta																							
Rhodophyceae	*Warrenia comosa*						0.46		0.14						1.59								
Rhodomelaceae	*Osmundaria prolifera*																	0.22	0.24		0.38		
Rhodymeniaceae	*Botryocladia sonderi*															0.15		0.66			1.94		

Phylum/Family	Scientific Name	Corny Point (CP)		Point Souttar (PS)			Point Yorke (PY)			Stenhouse Bay (SB)		Shell Beach (SH)			Troubridge Point (TP)			Wardang Island (WI)			Wool Bay (WO)		
		20 m	30 m	10 m	20 m	30 m	10 m	20 m	30 m	20 m	30 m	10 m	20 m	30 m	10 m	20 m	30 m	10 m	20 m	30 m	10 m	20 m	30 m
Corallinaceae	*Phymatolithon masonianum*																	0.12					
Corallinaceae	*Haliptilon roseum*																	0.18					
Rhodymeniales	*Hymenocladia usnea*																	0.15					
Dasyaceae	*Dasya* sp.																	0.76					
Rhodymeniaceae	*Coelarthrum opuntia*																	0.20					
Sporolithaceae	*Sporolithon durum*			0.13	14.15	0.99										2.94							
Rhodophyceae	*Hypnea charoides*			0.58																			
Rhodomelaceae	*Echinothamnion hystrix*			0.69	0.75																		
Rhodophyceae	*Laurencia calvata*				0.50																		
Urochordata																							
Pyuridae	*Pyura australis*			0.77			0.18	0.51										0.13					
Ascidiacea	Ascidian 1								0.94			0.38											
Riterellidae	*Ritterella* sp.		0.58																				
Pyuridae	*Herdmania momus*					0.16												0.24			0.25		
Styelidae	*Polycarpa s*p.					0.12																	
Pyuridae	*Pyura gibbosa*							0.50															
Ascidiacea	Ascidian sp.3		0.43																				
Ascidiacea	Ascidian sp.4																						1.25

Appendix 4. Taxonomic classification and abundance of 114 epibiota species collected from 19 trawl shots around Yorke Peninsula during 2008.

Phylum/Family	Scientific Name	Point Souttar (PS)			Point Yorke (PY)			Stenhouse Bay (SB)		Shell Beach (SH)			Troubridge Point (TP)			Wardang Island (WI)		Wool Bay (WO)		
		10 m	20 m	30 m	10 m	20 m	30 m	20 m	30 m	10 m	20 m	30 m	10 m	20 m	30 m	20 m	30 m	10 m	20 m	30 m
Annelida																				
Polychaetae	Annelid. sp.									42										
Chordata																				
Antennariidae	*Rhycherus gloveri*																	1		
Apogonidae	*Siphamia cephalotes*	16			1	3					3									
Blenniidae	*Parablennius tasmanianus*	2														1				
Callionymidae	*Foetorepus calauropomus*					1			1					3					1	
Callionymidae	*Repomucenus calcaratus*							2	12						24					
Carangidae	*Pseudocaranx wrighti*								1											
Clinidae	*Cristiceps australis*						1													
Clinidae	*Heteroclinus roseus*				1															
Cynoglossidae	*Cynoglossus broadhursti*								3								1			
Diodontidae	*Diodon nicthemerus*	1					2													
Gerreidae	*Parequula melbournensis*	1	1		15		1							3	3	2	13	1	5	3
Gonorynchidae	*Gonorynchus greyi*						2												1	
Labridae	*Austrolabrus maculatus*	1		2																
Labridae	*Dotalabrus aurantiacus*	10				9							2							
Labridae	*Notolabrus parilus*	1																		
Leptoscopidae	*Crapatulus munroi*							1	3	2		1								
Leptoscopidae	*Lesueurina platycephala*									3										1
Monacanthidae	*Acanthaluteres brownii*	2											12							
Monacanthidae	*Acanthaluteres spilomelanurus*	12		3	9	6	5	1		2						4	8			

Phylum/Family	Scientific Name	Point Souttar (PS)			Point Yorke (PY)			Stenhouse Bay (SB)		Shell Beach (SH)			Troubridge Point (TP)			Wardang Island (WI)		Wool Bay (WO)		
		10 m	20 m	30 m	10 m	20 m	30 m	20 m	30 m	10 m	20 m	30 m	10 m	20 m	30 m	20 m	30 m	10 m	20 m	30 m
Monacanthidae	*Acanthaluteres vittiger*					5	1										2			
Monacanthidae	*Brachaluteres jacksonianus*	4														1	2	7		
Monacanthidae	*Meuschenia scaber*															1				
Monacanthidae	*Scobinichthys granulatus*	3		4		9	1		1				3	3			6	5	6	2
Monacanthidae	*Thamnaconus degeni*			1						1					2				1	4
Mullidae	*Upeneichthys vlamingii*	6	1	1	12	7	3								1	2	9	6	1	2
Neosebastidae	*Maxillicosta meridianus*	2	1	16		1	7		1						1	9	6	2	1	
Neosebastidae	*Neosebastes bougainvillii*			1										2					1	1
Odacidae	*Haletta semifasciata*	1				2										1				
Odacidae	*Heteroscarus acroptilus*	5																		
Odacidae	*Neoodax balteatus*	2																28		
Odacidae	*Siphonognathus argyrophanes*	1				2							1							
Odacidae	*Siphonognathus attenuatus*						2		2						3	1	2		6	
Odacidae	*Siphonognathus beddomei*								1							1		1		
Odacidae	*Siphonognathus radiatus*	101				9		1					16			8				
Ostraciidae	*Aracana aurita*					1														
Ostraciidae	*Aracana ornata*						3							30	1	1		2		
Paralichthyidae	*Pseudorhombus jenynsii*			3			2				1				1	1	1			
Pegasidae	*Pegasus lancifer*								1								1			
Percophidae	*Enigmapercis reducta*							3	3	22		1								
Pinguipedidae	*Parapercis haackei*																	2	23	1
Pinguipedidae	*Parapercis ramsayi*	5		1													1			3
Platycephalidae	*Leviprora inops*					1														
Platycephalidae	*Platycephalus bassensis*						1		4		7	10		7	8		6			3

Phylum/Family	Scientific Name	Point Souttar (PS)			Point Yorke (PY)			Stenhouse Bay (SB)		Shell Beach (SH)			Troubridge Point (TP)			Wardang Island (WI)		Wool Bay (WO)		
		10 m	20 m	30 m	10 m	20 m	30 m	20 m	30 m	10 m	20 m	30 m	10 m	20 m	30 m	20 m	30 m	10 m	20 m	30 m
Platycephalidae	*Platycephalus laevigatus*	4																		
Platycephalidae	*Thysanophyrys cirronasa*	1				1														
Pleuronectidae	*Ammotretis lituratus*										2									
Rajidae	*Dipturus whitleyi*																			1
Rhinobatidae	*Aptychotrema vincentiana*				1															
Rhinobatidae	*Trygonorrhina dumerilii*				1									1						
Squatinidae	*Squatina australis*																			1
Syngnathidae	*Hippocampus breviceps*																	3		
Syngnathidae	*Hippocampus sp.*									1										
Syngnathidae	*Leptoichthys fistularius*					13							4			2				
Syngnathidae	*Phyllopteryx taeniolatus*	3														1		2		
Syngnathidae	*Pugnaso curtiorstris*	1																		
Syngnathidae	*Stigmatopora argus*	2			1	1														
Syngnathidae	*Stigmatopora sp.*	1																		
Syngnathidae	*Stipecampus cristatus*					1														
Syngnathidae	*Syngnathid sp.*					12														
Syngnathidae	*Vanacampus margaritifer*	1																		
Tetraodontidae	*Omegophora armilla*			1																
Tetraodontidae	*Polyspina piosae*				1			50	9	39	26	1				3				
Tetrarogidae	*Gymnapistes marmoratus*																			2
Triglidae	*Lepidotrigla papilio*			5	1				1						16	4				4
Triglidae	*Lepidotrigla vanessa*						1					1								
Urolophidae	*Urolophus paucimaculatus*											1						2		
Crustacea																				

Phylum/Family	Scientific Name	Point Souttar (PS)			Point Yorke (PY)			Stenhouse Bay (SB)		Shell Beach (SH)			Troubridge Point (TP)			Wardang Island (WI)		Wool Bay (WO)		
		10 m	20 m	30 m	10 m	20 m	30 m	20 m	30 m	10 m	20 m	30 m	10 m	20 m	30 m	20 m	30 m	10 m	20 m	30 m
	Austrodromidia australis																	1		
Caridea (Order)	Carid. Sp															1				
Diogenidae	*Paguristes frontalis*			1		2	1			1						1				
Majidae	*Leptomithrax gaimardii*		2	1										5		2			4	1
Majidae	*Naxia aurita*	1			2															
Majidae	*Naxia spinosa*																	1		
Penaeidae	*Penaeus latisulcatus*			1											4					
Pilumnidae	*Pilumnus tomentosus*			1			1													
Portunidae	*Nectocarcinus integrifrons*		3	10		2										8		6	1	
Portunidae	*Ovalipes australiensis*							45		40	2	7		2			1			1
Portunidae	*Portunus pelagicus*																	11	40	
Scyllaridae	*Ibacus peronii*					1						1								
Sphaeromatidae	Isopod sp.1							1												
Sphaeromatidae	Isopod sp.2							1		1										
Echinodermata																				
Arachnoididae	*Ammotrophus arachnoides*									8										
Asteriidae	*Coscinasterias muricata*			2																
Asteriidae	*Uniophora granifera*																		1	
Cidaridae	*Goniocidaris tubaria*			1																
Holothuriidae	*Holothuria hartmeyeri*			7														1	3	
Holothuroidea	Holothuroidea sp.2									1										
Oreasteridae	*Anthaster valvulatus*			1																
Oreasteridae	*Nectria macrobrachia*			2																
Oreasteridae	*Nectria ocellata*			1										3						

Phylum/Family	Scientific Name	Point Souttar (PS)			Point Yorke (PY)			Stenhouse Bay (SB)		Shell Beach (SH)			Troubridge Point (TP)			Wardang Island (WI)		Wool Bay (WO)		
		10 m	20 m	30 m	10 m	20 m	30 m	20 m	30 m	10 m	20 m	30 m	10 m	20 m	30 m	20 m	30 m	10 m	20 m	30 m
Temnopleuridae	*Amblypneustes formosus*															2				
Temnopleuridae	Echinoid. sp.5	7			2															
Temnopleuridae	Echinoid. sp.6			2																
Temnppleuridae	Amblypneustes pallidus	6				2				1										
Mollusca																				
Buccinidae	*Fusinus australis*						2										2			
Buccinidae	*Pleuroploca australasiae*													1						1
Buccunidae	*Cominella eburnea*				1															
Calliostomatidae	*Calliostoma armillata*				6	3														
Carditidae	*Cardita incrassata*			1																
Cassidae	*Semicassis sp.*			1																
Corbulidae	*Corbula stolata*									1										
Donacidae	*Donax electilis*									17										
Haliotidae	*Haliotis cyclobates*				2															
Mactridae	*Mactra sp.*									1										
Naticidae	*Polinices conicus*									2										
Octopodidae	*Octopus pallidus*		1	1										1				3		
Olividae	*Amalda edithae*									2		3								
Olividae	*Oliva australis*									39										
Pectinidae	*Equichlamys bifrons*		1	8	2									4					8	
Pectinidae	*Mimachlamys asperrima*	1			10												12			
Pectinidae	*Pecten fumatus*				4															
Phasianellidae	*Phasianella australis*					7														
Sepiidae	*Sepia novaehollandiae*													1			1	3		

Phylum/Family	Scientific Name	Point Souttar (PS)			Point Yorke (PY)			Stenhouse Bay (SB)		Shell Beach (SH)			Troubridge Point (TP)			Wardang Island (WI)		Wool Bay (WO)		
		10 m	20 m	30 m	10 m	20 m	30 m	20 m	30 m	10 m	20 m	30 m	10 m	20 m	30 m	20 m	30 m	10 m	20 m	30 m
Trochidae	*Thalotia conica*	6			2	17														
Veneridae	*Sunetta vaginalis*									49										

Appendix 5. Taxonomic classification and abundance of 24 fish and motile invertebrate species observed during trap deployment at 24 sites around Yorke Peninsula during 2008. Sites with no fish observed are not included.

Phylum/Family	Scientific Name	Corny Point (CP)			Point Souttar (PS)		Point Yorke (PY)			Stenhouse Bay (SB)		Shell Beach (SH)			Troubridge Point (TP)			Wardang Island (WI)		Wool Bay (WO)	
		10 m	20 m	30 m	10 m	30 m	10 m	20 m	30 m	20 m	30 m	10 m	20 m	30 m	10 m	20 m	30 m	20 m	30 m	20 m	30 m
Chordata																					
Berycidae	*Centroberyx gerrardi*													1							
Clinidae	*Cristiceps australis*									1											
Enoplosidae	*Enoplosus armatus*	2																			
Heterodontidae	*Heterodontus portusjacksoni*						3														1
Labridae	*Notolabrus fucicola*											1									
Labridae	*Notolabrus tetricus*			1										2							
Labridae	*Pictilabrus laticlavius*											4									
Monacanthidae	*Meuschenia freycineti*			1										1							
Monacanthidae	*Meuschenia hippocrepis*	2	1																		
Monacanthidae	*Thamnaconus degeni*					2			1								3		1	2	15
Moridae	*Pseudophycis barbata*			1										1							
Mullidae	*Upeneichthys vlamingii*															1				9	
Neosebastidae	*Neosebastes bougainvillii*		4													1					
Ostraciidae	*Aracana ornata*																	1			
Rhinobatidae	*Trygonorrhina dumerilii*				1										1	1		1			
Sparidae	*Pagrus auratus*			4										7							
Urolophidae	*Urolophus gigas*		1																		
Crustacea																					
Majidae	*Leptomithrax gaimardii*															3				2	
Palinuridae	*Jasus edwardsii*	3																			
Plagusiidae	*Plagusia chabrus*	3	3																		

Phylum/Family	Scientific Name	Corny Point (CP)	Point Souttar (PS)	Point Yorke (PY)	Stenhouse Bay (SB)		Shell Beach (SH)	Troubridge Point (TP)	Wardang Island (WI)	Wool Bay (WO)
Portunidae	*Nectocarcinus integrifrons*		8						6	3
Portunidae	*Ovalipes australiensis*				4	2	9	3		
Echinodermata										
Luidiidae	*Luidia australiae*			1						

Appendix 6. Taxonomic classification and abundance of 89 fish species observed during BRUVS deployment at 24 sites around Yorke Peninsula during 2008.

Scientific Name	Corny Point (CP)			Point Souttar (PS)			Point Yorke (PY)			Stenhouse Bay (SB)			Shell Beach (SH)			Troubridge Point (TP)			Wardang Island (WI)			Wool Bay (WO)		
	10 m	20 m	30 m	10 m	20 m	30 m	10 m	20 m	30 m	10 m	20 m	30 m	10 m	20 m	30 m	10 m	20 m	30 m	10 m	20 m	30 m	10 m	20 m	30 m
Acanthaluteres brownii																			3					
Acanthaluteres spilomelanurus																1			6				2	
Acanthaluteres vittiger				8	2	5		2	4						1	3		3			3		5	
Achoerodus gouldii															1									
Allomycterus pilatus					1																			
Aplodactylus arctidens	1																							
Aracana aurita				1	1								1				3		3	1	1			
Aracana ornata									1		1													
Aracana sp1					1						1						1	1						
Arripis georgianus				29												39			2					
Asymbolus vincenti	1																							
Austrolabrus maculatus	3	3	2												2				2					
Bodianus frenchii		1	1																					
Caesioperca rasor		4	8												4									
Callorhinchus milii																								1
Carangidae sp1									70															
Carcharhinidae sp1							2																	
Carcharhinus obscurus						1																		
Carcharhinus sp1		1																						
Centroberyx gerrardi		4	1												12									
Cheilodactylus nigripes	1	2													2									

Scientific Name	Corny Point (CP)			Point Souttar (PS)			Point Yorke (PY)			Stenhouse Bay (SB)			Shell Beach (SH)			Troubridge Point (TP)			Wardang Island (WI)			Wool Bay (WO)		
	10 m	20 m	30 m	10 m	20 m	30 m	10 m	20 m	30 m	10 m	20 m	30 m	10 m	20 m	30 m	10 m	20 m	30 m	10 m	20 m	30 m	10 m	20 m	30 m
Chelmonops curiosus	1	3																						
Dactylophora nigricans										1														
Dasyatis brevicaudata		2						1	1	2														
Dasyatis thetidis							1	2																
Dinolestes lewini															2									
Diodon nicthemerus															50									
Dipturus whitleyi																								1
Dotalabrus aurantiacus	1																							
Enoplosus armatus	2	4	2												2									
Eubalichthys gunnii		1																						
Furgaleus macki		1																						
Girella zebra	1																							
Haletta semifasciata				1																				
Heterodontus portusjacksoni	1			3	1	2	4		1	1					1	2		1				1		2
Hypoplectrodes nigroruber		1	1												1									
Kyphosus sydneyanus	2	2																						
Meuschenia flavolineata	2	2													2									
Meuschenia freycineti		1	4	3																				
Meuschenia galii		1																						
Meuschenia hippocrepis	10	11	9												1									
Monacanthidae sp1					1													117	150			17		
Mullidae sp1		1																						
Mustelus antarcticus								1								1					1			
Myliobatis australis		1	3									1		3	1									

Scientific Name	Corny Point (CP)			Point Souttar (PS)			Point Yorke (PY)			Stenhouse Bay (SB)			Shell Beach (SH)			Troubridge Point (TP)			Wardang Island (WI)			Wool Bay (WO)		
	10 m	20 m	30 m	10 m	20 m	30 m	10 m	20 m	30 m	10 m	20 m	30 m	10 m	20 m	30 m	10 m	20 m	30 m	10 m	20 m	30 m	10 m	20 m	30 m
Nelusetta ayraudi					7				2			1	20	1				1					2	1
Nemadactylus valenciennesi		1													1									
Neoodax balteatus																1								
Neosebastes bougainvillii			1														1						1	
Neosebastes pandus			2	1																				
Neosebastes scorpaenoides																					1			
Notolabrus parilus	3	5	4	6						4					1	11								
Notolabrus tetricus	8	11	8												4									
Notorynchus cepedianus										1								9			1			3
Odax acroptilus	1									1														
Odax cyanomelas	1																							
Omegophora cyanopunctata																	1							
Pagrus auratus	2	20	9				1								1									
Parapercis sp1		1																					1	
Parascyllium ferrugineum				1																				
Parequula melbournensis	6	2	5	11	100	8	1	13	2	15						1	87		26	7	203	2	3	
Paristiopterus sp1	1																							
Pelates sexlineatus																								1
Pentaceropsis recurvirostris															1							2		
Pictilabrus laticlavius	5	2	2							1					1									
Platycephalus bassensis								1	17		4	1	1	7	5		2	1			9			4
Platycephalus sp1						3		1			1	4		3			1			1			1	1
Platycephalus speculator						2							1											
Polyspina piosae								2	2	2	17	4	7	7	3		12			3				

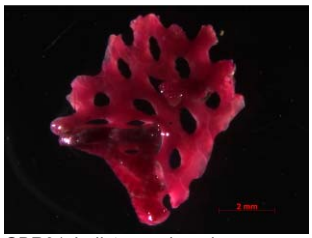
Scientific Name	Corny Point (CP)			Point Souttar (PS)			Point Yorke (PY)			Stenhouse Bay (SB)			Shell Beach (SH)			Troubridge Point (TP)			Wardang Island (WI)			Wool Bay (WO)		
	10 m	20 m	30 m	10 m	20 m	30 m	10 m	20 m	30 m	10 m	20 m	30 m	10 m	20 m	30 m	10 m	20 m	30 m	10 m	20 m	30 m	10 m	20 m	30 m
Pristiophorus nudipinnis									1			1											2	
Pseudocaranx sp		3	7			1			80			25			1		11			80	99		7	33
Pseudophycis sp1															2									
Scobinichthys granulatus				11		5		6	1	1						9	2	1	5		2			
Scorpis aequipinnis	8	2																						
Scyliorhinidae sp1			1																					
Sillaginodes punctata	1	2	4	9				10		1			2		2	1								
Sillago bassensis									7		5	3	99	154	1			59			2			
Sillago sp1									8															
Siphonognathus sp1	18																							
Sphyraena novaehollandiae				2												4								
Sphyraena obtusata																2								
Sphyraena sp1			1																					
Squalus sp1												1									2			
Thamnaconus degeni						943			10									225			20		58	284
Tilodon sexfasciatus	1	4	2												2									
Torquigener pleurogramma													1											
Trachurus novaezelandiae			29						2															1
Trygonorrhina fasciata				5	1		3	2	1							3	12		1	2		1	1	
Upeneichthys vlamingii	14	2	3	7	5	4		4	1	2			1			1			1	2	2			

Appendix 7. Photographic plates depicting 169 infauna species collected in 23 benthic grab samples around Yorke Peninsula. (GB=Brachiopods, GC=Crustaceans, GP=Polychaetes, GM= Mollusca, GE=Echinoderms, GF=Foraminiferans, GNE=Nemerteans, GS=Sipunculans, GBR=Bryozoans, GCE= Cephalochordata, GN=Nematods, GPO=Polyplacophora, GPY=Pycnogonida, GPL= Platyhelminthes


GB01-*Magellania flavescens*


GC04-Phoxocephalidae


GC09-Platyischnopidae


GBR01-*Iodictyum phoeniceum*


GC05-*Gammaridea sp2*


GC10-*Monocorophium*


GC01-*Gammaridea-1*


GC06-Valvifera


GC11-Cumacea


GC02-Flabellifera


GC07-Apseudidae


GC12-*Phoxocephalidae sp2*


GC03-Urohaustoriidae


GC08-*Gammaridea sp3*


GC13-Aoridae


GC14-Dexaminidae

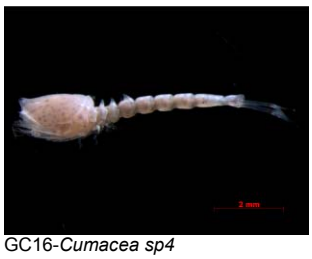

GC20-Pontogeneiidae


GC25-Stenothoidae


GC15-Ampithoinae


GC21-Cylindroleberididae-1


GC26-Oedicerotidae-1


GC16-*Cumacea sp4*

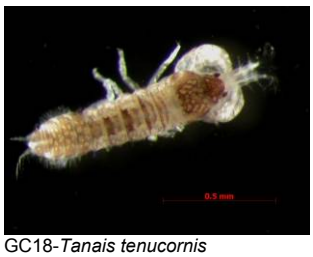

GC21-Cylindroleberididae-2


GC26-Oedicerotidae


GC17-*Ceradocus*


GC22-Crab Megalopa sp2-dorsal


GC27-Cirolana

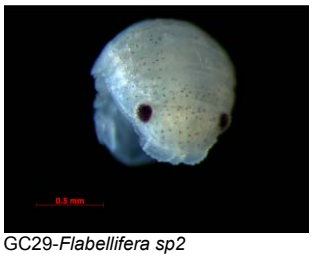

GC18-*Tanais tenucornis*

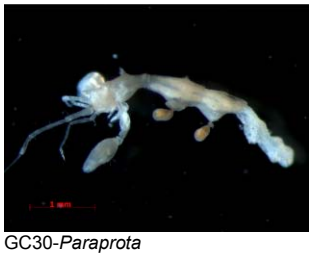

GC23-*Serolina*

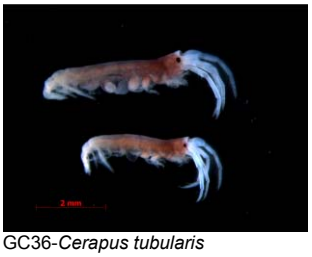

GC28-Ostracoda-1


GC19-Lysianassidae


GC24-Mysidacea


GC29-*Flabellifera sp2*

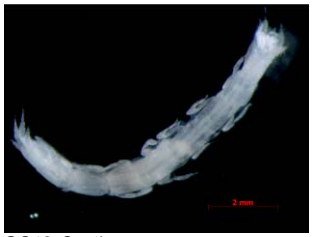

GC30-*Paraprota*


GC36-*Cerapus tubularis*


GC41-*Leptocuma*


GC31-Crab Megalopa-dorsal


GC36-*Cerapus tubularis*-whole


GC42-*Cyathura*


GC32-Diogenidae


GC37-*Ovalipes australiensis*


GC43-Cirolanidae

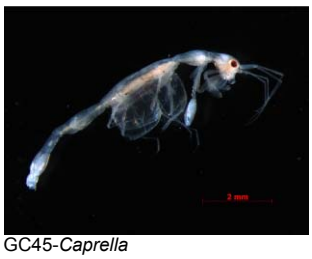

GC33-Alpheidae

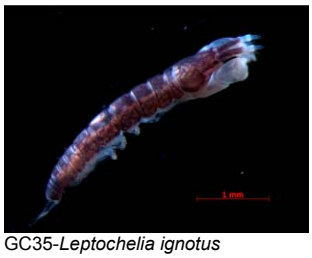

GC38-Corophiidae

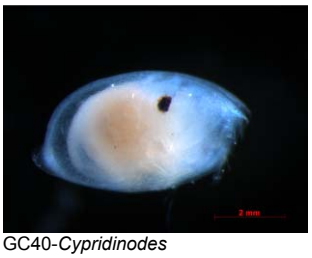

GC44-Majidae


GC34-Anthuridea


GC39-*Cymodoce*


GC45-*Caprella*


GC35-*Leptochelia ignotus*


GC40-*Cypridinodes*

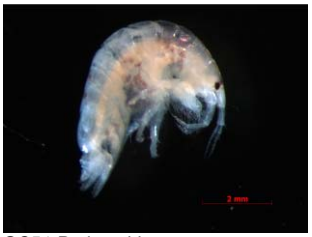

GC46-Leucothoidae

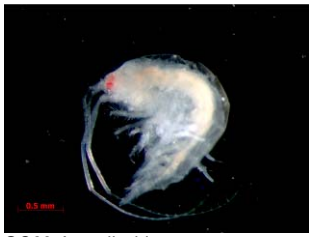

GC47-Philomedidae


GC53-*Nebalia*


GC59-*Ceradocus sp2*


GC48-Cypridinidae


GC54-Podoceridae


GC60-Ampeliscidae


GC49-*Cumacea sp2*


GC55-Janiridae


GC61-Eusiridae


GC50-*Cumacea sp3*


GC56-Melitidae


GC62-Galatheidae


GC51-Pontocyprididae


GC57-Ischyroceridae


GC63-*Gnathia*


GC52-*Glyphocuma bakeri*


GC58-*Asellota*


GCE01-*Epigonichthys australis*


GCE01-*Epigonichthys australis*-hole


GM02-Condylocardiidae


GM08-*Nemocardium thetidis*


GE01-Holothuroidea

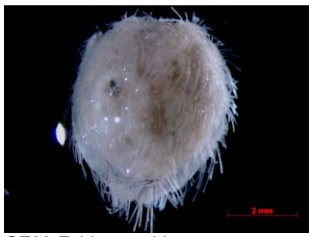

GM03-*Aclophoropsis festiva*


GM09-*Cacozeliana granaria*

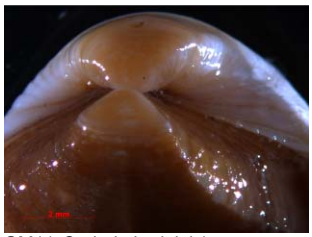

GE02-Ophiuroidea


GM04-Trochidae

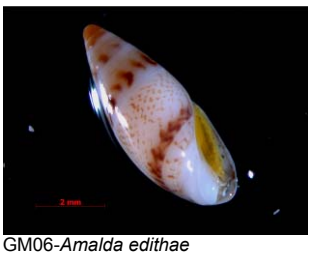

GM10-*Limopsis*


GE03-Echinometridae


GM05-Eulimidae


GM11-*Corbula iredalei*-1


GF01-Foraminifera


GM06-*Amalda edithae*


GM11-*Corbula iredalei*-3


GM01-*Rissoina fasciata*


GM07-Nuculanidae


GM12-*Calyptraea*-dorsal

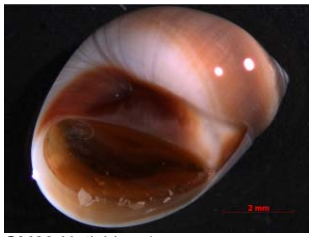

GM12-*Calyptraea*-ventral


GM18-*Placamen*


GM22-*Tawera*


GM13-*Notocallista kingi*


GM19-Tellinidae


GM23-Naticidae-1


GM14-*Acrosterigma*


GM20-Philinidae


GM23-Naticidae-2


GM15-Columbellidae


GM20-Philinidae-lateral


GM24-Carditidae


GM16-Limidae


GM21-*Salinator*-operculum


GM25-*Musculus*


GM17-*Dosinia victoriae*

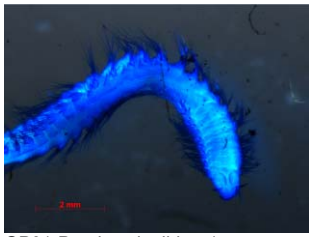

GM21-*Salinator*-spire

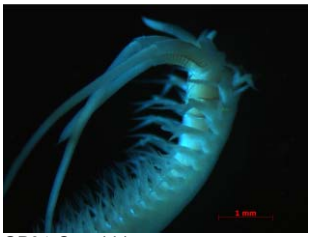

GM26-Pectinidae


GN01-Nematoda

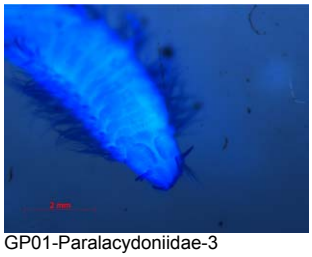

GP03-*Nephtys gravieri*


GP08-Opheliidae

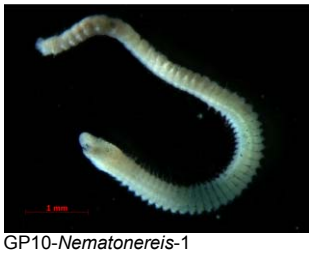

GP01-Paralacydoniidae-1

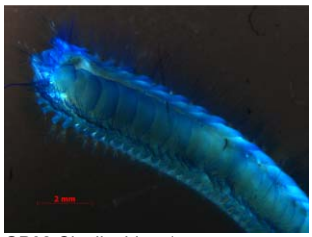

GP04-Onuphidae


GP09-Lumbrineridae


GP01-Paralacydoniidae-3

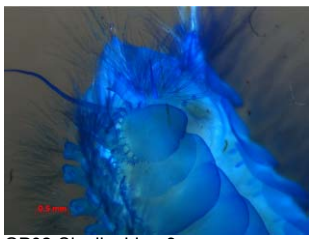

GP04-Onuphidae-Anterior


GP10-*Nematonereis*-1


GP02-Sigalionidae-1

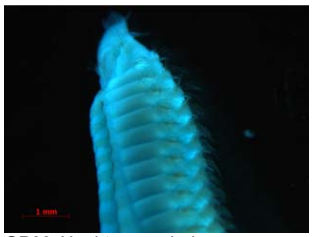

GP05-*Hesionidae sp1*


GP11-Terebellidae-dorsal


GP02-Sigalionidae-3

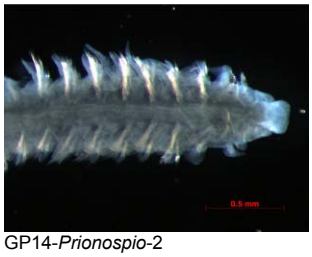

GP06-*Syllinae*

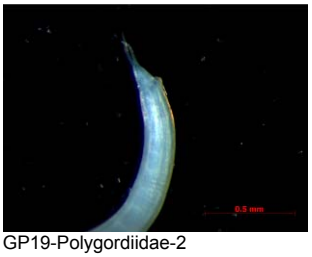

GP12-*Malacoceros*-1


GP03-*Nephtys gravieri*


GP07-*Magelona*


GP13-Orbiniidae


GP14-*Prionospio*-2

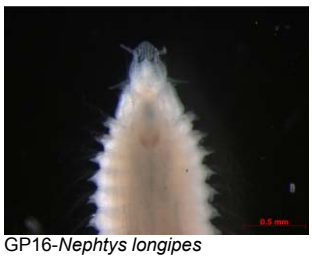

GP19-Polygordiidae-2


GP25-Polynoidae


GP15-*Scolelepis*

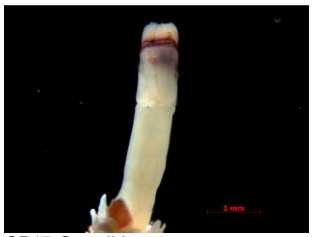

GP20-Nephtydae-1


GP26-*Aglaophamus*


GP16-*Nephtys longipes*


GP21-Sigalionidae


GP27-*Schistomeringos*


GP17-Oweniidae

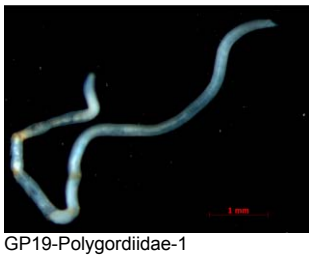

GP22-*Phylo*


GP28-*Hesionura australiensis*


GP18-Sphaerodoridae

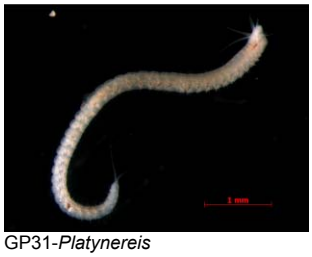

GP23-*Amphicteis dalmatica*


GP29-Serpulidae

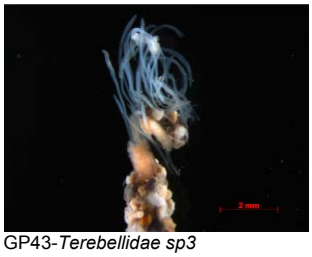

GP19-Polygordiidae-1


GP24-*Mediomastus*


GP30-Dorvilleidae


GP31-*Platynereis*


GP37-Syllidae


GP43-*Terebellidae sp3*


GP32-Flabelligeridae

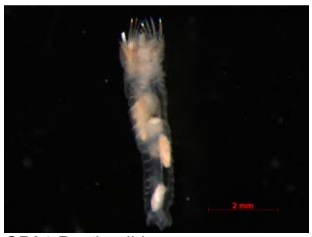

GP38-*Sigalionidae sp2*


GP44-*Microspio occipitalis*


GP33-*Aonides*


GP39-*Capitella*


GP45-Scalibregmatidae


GP34-Pectinariidae


GP40-Oenonidae


GP46-Maldanidae


GP35-Poecilochaetidae


GP41-Paraonidae


GP47-Goniadidae-chevron


GP36-Chrysopetalidae


GP42-*Terebellidae sp2*


GP48-Ampharetidae


GP49-*Pseudopolydora*


GP55-*Flabelligeridae sp2*

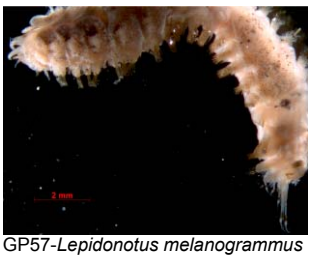

GP60-Glyceridae


GP50-Nereididae


GP56-*Notomastus*


GP60-Glyceridae-Jaws


GP51-*Phillodoce*


GP57-*Lepidonotus melanogrammus*


GP61-Amphinomidae


GP52-*Micronephthys*

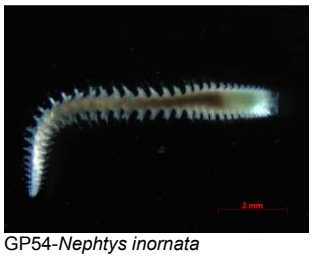

GP58-*Marphysa*


GP62-Sabellidae

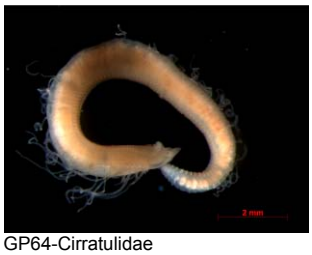

GP53-*Prionospio auklandica*


GP59-Euphrosinidae-dorsal


GP63-Trichobranchidae

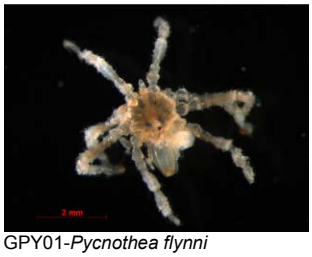

GP54-*Nephtys inornata*

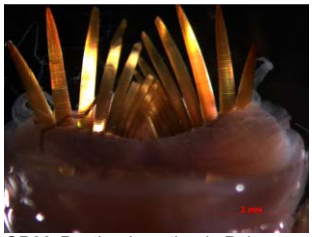

GP59-Euphrosinidae-ventral


GP64-Cirratulidae


GP65-Acoetidae


GPO01-*Ischnochitonidae sp1*


GPY01-*Pycnothea flynni*


GP66-*Pectinaria antipoda*-Paleae


GPO02-*Ischnochitonidae sp2*


GNE01-Nemertea


GP67-Eunicidae


GPO03-Chitonidae


GS01- Sipuncula


GPL01-Platyhelminthes


GPO04-*Stenochiton longicymba*

Appendix 8. Photographic plates depicting 232 epibiota species collected in trap, sled and beam trawl samples around Yorke Peninsula. (F=fish, G=seagrass, I=invertebrates, X=algae)


F001 *Heterodontus portusjacksoni*


F005 *Neosebastes bougainvillii*


F009 *Meuschenia hippocrepis*


F002 *Leptoichthys fistularis*


F006 *Thamnaconus degeni*


F010 *Urolophus gigas*


F003 *Upeneichthys vlamingii*


F007 *Aracana ornata*


F011 *Meuschenia freycineti*


F004 *Tygonorrhrhina dumerilii*


F008 *Enoplosus armatus*


F012 *Notolabrus tetricus*


F013 *Pseudophycis barbata*

F018 *Centroberyx gerrardi*


F023 *Parequula melbournensis*

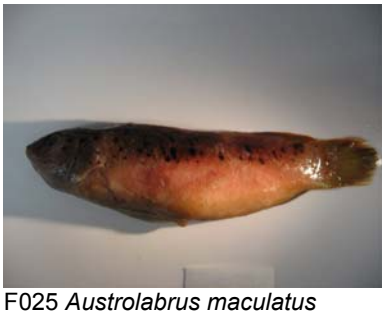
F014 *Chrysophrys auratus*


F019 *Pseudorhombus jenynsii*


F024 *Polysina piosae*

F015 *Notolabrus fucicola*

F020 *Cristiceps australis*


F025 *Austrolabrus maculatus*


F016 *Pictilabrus laticlavius*


F021 *Maxillicosta meridianus*


F026 *Meuschenia scaber*


F017 *Phyllopteryx taeniolatus*


F022 *Lepidotrigla papilo*

F027 *Brachaluteres jacksonianus*


F028 *Acanthaluteres spilomelanurus*


F033 *Lepidotrigla vanessa*


F038 *Platycephalus bassensis*


F029 *Haletta semifasciata*


F034 *Gonorynchus greyi*


F039 *Cynoglossus broadhursti*


F030 *Siphonognathus beddomei*


F035 *Diodon nicthemerus*


F040 *Pegasus lancifer*


F031 *Siphongnathus attenuatus*


F036 *Acanthaluteres vittiger*


F041 *Parapercis ramsayi*


F032 *Parablennius tasmanianus*


F037 *Scobinichthys granulatus*


F042 *Siphonognathus argyrophanes*


F043 *Acanthaluteres brownii*


F048 *Lesueurina platycephala*

F053 *Thysanophyrys cirronasa*


F044 *Dotalabrus aurantiacus*


F049 *Hippocampus* sp.


F054 *Notalabrus parilus*

F045 *Siphonognathus radiatus*


F050 *Repomucenus calcaratus*


F055 *Siphamia cephalotes*


F046 *Enigmapercis reducta*


F051 *Hippocampus breviceps*

F056 *Stigmatapora argus*

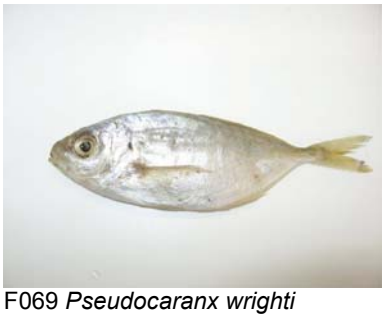

F047 *Crapatulus munroi*

F052 *Platycephalus laevigatus*

F057 *Pugnaso curtiostris*


F058 Vanacampus margaritifer


F064 *Foetorepus calauropomus*


F069 *Pseudocaranx wrighti*


F059 *Stigmatopora* sp.


F065 *Laeviprora inops*


F070 *Urolophus paucimaculatus*


F060 *Neoodax balteatus*


F066 *Aracana aurita*


F071 *Parapercis haackei*


F062 *Heteroscarus acroptilus*


F067 Syngnathid sp.


F072 Ammotretis lituratus


F063 *Omegophora armilla*


F068 *Stipecampus cristatus*


F073 *Spiniraja whitleyi*


F074 *Squatina australis*


F079 *Heteroclinus roseus*


G006 *Posidonia coriacea*


F075 *Gymnapistes marmoratus*


G001 *Amphibolis antarctica*


I001 *Sarcoptilus grandis*


F076 *Rhycherus gloveri*


G003 *Posidonia angustifolia*


I002 *Luidia australiae*


F077 *Vincentia conspersa*


G004 *Zostera/Heterozostera*


I003 *Nectocarinus integrifrons*


F078 *Aptychotrema vincentiana*


G005 *Halophila australis*


I004 *Jasus edwardsii*


I005 *Plagusia chabrus*

I010 *Amblypneustes formosus*

I015 *Naxia spinosa*

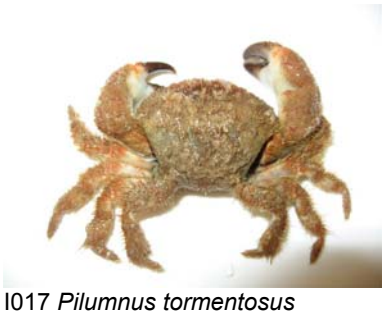
I006 *Ovalipes australiensis*

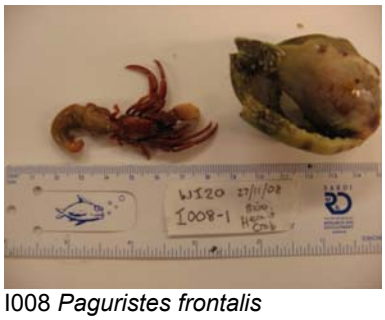

I011 *Phasianella australis*

I016 *Litocheira bispinosa*


I007 *Leptomithrax gaimardii*


I012 *Pyura australis*


I017 *Pilumnus tormentosus*

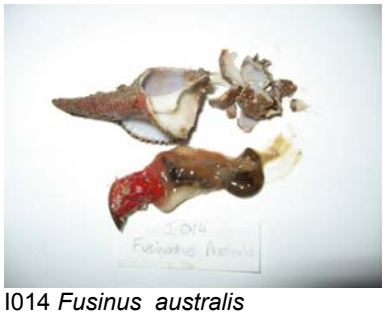


I008 *Paguristes frontalis*


I013 *Mimachlamys asperrima*

I018 *Atrina (Servatrrina) tasmanica*


I009 Carid sp.


I014 *Fusinus australis*


I020 *Chondropsis* sp.3


I021 Ascidian sp. 1


I027 Haplosclerid sp.3


I032 *Corbula stolata*


I022 *Sepia novaehollandiae*


I028 *Sunetta vaginalis*


I033 *Polinices conicus*


I023 *Smilium peroni*


I029 *Oliva australis*

I034 *Mactra* sp.

I025 *Ostrea angasi*


I030 *Almada edithae*


I035 *Ammotrophus arachnoids*


I026 Didemnid sp.1


I031 *Donax electilis*


I036 *Ampblypneustes pallidus*


I037 Isopod sp. 2


I042 *Clathria* sp.

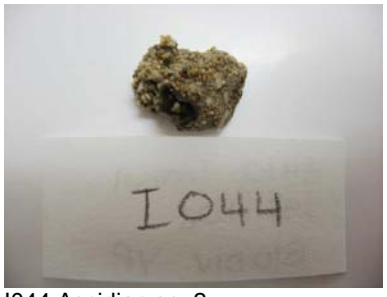

I048 *Comatuella brachiolata*


I038 Annelid sp.

I043 *Bugularia dissimilis*


I049 Demosponge sp. 17

I039 Holothuroidea sp. 1



I044 Ascidian sp. 2


I050 *Centrostephanus tenuispinus*


I040 Demosponge sp 1


I046 *Amphisbetia operculata*


I051 Isopod sp. 1


I041 *Ritterella* sp.


I047 *Glycymeris (G.) striatularis*


I052 *Scytalium* sp.


I053 *Pleuroploca australasiae*

I058 *Herdmania momus*


I063 *Tethya* sp. 1


I054 *Equichlamys bifrons*


I059 Chondropsid. sp.1


I064 Echinoid sp.5.


I055 *Malleus (M.) meridianus*


I060 *Thorectandra* sp.

I065 *Thalotia conica*


I056 *Iodictyum phoeniceum*


I061 Verongid. sp.


I066 *Pterynotis triformis*


I057 *Thorectandra* sp.


I062 *Naxia aurita*

I067 *Nectria ocellata*


I068 Spirophorid. sp.


I073 *Polycarpa* sp


I078 *Coscinasterias muricata*


I069 *Haliotis cyclobates*


I074 Demosponge sp. 19


I079 *Anthaster valvulatus*


I070 *Eucrassatella donacina*


I075 *Nectria macrobrachia*


I080 *Goniocidaris tubaria*


I071 *Holothuria hartmeyeri*


I076 *Octopus pallidus*


I081 *Plesiastrea versipora*


I072 Haplosclerid sp. 4


I077 *Penaeus latisulcatus*


I082 *Pinna bicolor*


I083 *Semicassis* sp.


I088 Demosponge sp.6


I093 *Pyura abradata*


I084 *Cardita incrassata*


I089 Demosponge sp.5


I094 *Polycarpa pedunculata*


I085 *Psammocinnia* sp. SG1


I090 *Holopsamma* sp. Indet.


I095 *Glycymeris* sp.


I086 Echinoid sp.6.


I091 *Pyura spinifera*


I096 *Conus anemone*


I087 *Triphyllozoon moniliferum*


I092 *Cnemidocarpa pedata*


I097 *Paguristes breviostris*


I098 Haplosclerid. sp. 2


I103 *Fusinus novaehollandiae*


I108 Ascidian sp. 3


I099 *Calliostoma armillata*


I104 *Astropecten vappa*


I109 Bryozoan sp. 1


I100 *Ibacus peronii*


I105 *Magellania flavescens*


I110 *Amathia* sp.


I101 *Orthoscuticella ventricosa*


I106 *Cancellothyris hedleyi*


I111 *Bulgula dentata*


I102 *Pyura gibbosa*


I107 Spongiid. sp.


I112 *Tosia australis*


I113 *Portunus (P.) pelagicus*


I118 *Austrodromidia australis*


I123 *Cryptodromia octodentata*


I114 *Trichomya hirsuta*


I119 *Holopsamma* sp.


I124 Ascidian sp.4


I115 *Uniophora granifera*


I120 Demosponge sp.2


I125 Demosponge sp.9


I116 *Sepioloidea lineolata*


I121 *Actaea calculosa*


I126 *Pecten fumatus*


I117 *Alpheus* sp.


I122 Sponge 4


I127 *Cominella eburnean*

X001 Caulerpa flexilis


X006 *Botryocladia sonderi*


X011 *Dasya* sp.


X002 *Warrenia cosmosa*


X007 *Cystophora botrycystis*

X012 *Coelarthrum opuntia*


X003 *Osmundaria prolifera*


X008 *Phymatolithon masonianum*

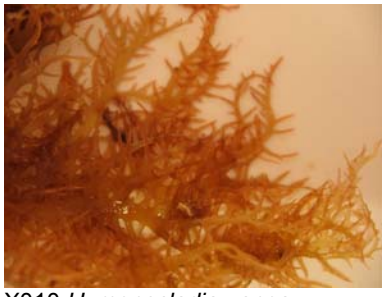

X013 *Sargassum* sp. 1


X004 *Scaberia agardhii*


X009 *Haliptilon roseum*


X014 *Sporolithon durum*


X005 *Zonaria spiralis*


X010 *Hymenocladia usnea*


X015 *Hypnea charoides*


X016 *Sargassum* sp. 2


X021 *Cystophora monilifera*


X017 *Echinothamnion hystrix*


X022 *Ecklonia radiata*


X018 Ceramiaceae

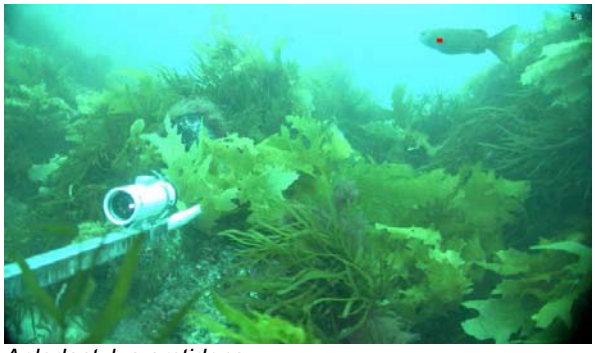

X023 *Scythothalia dorycarpa*


X019 *Sporolithon* 2


X024 *Carpoglassum confluens*


X020 *Laurencia clavata*

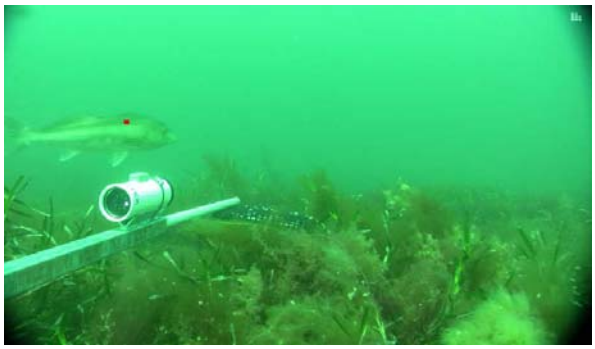
Appendix 9. Still images of 38 fish species identified from BRUVS deployments at 24 sites around Yorke Peninsula. In the case of multiple fish in one image the species identified is indicated by a red dot.



Aplodactylus arctidens

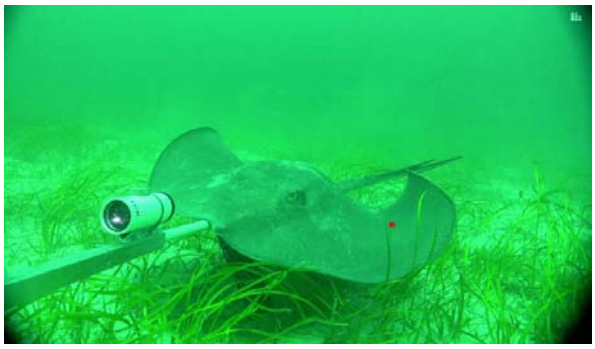
Cheilodactylus nigripes

Centroberyx gerrardi



Dactylophora nigricans

Chelmonops curious



Dasyatis brevicaudata

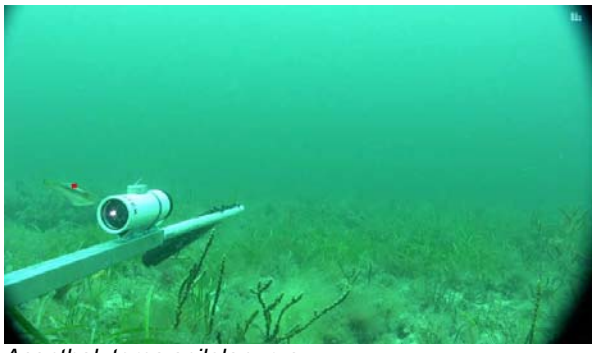

Dasyatis theditis

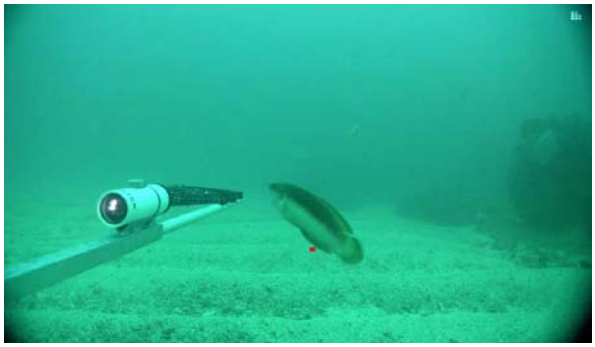

Notolabrus parilus


Paraquula melbournensis


Pictolabrus laticlavius


Notorynchus cepedianus

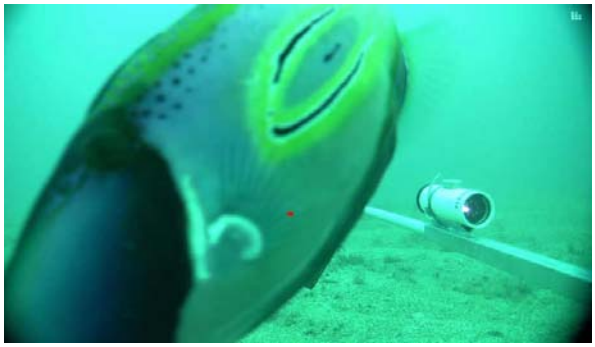

Acanthaluteres spilolanurus

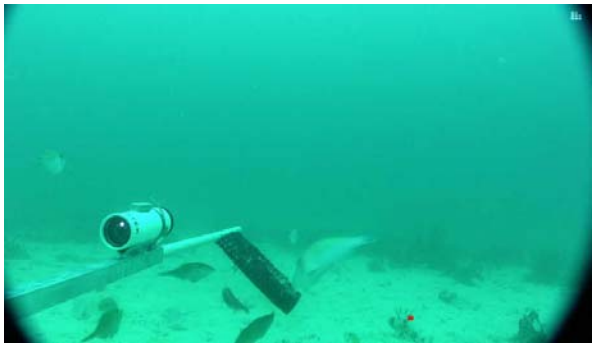

Austrolabrus maculates


Acanthaluteres vittiger


Meuschenia freycineti

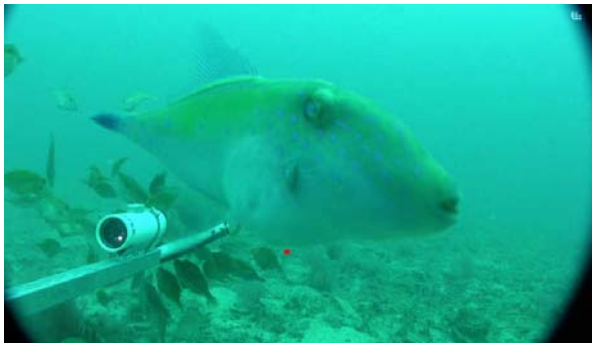

Neobastes pandus


Meuschenia hippocrepis

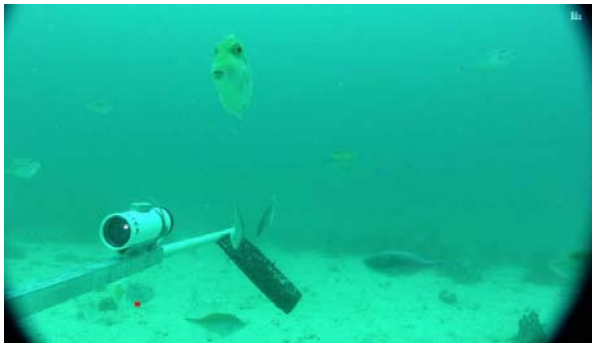

Neobastes scorpaenoides


Scorpinichthys granulatus


Haletta semifasciata


Thamnaconus degeni


Neobax balteatus


Aracana aurita

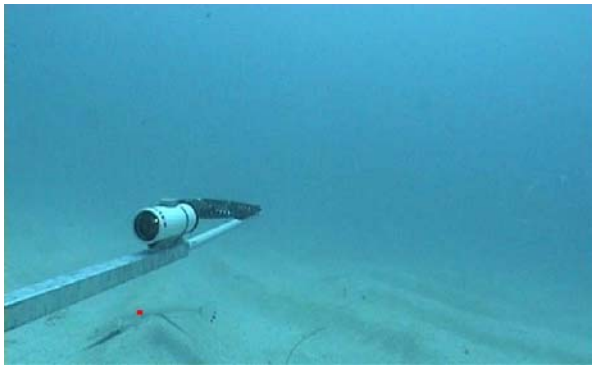

Trygonorrhina dumerilii


Aracana ornate


Scorpis aequipinnis

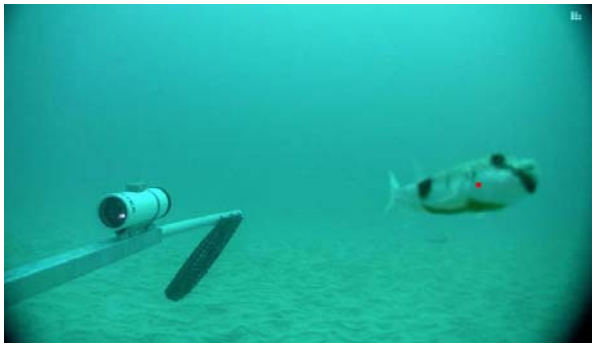

Pentaceropsis recurvirostris


Caesioperca razor

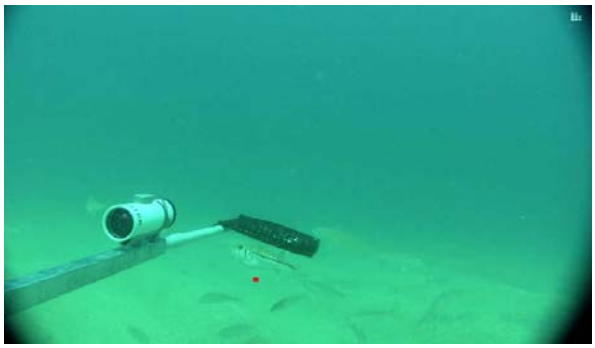

Platycephalus speculator


Sillaginodes punctata


Chrysophrys auratus


Polyspina peosae


Sphyraena novaehollandiae


Torquigener pleurogramma


Sphyraena obtusata


Furgaleus macki


Omegophora cyanopunctata


Mustelus antarcticus